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B.Sc. (Semester - I) (Old) (CBCS) Examination: March/April - 2025
English (Comp.)
Communication Skill (22221101)

Day & Date: Thursday, 08-May-2025
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Choose the correct alternatives from the options.

08

- 1) Where did Gandhi meet his Missionary friends?

a) Vellore	b) Ranchi
c) Madras	d) Delhi
- 2) Khushwant Singh went abroad for _____ years for his study.

a) six	b) five
c) three	d) two
- 3) Where should one look for allies?

a) Heart	b) Friends
c) Brothers	d) The battlefield
- 4) _____ sung praises for flowers.

a) Bard	b) Sparrows
c) Honey bees	d) Saints
- 5) What did the father do at last?

a) Hugs the boy	b) Prays
c) Feed the boy	d) Put off the light
- 6) What is the suitable prefix of the word - possible?

a) impossible	b) impossible
c) nonpossible	d) impossible
- 7) What is the suitable suffix for the word - weak?

a) Unweak	b) Weakless
c) Weakness	d) Weakout
- 8) I like movies. The underlined word in the sentence is _____.

a) verb	b) adverb
c) adjective	d) None of the above

- Q.2 Write the answers in short. (Any Four) 12**
- a) What is the subject matter of the poem - The Lotus?
 - b) What is the importance of khadi in the context of the freedom struggle?
 - c) What is the significance of sparrows?
 - d) Discuss the poet's state of mind in the poem - Let Me Not Pray to be Sheltered from Dangers?
 - e) Discuss the theme of guilt in the poem - The Toys?
 - f) What is the significance of the toys in the poem?
- Q.3 Answer the following questions. (Any One) 10**
- a) What is communication and state the components of communication?
- OR**
- b) Write a detail note on the channels of communication?
- Q.4 Discuss Interpersonal Skills and the strategies to improve it? 10**

Seat No.	

Set P

B.Sc. (Semester - I) (Old) (CBCS) Examination: March/April - 2025
CHEMISTRY (Paper - I)
Physical Chemistry (22221106)

Day & Date: Friday, 09-May-2025
 Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Draw neat diagram and give equations wherever necessary.
 3) Figures to the right indicate full marks.

Q.1 Multiple choice questions.

08

- 1) The slope of straight line may be _____.
 a) always positive b) always negative
 c) may be positive or negative d) Zero
- 2) The compressibility factor 'Z' for an ideal gas is _____.
 a) Zero b) less than one
 c) equal to one d) more than one
- 3) The unit of a in Van der Waals equation is _____.
 a) $\text{Nm}^{-2} (\text{dm}^3)^2 \text{mole}^{-2}$ b) $\text{Nm}^{-2} (\text{dm}^3)^{-2} \text{mole}^{-2}$
 c) $\text{Nm}^{-2} (\text{dm}^3)^{-2} \text{mole}^2$ d) $\text{Nm}^{-2} (\text{dm}^3) \text{mole}^{-1}$
- 4) All spontaneous processes are irreversible. This statement represents _____ law of thermodynamics.
 a) zeroth b) First
 c) second d) Third
- 5) The half life period of a reaction is independent of the initial concentration of the reactants. The reaction is of _____.
 a) Zero order b) First order
 c) Second order d) Third order
- 6) Processes that are occurring at constant volume are referred as _____ processes.
 a) Isochoric b) Isothermal
 c) Isobaric d) Isotonic
- 7) Hydrolysis of methyl acetate in presence of acid is an example of _____ reaction.
 a) Pseudo-unimolecular b) Bimolecular
 c) Unimolecular d) Termolecular
- 8) The critical volume V_c is related with van der Waal's constant 'b' as _____.
 a) $V_c = b$ b) $V_c = 2b$
 c) $V_c = 3b$ d) $V_c = -2b$

- Q.2 Answer any four of the following. 08**
- a) Write the rate constant expression for second order reaction with equal initial concentrations of reactants.
 - b) Give the mechanism of the reaction between $K_2S_2O_8$ and KI.
 - c) What is excluded volume for a gas?
 - d) Define order of a chemical reaction.
 - e) State Joule-Thomson effect.
- Q.3 Write short notes on any two of the following 08**
- a) Rules of differentiation
 - b) Pseudo-unimolecular chemical reaction
 - c) Characteristics of first order reaction
- Q.4 Answer any two of the following. 08**
- a) Van der Waals constants for carbon dioxide are given as,
 $a = 3.6 \times 1.013 \times 10^5 \text{ Pa (dm}^3)^2 \text{ mol}^{-2}$; $b = 0.0428 \text{ dm}^3 \text{ mol}^{-1}$,
 $R = 0.082 \times 1.013 \times 10^5 \text{ dm}^3 \text{ Nm}^{-2} \text{ K}^{-1} \text{ mol}^{-1}$.
Calculate the critical constants P_c and V_c of CO_2 .
 - b) A second order reaction where initial concentrations of both the reactants same is half completed in 40 min. In how much time it will be 90% completed?
 - c) What is a slope? Explain the characteristics of slope.
- Q.5 Answer any one of the following. 08**
- a) Discuss Andrew's isotherm for carbon dioxide gas.
 - b) By using Carnot's cycle, derive the expression for efficiency of the process.

Max. Marks: 40

Q.1 Choose Correct Alternatives:

08

- Page 1 of 2

- Q.2 Answer the following. (Any Four) 08**
- a) What is Pseudo code?
 - b) Define system Software.
 - c) Define Hardware.
 - d) List out all Input devices.
 - e) What is Primary memory?
 - f) Define Output Device.
- Q.3 Write short note. (Any Two) 08**
- a) Algorithm
 - b) Mark - I computer
 - c) Flowcharts
- Q.4 Answer the following. (Any Two) 08**
- a) Write any four excel functions with example.
 - b) Explain different characteristics of computer.
 - c) Explain mouse and its types.
- Q.5 Answer the following. (Any One) 08**
- a) Write the features of MS-Excel.
 - b) Write the steps of mail merge.

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B.Sc. (Semester - I) (Old) (CBCS) Examination: March/April - 2025
CHEMISTRY (Paper - II)
Inorganic Chemistry (22221107)

Day & Date: Saturday, 10-May-2025
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary
3) Figures to the right indicate full marks.
4) Use of logarithmic table and calculator is allowed.
(At. Wts.: H = 1, C = 12, O = 16, N = 14, Na = 23, Cl = 35.5)

Q.1 Select the most correct alternative from among those given below and rewrite the sentence. **08**

- The outer electronic configuration of Chlorine is _____.
a) [Ne] $3s^2 3p^5$ b) [Ne] $3s^3 3p^4$
c) [Ne] $3s^2 3p^3$ d) [Ne] $3s^2$
- The electrostatic force of attraction between oppositely charged ions produces _____.
a) covalent bond b) metallic bond
c) ionic bond d) chemical bond
- Geometry of molecule depends upon _____.
a) type of overlap b) type of orbitals
c) nature of overlap d) type of hybridization
- Principal quantum number accounts _____ of electron.
a) size b) energy
c) orientation d) spin
- Limiting radius ratio for octahedral geometry is _____.
a) 0.225 b) 0.414
c) 0.175 d) 0.832
- In Nonbonding molecular orbitals (NBMO's), overlap integral 's' is _____.
a) equal to zero b) always one
c) greater than zero d) less than zero
- Degenerate atomic orbitals have _____ energy.
a) very high b) very low
c) same d) different
- Born-Haber cycle is used to calculate _____.
a) lattice energy b) heat of formation
c) electron affinity d) all of these

- Q.2 Answer any four of the following** **08**
- a) Give significance of Fajans rule.
 - b) Explain in brief Pauli's Exclusion Principle.
 - c) Give the limitations of Valence Bond Theory (VBT).
 - d) Explain s-s overlap.
 - e) Draw the structure of unit cell of Caesium chloride.
- Q.3 Write short notes on any two of the following.** **08**
- a) Characteristics of ionic compounds
 - b) Quantum mechanics
 - c) Formation of PCl_5 molecule on the basis of sp^3d hybridization
- Q.4 Answer Any Two of the following** **08**
- a) Discuss the trend of atomic radii, ionization energy, electronegativity and reactivity of s-block and p-block elements across the period and group in periodic table.
 - b) Describe the structure of NaCl w.r.to unit cell, coordination number and stoichiometry.
 - c) Difference between bonding and antibonding molecular orbitals.
- Q.5 Answer any one of the following** **08**
- a) Give the postulates of VSEPR Theory. Explain the bonding and structure of H_2O molecule on the basis of VSEPR theory.
 - b) Draw the molecular orbital diagram for N_2 and CO molecule. Comment on their bond order, stability and magnetic characters. Why CO is more stable than N_2 though both have same bond order?

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B.Sc. (Semester - I) (Old) (CBCS) Examination: March/April - 2025
COMPUTER SCIENCE (Paper - II)
Programming Using C (22221121)

Day & Date: Saturday, 10-May-2025
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary
3) Figures to the right indicate full marks.

Q.1 Multiple choice questions.

08

- 1) _____ operator not operates on floating type data.

a) %	b) &&
c) sizeof	d) ++
- 2) _____ format code is used to read array of character.

a) %char	b) %string
c) %s	d) %arr
- 3) _____ file is created after compilation of “Good.c” program.

a) Good.doc	b) Good.obj
c) Good.exe	d) Good.apk
- 4) _____ is the illegal identifier.

a) MaX12	b) Max_12
c) 12Max	d) _Max
- 5) _____ function is user defined.

a) clrser()	b) printf()
c) getch()	d) main()
- 6) _____ is the name given by the programmer.

a) Header file	b) Operator
c) Identifier	d) Both a & b
- 7) _____ operator returns memory address of operand.

a) sizeof	b) add
c) &	d) <<
- 8) What will be output of following C code?

```
Float a = 16, b = 4;  
printf(“%f”,(a%b));
```

a) 4.0	b) 0.0
c) 24	d) Compilation error

- Q.2 Answer Any Four of the following** **08**
- a) What is token?
 - b) List of types of operators.
 - c) How to access array element?
 - d) What is dynamic array?
 - e) Define the term looping.
 - f) What is Table of string?
- Q.3 Write short notes on Any Two of the following.** **08**
- a) Recursion
 - b) Structure & union
 - c) Storage classes
- Q.4 Answer Any Two of the following** **08**
- a) Explain the structure of 'C' Program.
 - b) Explain call by value and call by address with example.
 - c) What is command line argument? Explain in details.
- Q.5 Answer Any One of the following** **08**
- a) Write a program for addition of matrices.
 - b) What is string? Explain all inbuilt function of strings in details.

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B.Sc. (Semester - I) (Old) (CBCS) Examination: March/April - 2025
PHYSICS (Paper - I)
Mechanics and Properties of Matter (22221104)

Day & Date: Tuesday, 13-May-2025
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams and give equations wherever necessary
- 4) Use of log or calculator is allowed.

Q.1 Select the correct alternatives from the following:

08

- 1) Moment of inertia of a spherical shell of mass 500 gm and radius 5 cm about an axis of rotation passing through its diameter _____

a) 8333 gm.cm^2 b) 20833 gm.cm^2

c) 8603 gm.cm^2 d) 2333 gm.cm^2
- 2) All types of pendulum can be used to determine _____ at a given place.

a) Gravitational constant

b) acceleration due to gravity

c) Gravitational potential

d) the period of rotation of earth
- 3) The ratio of lateral compression strain to the longitudinal extension strain is Called _____

a) Young's modulus b) Bulk modulus

c) Poisson's ratio d) Modulus of rigidity
- 4) Bernoulli's equation deals with the law of conservation of _____

a) work b) mass

c) momentum d) energy
- 5) The SI unit of Young's modulus is _____

a) N/m^2 b) Nm^2

c) dyne/cm^3 d) dyne/cm
- 6) Length of the equivalent simple pendulum is also called as _____ of the compound pendulum.

a) Equal length b) Reduced length

c) Extended length d) Suspension length
- 7) If the substance is highly soluble in a liquid, then the surface tension of liquid _____

a) decrease b) does not change

c) increase d) either increase or decrease

- 8)** Potential energy possessed by unit mass of a liquid flowing at a height of 25m is _____
- a) 245J b) 2.45J
c) 20J d) 2.04J

Q.2 Answer any four of the following **08**

- State Hook's law of elasticity.
- What is damped oscillatory motion?
- Calculate the surface tension of water it's the difference of pressure between the two slides of surface of spherical drop of water 300N/m^2 and radius 0.5mm .
- Draw a labelled diagram of Fly Wheel.
- State coefficient of viscosity.

Q.3 Attempt any two of the following. 08

- Write note on Streamline and turbulent flow of liquid.
- A uniform rod of mass 200 gm is suspended horizontally by two parallel threads each of the length 50 cm and separated by a distance 10 cm. Calculate M.I. of rod about vertical axis passing through the centre, if the period of oscillation is 4 second. [$g = 980 \text{ cm/sec}^2$]
- Discuss application of surface tension.

Q.4 Attempt any two of the following. 08

- Derive the relation between surface tension, excess of pressure and radius of curvature.
- Obtain expression for acceleration due to gravity using Bessel theory for Kater's pendulum.
- Water is escaping from a tank through a horizontal capillary tube 0.2m long and 1.2 mm in diameter, when it stands 1 m above the tube. At what rate water is escaping? (Given: η for water is 0.001 N.sec/m², ρ = Density of water = 1000kg/m³)

Q.5 Answer any one of the following **08**

- Derive an expression for M.I. of a spherical shell about an axis passing through its diameter.
- Derive a relation of equivalence of shear strain to compression and extension strain.

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B.Sc. (Semester - I) (Old) (CBCS) Examination: March/April - 2025
MICROBIOLOGY (Paper - I)
Introduction to Microbiology and Microbial Diversity (22221114)

Day & Date: Tuesday, 13-May-2025
 Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Draw neat diagrams and give equations wherever necessary
 3) Figures to the right indicate full marks.
 4) Use of logarithmic table and calculator is allowed.
 (At. Wts.: H = 1, C = 12, O = 16, N = 14, Na = 23, Cl = 35.5)

Q.1 Multiple choice questions**08**

- 1) The viruses that infect Fungi are called as _____.
 a) Bacteriophages b) Mycophages
 c) Plant viruses d) Animal Viruses

- 2) VSI stands for _____.
 a) Vasantdada Sugar Institute
 b) Very Super Industries
 c) Vitthal Sugar Industries
 d) None of the above

- 3) Malarial Parasite Plasmodium is a _____.
 a) Bacteria b) Fungus
 c) Protozoa d) Rickettsia

- 4) Viroids are small single-stranded _____, that are infectious pathogens.
 a) Proteins b) DNA
 c) circular RNAs d) Fatty acids

- 5) Which of the following are produced by microorganisms?
 a) Alcoholic beverages b) Fermented dairy products
 c) Breads d) All of the mentioned

- 6) Ernst Ruska Invented _____.
 a) Electron Microscope b) Compound Microscope
 c) Electron d) Electric Microscope

- 7) Which of the following gene deduced the evolutionary relationship between the taxonomic groups?
 a) 16S rRNA b) 23S rRNA
 c) 5S rRNA d) 18S rRNA

- 8) Gram Positive Bacteria show _____ colour after Gram's staining.
- a) Pink
 - b) Red
 - c) Orange
 - d) Violet

Q.2 Answer any four of the following. 08

- a) Write the long forms of NIV.
- b) Define Phytophage.
- c) Define Viruses.
- d) Define Taxonomy.
- e) Give names of any two industrially important Micro-organisms.

Q.3 Write short notes on any two of the following. 08

- a) What are the basic principles of the Nomenclature of Bacteria?
- b) Enlist the branches of Microbiology.
- c) Write a note on the Germ theory of disease.

Q.4 Answer any two of the following. 08

- a) Write a note on the contributions of Alexander Fleming in the development of Microbiology.
- b) Enlist the Koch's postulates.
- c) Explain the general characteristics of Fungi.

Q.5 Answer any one of the following. 08

- a) Differentiate between Prokaryotic and Eukaryotic cells.
- b) Elaborate in detail about the development of the theory of Spontaneous generation.

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B.Sc. (Semester - I) (Old) (CBCS) : Examination March/April - 2025
PHYSICS (Paper - II)
Optics (22221105)

Day & Date: Wednesday, 14-May-2025
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of logarithmic table or nonprogrammable calculator is allowed.
4) Neat diagrams must be drawn wherever necessary.

Q.1 Choose the correct alternatives from the options. 08

- 1) When the value of the first order differentiation of time of traverse t with respect to the path length x is zero then the time of traverse t is ____.

a) extremum b) optimum
c) stationary d) finite
- 2) A parallel incident ray very near to an edge of a convex lens having the large aperture is called ____.

a) co-axial ray b) para-axial
c) axial ray d) marginal
- 3) If f is focal length of an eye lens in the Huygen's eyepiece then the distance of separation between the eye lens and field lens ____.

a) $3f$ b) $2f$
c) $4f$ d) $5f$
- 4) If f is focal length of the eye lens and the field lens then the focal length of Ramsden's eyepiece is ____.

a) $f/2$ b) $f/3$
c) $3f/4$ d) $3f/5$
- 5) The type of pumping used in Helium-Neon Laser is ____.

a) thermal b) magnetic
c) chemical d) electrical
- 6) In comparison with the laser source of light, an ordinary source of light have ____.

a) more intensity and high degree of coherence
b) more intensity and low degree of coherence
c) less intensity and low degree of coherence
d) less intensity and high degree of coherence

- 7) If a convex lens have focal length an axial chromatic aberration 0.44 cm and the dispersive power of the material of a convex lens 0.022 then the focal length of a convex is _____.
- a) 10 cm b) 20 cm
c) 11 cm d) 22 cm
- 8) The maximum order of diffraction for a plane transmission grating having the value of grating element 1.693×10^{-4} cm. when wavelength light is 5700 Å _____.
- a) 3 b) 4
c) 5 d) 6

Q.2 Answer any four of the following.

08

- What is the function of collimator of a Spectrometer?
- Write the formula to calculate the fringe width for the interference of light in wedge shaped thin film.
- What do you mean by population inversion in production of the Laser?
- In the Newton's Rings experiment the source of light used whose wavelength is $6000 \text{ \AA}$. The diameter of 15th dark ring 0.6 cm was noted. Calculate the radius of curvature of a Plano-convex lens.
- Calculate the value of grating element of a plane transmission grating having 15000 lines per inch.

Q.3 Write short notes. (Any Two)

08

- a) Huygen's Eye-piece
- b) Aberration
- c) Ruby Laser

Q.4 Answer of the following (Any Two)

08

- By using the Fermat's Principle prove that the angle of incidence is equal to the angle off reflection.
- Describe the process of the absorption of radiation and the spontaneous emission of radiation.
- Two thin convex lenses made by the same material having focal length 10 cm and 14 cm are co-axially separated to form an achromatic combination. Calculate focal length of an achromatic combination.

Q.5 Answer of the following (Any One)

08

- Describe the Newton's Ring Experiment and derive the formula used to determine radius of curvature of a Plano-convex lens.
- Describe the Plane Diffraction Grating Experiment to determine the value of the grating element.

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B.Sc. (Semester - I) (Old) (CBCS) Examination: March/April - 2025

MICROBIOLOGY (Paper-II)

Cell cytology and Microbial Techniques (22221115)

Day & Date: Wednesday, 14-May-2025

Max. Marks: 40

Time: 03:00 PM To 05:00 PM

Instructions: 1) All questions are compulsory.

2) Draw neat diagrams and give equations wherever necessary.

3) Figures to the right indicate full marks.

4) Use of logarithmic table and calculator is allowed.

(At. Wts.: H = 1, C = 12, O = 16, N = 14, Na = 23, Cl = 35.5)

Q.1 Choose the correct alternatives from the options.

08

- 1) The ability to distinguish images of two objects as separate and distinct is called _____.
a) Magnification
b) Resolving power
c) Numerical Aperture
d) Focal length
- 2) The bacterial cell wall can be stained by _____ method.
a) Albert's
b) Chance's
c) Maneval's
d) Dörner's
- 3) Bacteria having clusters of flagella at both poles of cells are known as _____.
a) Amphitrichous
b) Monotrichous
c) Peritrichous
d) Lophotrichous
- 4) _____ is used in cosmetics and perfumes.
a) Chlorine
b) Ethyl alcohol
c) Copper
d) Ethylene oxide
- 5) Peptidoglycan layer is present in large quantity in _____.
a) Gram-positive bacteria
b) Gram-negative bacteria
c) Fungi
d) Algae
- 6) _____ takes part in protein synthesis.
a) Ribosomes
b) Mesosomes
c) Endospore
d) Capsule
- 7) Light can be focused by adjusting the _____.
a) Base
b) Condenser
c) Stage
d) Automatic Stop
- 8) At _____ wavelength U.V. rays have highest microbicidal activity.
a) 30 nm
b) 500 nm
c) 265 nm
d) 3 nm

- Q.2 Write short answers. (Any Four) 08**
- a) List three uses of a compound microscope
 - b) Define Protoplast.
 - c) What is disinfection?
 - d) Mention the use of membrane filtration
 - e) What is negative staining?
- Q.3 Write short notes. (Any Two) 08**
- a) Ultrastructure of Endospore
 - b) Define stain and give types of stain.
 - c) Write a short note on capsule.
- Q.4 Answer of the following (Any Two) 08**
- a) Give applications of electron microscope.
 - b) Describe structure of bacterial flagella and give its functions.
 - c) Write an account on use of U V rays to obtain sterilization.
- Q.5 Answer of the following (Any One) 08**
- a) Structure and function of Gram-positive bacterial cell wall
 - b) Explain sterilization by physical agent by moist heat.

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B.Sc. (Semester - I) (Old) (CBCS) Examination: March/April - 2025
STATISTICS (Paper-I)
Descriptive Statistics - I (22221108)

Day & Date: Thursday, 15-May-2025
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of Calculator is allowed.

Q.1 Choose the correct alternative.

08

- 1) With the help of ogive curves, one cannot determine _____.
a) Median
b) Deciles
c) Percentiles
d) Mode
- 2) Number of family members in different families in a town is an example of a _____.
a) Discrete variable
b) Continuous variable
c) Dependent variable
d) Qualitative variable
- 3) The total number of class frequencies of three attributes is _____.
a) 3
b) 9
c) 27
d) 12
- 4) Half of the difference between upper and lower quartiles is called as _____.
a) Inter quartile range
b) Quartile deviation
c) Mean deviation
d) Standard deviation
- 5) The G. M. of the two numbers 4 and 9 is _____.
a) 6
b) 6.5
c) 7
d) None of the above
- 6) Which measures of central value cannot be calculated for grouped data with open end classes?
a) Mean
b) Median
c) Mode
d) All the above
- 7) Sum of absolute deviations of observations about median is always _____.
a) Zero
b) Minimum
c) Maximum
d) 1

- 8) The value of β_2 can be _____.
a) Less than 3 b) Greater than 3
c) Equal to 3 d) All of the above

Q.2 Answer any four of the following. 08

- a) Define frequency and cumulative frequency.
- b) Find median of the following data 20, 18, 10, 12, 11, 22, 21, 14, 13, 15
- c) Define the term attribute and ultimate class frequencies.
- d) Define coefficient of variation.
- e) Prove that second central moment is variance.

Q.3 Write short note on any two of the following: 08

- a) Distinguish between Qualitative and Quantitative data.
- b) State and prove effect of change of origin and scale on standard deviation.
- c) Write a note on skewness.

Q.4 Answer any two of the following. 08

- a) State empirical relation between mean, median and mode. For a distribution if mean is 70 and mode is 100. Find median of the distribution.
- b) Find the conditions of consistency of data related to two attributes A and B.
- c) Find Mean and variance of first n natural numbers.

Q.5 Answer any one of the following. 08

- a) Define mode and derive the formula for mode in case of continuous frequency distribution.
- b) Obtain the relation between coefficient of association (Q) and coefficient of colligation (Y). Deduce that $|Q| > |Y|$

Seat No.	

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B.Sc. (Semester - I) (Old) (CBCS) Examination: March/April - 2025
ZOOLOGY (Paper-I)
Animal Diversity - I (22221122)

Day & Date: Thursday, 15-May-2025
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Multiple choice questions.

08

- 1)** Paramaecium belongs to class _____.
a) Calcarea b) Ciliata
c) Phytomastogophora d) Zoomastigophora
- 2)** Presence of Canal System is distinguishing characteristic of which Phylum?
a) Cnidaria b) Arthropoda
c) Platyhelminthes d) Porifera
- 3)** Nematocysts (Stinging cells) are present in _____.
a) Sycon b) Jelly Fish
c) Hydra d) Both b and c
- 4)** Nereis belongs to class _____.
a) Polychaeta b) Oligochaeta
c) Hirudinea d) Insecta
- 5)** _____ are the organs excretion in insets.
a) Green Glands b) Malpighian Tubules
c) Trachea d) Both a and b
- 6)** Metamerism found in _____.
a) Sponges b) Sea Anemone
c) Tapeworm d) Earthworm
- 7)** Octopus belons to class _____.
a) Gastropoda b) Pelecypoda
c) Cephalopoda d) Monoplacophora
- 8)** Brittle Star belongs to Phylum _____.
a) Echinodermata b) Porifera
c) Arthropoda d) Mollusca

- Q.2 Answer the following question (Any Four) 08**
- a) General Characters of class Calcarea
 - b) Define Polymorphism.
 - c) General Characters of class Trematoda
 - d) Economic Importance of Earthworm
 - e) Limulus (King Crab)
 - f) Tube Feet
- Q.3 Write short notes on the following (Any Two) 08**
- a) Describe General characters of phylum Annelida.
 - b) Locomotion in Euglena.
 - c) Describe economic importance of Mollusca.
- Q.4 Answer the following question (Any Two) 08**
- a) Describe nutrition in Amoeba.
 - b) Describe Parasitic adaptations of *Ascaris*.
 - c) Describe importance of Water Vascular system of Sea star.
- Q.5 Answer the following question (Any One) 08**
- a) Describe Life History of *Taenia solinum* (Tapeworm). Add a note on its parasitic adaptations.
 - b) Describe General Characters of Phylum Arthropoda. Give suitable examples.

Day & Date: Friday, 16-May-2025
Time: 12:00 PM To 02:00 PM

Instructions:

- 1) All questions are compulsory.
- 2) Draw neat & well labelled diagrams wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of Calculator allowed.

Page 1 of 2

- 7)** If A and B are two independent events then $P(A|B)$ is equal to _____.
 a) $P(A)$ b) $P(B)$
 c) $P(A \cap B)$ d) $P(A \cup B)$
- 8)** For two events A and B, if $P(A) = \frac{2}{3}$, $P(B) = \frac{3}{8}$ and $P(A \cap B) = \frac{1}{4}$ then A and B are _____.
 a) mutually exclusive but not independent
 b) mutually exclusive and independent
 c) independent but not mutually exclusive
 d) not mutually exclusive not independent

Q.2 Answer the following questions. (Any Four)

08

- Define Compound event with suitable example.
- An urn contains 25 tickets numbered 1,2,3,4.....,25. One ticket is drawn at random. Compute the probability that it is a multiple of 5 or 7.
- If A and B are independent event with $P(A) = \frac{1}{2}$, $P(B) = \frac{2}{3}$. Find $P(A \cap \bar{B})$
- If $A \subset B$ then find $P(\bar{A}/B)$
- If $P(A) = 0.4$, $P(B) = 0.3$ $P(A \cap B) = 0$. Find $P(\bar{A}/\bar{B})$

Q.3 Write short notes. (Any Two)

08

- a)** Two dice one is red and other is green are thrown. Let A be the event that the sum of the points on the faces shown is even and B be the events that at least one is ace number. Obtain
- 1) The sample space
 - 2) Events A and B
- b)** If $P(A) = 0.3, P(\bar{B}) = 0.22, P(A \cap B) = 0.16$ Evaluate
- 1) $P(A \cap \bar{B})$
 - 2) $P(\bar{A} \cap \bar{B})$
- c)** If A and B are independent events. Then prove that
- 1) A and B^c are independent
 - 2) A^c and B are independent

Q.4 Answer of the following (Any Two)

08

- a) The probability that at least one of A and B occur is 0.6. If A and B occur simultaneously with probability 0.2, then find $P(\bar{A}) + P(\bar{B})$.
- b) With usual notation prove that
 - 1) $P(\varphi) = 0$
 - 2) $P(\bar{A}) = 1 - P(A)$
- c) If A, B, C forms the partition of the sample space. And $3P(A) = 2P(B) = 6P(C)$ then find $P(A)$.

Q.5 Answer of the following (Any One)

08

- a)** Prove that for any two events A and B.

$$P(A \cap B) \leq P(A) \leq P(A \cup B) \leq P(A) + P(B)$$
- b)** State and prove Baye's theorem on probability.

Day & Date: Friday, 16-May-2025
Time: 03:00 PM To 05:00 PM

Page 1 of 2

- Q.2 Write short answers. (Any Four) 08**
- a) Characters of chordates
 - b) Apoda
 - c) Myxine
 - d) Bony fishes
 - e) Turtles
 - f) Herdmania
- Q.3 Write short notes. (Any Two) 08**
- a) Urochorda
 - b) Venomous snakes
 - c) Flight adaptations in birds
- Q.4 Answer of the following. (Any Two) 08**
- a) General character of amphibian
 - b) Economic importance of fishes
 - c) Adaptive radiation in mammals
- Q.5 Answer of the following (Any One) 08**
- a) Describe general characters of class Aves.
 - b) Explain types of venom, symptoms and treatments of snake bite.

Day & Date: Saturday, 17-May-2025
Time: 12:00 PM To 02:00 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

08

- Page 1 of 3

8) Period of $\cosh z$ is _____.

- a) 2π
c) $3\pi i$

- b) 3π
d) $2\pi i$

Q.2 Attempt any Four of the following.

08

a) Find the rank of matrix to normal form.

$$\begin{bmatrix} 1 & 3 & 4 & 5 \\ 1 & 2 & 6 & 7 \\ 1 & 5 & 0 & 10 \end{bmatrix}$$

b) Solve the equations $x - y + z = 0$, $x + 2y - z = 0$, $2x + y + 3z = 0$

c) If z is complex number then prove that, $\cos^2 z + \sin^2 z = 1$.

d) If z is complex number then show that, $\cosh^{-1} z = \log(z + \sqrt{z^2 - 1})$

e) Find eigen value of matrix $\begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & \sqrt{2} \\ 0 & \sqrt{2} & 2 \end{bmatrix}$

Q.3 Attempt the following (Any Two)

08

a) If $\sin(p + iq) = x + iy$ then prove that

i) $\frac{x^2}{\cosh^2 q} + \frac{y^2}{\sinh^2 q} = 1$

ii) $\frac{x^2}{\sin^2 p} - \frac{y^2}{\cos^2 p} = 1$

b) If $2 \cos \theta = x + \frac{1}{x}$ then show that

i) $x^n + \frac{1}{x^n} = 2 \cos n\theta$

ii) $x^n - \frac{1}{x^n} = 2i \sin n\theta$

Express the following matrix as the sum of symmetric and a

c) skew-symmetric matrix $\begin{bmatrix} 5 & 4 & 7 \\ 2 & 4 & 6 \\ 3 & 6 & 2 \end{bmatrix}$

Q.4 Attempt the following (Any Two)

08

a) Investigate for what value of λ and μ the following system of equations, $2x + 3y + 5z = 9$; $7x + 3y - 2z = 8$; $2x + 3y + \lambda z = \mu$ will have

- i) no solution
ii) a unique solution

b) Find all values of $(-1)^{1/3}$

c) Prove that $\cosh(z_1 + z_2) = \cosh z_1 \cdot \cosh z_2 + \sinh z_1 \cdot \sinh z_2$

Q.5 Attempt the following (Any One)**08****a)** State and prove Cayley-Hamilton theorem.**b)** i) If $\tan(\alpha + i\beta) = x + iy$ then prove that $\tan 2x = \frac{2x}{1-x^2-y^2}$ ii) If Z is any complex number then show that $\tan h^{-1}Z = \frac{1}{2} \log \left(\frac{1+Z}{1-Z} \right)$

- Q.2 Answer of the following (Any Four) 08**
- a) What are the uses of Yeast?
 - b) Write occurrence of Voucheria.
 - c) Define the Virology.
 - d) Enlist the pigments of Cyanophyta.
 - e) Define the flagellum.
- Q.3 Write short notes of the following (Any Two) 08**
- a) Explain the Bacteriophage.
 - b) write the general characters of Mycoplasmas.
 - c) Economic importance of Algae.
- Q.4 Answer of the following (Any Two) 08**
- a) Write classification of Sargassum with reasons.
 - b) Explain in brief scope of Microbiology.
 - c) Explain the thallus structure of Spirogyra.
- Q.5 Answer the following (Any One) 08**
- a) Describe the thallus structure and reproduction of Nostoc.
 - b) Explain ultra structure of bacterial cell wall with neat labelled diagram.

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B.Sc. (Plain) (Semester - I) (Old) (CBCS) Examination: March/April - 2025
MATHEMATICS (Paper-II)
Calculus (22221117)

Day & Date: Monday, 19-May-2025
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Choose the correct alternatives from the options.

08

- 1) $\lim_{x \rightarrow 0} [x \cdot \log x] = \underline{\hspace{2cm}}$.
a) 0
b) 1
c) 2
d) ∞
- 2) Number of independent variables in Partial differentiation should be $\underline{\hspace{2cm}}$.
a) 0
b) 1
c) at least 2
d) at least 1
- 3) If $y = (ax + b)^m$ then $y_n = \underline{\hspace{2cm}}$ if $m = n$.
a) 0
b) $n! a^n$
c) $n! a^n (ax + b)^n$
d) $\frac{m!}{(m-n)!} a^n (ax + b)^n$
- 4) $\int_0^{\pi/2} \sin^7 x dx \underline{\hspace{2cm}}$.
a) $\frac{16}{35}$
b) $\frac{16}{35} \pi$
c) $\frac{35}{16} \pi$
d) None of these
- 5) The degree of Homogeneous function $u = \frac{x^3 + y^3}{x^2 + y^2}$ is $\underline{\hspace{2cm}}$.
a) 0
b) 3
c) -1
d) 1
- 6) $x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots \infty$ is expansion of $\underline{\hspace{2cm}}$.
a) $\sin x$
b) $\cos x$
c) $\tan x$
d) None of these

- 7)** If $r = xi + yj + zk$ then $\text{div } r = \underline{\hspace{2cm}}$.
- a) 0 b) 1
c) 2 d) 3
- 8)** If ϕ is constant then $\nabla\phi$ is .3
- a) 0 b) positive
c) negative d) infinite

Q.2 Write short answers. (Any Four)

08

- Find the value of $\lim_{x \rightarrow 0} \frac{3^x - 2^x}{x}$
- Solve $\int_0^{\pi} \sin\left(\frac{x}{2}\right) dx$
- If $\phi(x, y, z) = 3x^2y - y^3z^2$ find $\nabla \phi$ at point $(1, -2, -1)$
- Find $\frac{\partial z}{\partial x}$ & $\frac{\partial z}{\partial y}$ if $z = x^2y^3$
- Find n^{th} derivative of $y = e^{ax}$

Q.3 Answer of the following. (Any Two)

08

- Prove that $\text{curl}(\text{grad}\phi) = 0$
- Find the expansion of 'cosx'
- If u is homogeneous function of degree n in x & y then

$$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = nu.$$

Q.4 Answer the following. (Any Two)

08

- a)** If $u = x^3 - 3xy^2, v = 3x^2y - y^3$ prove that
- 1) $\frac{\partial u}{\partial x} - \frac{\partial v}{\partial y} = 0$
- 2) $\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} = 0$
- b)** State & Prove L'Hospital's Rule.
- c)** Evaluate $\int_0^2 (4 - x^2)^{7/2} dx$

Q.5 Answer the following (Any One)

08

- State and prove Leibnitz's theorem.
- Prove that $\nabla^2 \left(\frac{1}{r} \right) = 0$, where $r = \sqrt{x^2 + y^2 + z^2}$

Day & Date: Monday, 19-May-2025
Time: 03:00 PM To 05:00 PM

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.

08

- Page 1 of 2

- Q.2 Write short answers. (Any Four)** **08**
- a) Cell wall composition of Fungi
 - b) Draw a well diagram of Mucor.
 - c) Write the types of Yeast.
 - d) Mention the order of *Riccia* with reason
 - e) Define Heterospory.
 - f) Coralloid roots in *Cycas*
- Q.3 Write short notes. (Any Two)** **08**
- a) Thallus organization in fungi.
 - b) General characters of Bryophytes.
 - c) Explain sexual reproduction in *Cycas*.
- Q.4 Answer of the following (Any Two)** **08**
- a) Describe the life cycle of Yeast with suitable example.
 - b) Explain the gametophytic thallus of *Riccia*.
 - c) Economic importance of Gymnosperm.
- Q.5 Answer of the following (Any One)** **08**
- a) Describe the morphology of sporophyte of *Cycas*.
 - b) Give an account on *Selaginella*.

Seat No.	

Set P

B.Sc. (Semester - I) (Old) (CBCS) : Examination March/April - 2025
ELECTRONICS (Paper-I)
Basic Circuit Theory and Network Analysis (22221118)

Day & Date: Tuesday, 20-May-2025
 Time: 12:00 PM To 02:00 PM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
 2) Draw neat diagrams and give equations wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of logarithmic table and scientific calculator is allow.

Q.1 Multiple choice questions.

08

- 1) A color bands for $330\Omega \pm 5\%$ resistor is _____.
 a) orange, orange, black & Gold
 b) orange, orange, red & Gold
 c) orange, orange, brown & Gold
 d) orange, orange, yellow & Gold
- 2) The unit of inductance is _____.
 a) Farad
 b) Henry
 c) Ohms
 d) Ampere
- 3) If _____ then an LCR series circuit is to be considered as a inductive circuit.
 a) $X_L = X_C$
 b) $X_L < X_C$
 c) $X_L < R$
 d) $X_L > X_C$
- 4) The Z parameters are same as _____ circuit parameters.
 a) Short
 b) Hybrid
 c) Open
 d) None of these
- 5) The working principle of a transformer is based on _____.
 a) self-induction
 b) conduction
 c) Insulation
 d) mutual induction
- 6) Series resonance circuit is also called as _____.
 a) Rejecter
 b) Current Magnifier
 c) Acceptor
 d) Anti-resonant circuit
- 7) A ideal voltage source has _____ internal resistance.
 a) Infinite
 b) Zero
 c) Finite
 d) all of these

- 8)** If a sinusoidal signal has a frequency of 500 Hz, then its time is _____.
 a) 2 m sec b) 200 m sec
 c) 20 m sec d) 0.2 m sec

Q.2 Answer any four of the following. 08

- Define inductance, State its practical unit.
- Define Non-sinusoidal sources.
- Write any four application of capacitor.
- State Kirchhoffs laws.
- Draw the symbol of fixed and variable resistance.

Q.3 Write short notes on any two of the following. 08

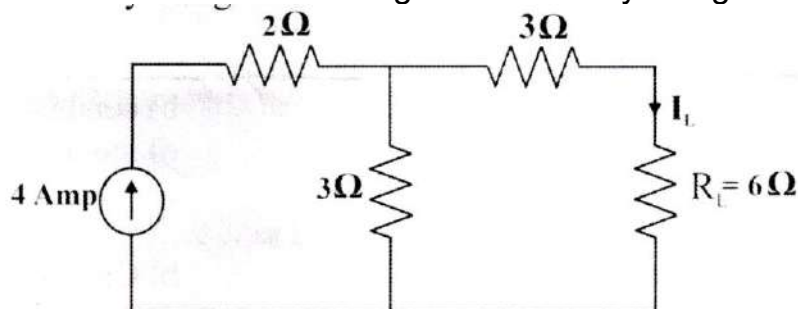
- a) Relay.
- b) Voltage sources.
- c) Maximum Power Transfer Theorem.

Q.4 Answer any two of the following. 08

- Define active and passive components. State the any four application of inductor.
- Compare Series and Parallel resonance circuit.
- A series LCR circuit has $L = 10\text{mH}$, $C = 100\mu\text{F}$ and $R = 10\Omega$ which connected to AC source having frequency of 50Hz . Calculate
 - Inductive reactance
 - Capacitive reactance

Q.5 Answer any one of the following. **08**

- a) State Norton's theorem. Calculate current flowing through load resistance R_L of a following de network by using Norton's theorem.



- b)** Describe the voltage-current phase relationship in a pure resistor and a capacitor.

Set

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B.Sc. (Semester - I) (Old) (CBCS) : Examination March/April - 2025
GEOGRAPHY (Paper-I)
Geomorphology-I (22221124)

Day & Date: Tuesday, 20-May-2025
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.
4) Use of stencil is allowed.

Q.1 Rewrite the sentences by choosing the correct alternatives. 08

- 1) _____ may be defined as the science which deals the distribution of different kinds of landforms on the earth surface.

a) Climatology	b) Geomorphology
c) Biogeography	d) Oceanography
- 2) Fossils are best preserved in _____ type of rocks.

a) Metamorphic	b) igneous
c) sedimentary	d) None of them
- 3) Etna & Stromboli volcanoes near the Mediterranean sea are the examples of _____.

a) Active	b) dormant
c) extinct	d) None of them
- 4) The density of whole earth is a _____ gm/cm³.

a) 13.6	b) 3.1
c) 5.5	d) 10.0
- 5) The _____ discontinuity is found in between lithosphere and Mantle.

a) Mohovisic	b) Conrad
c) Guttenberg	d) None of them
- 6) The peninsular portion of India separated from Gondwana land and drifted towards _____ movement of continents in continental drift theory.

a) equator ward	b) Southward
c) Westward	d) None of them
- 7) It is believed that all tectonic movements like earthquakes and volcanoes and earth movements originates from _____.

a) inner mantle	b) outer mantle
c) inner core	d) outer core

- 8) The rock which is formed by cooling and solidifying of the molten material is known as _____ rocks.
- a) igneous
 - b) metamorphic
 - c) stratified
 - d) none of them

Q.2 Answer any four of the following. 08

- a) Characteristics of metamorphic rocks.
- b) Give the names of different transition zones in interior earth.
- c) Characteristics of primary waves.
- d) Density of Interior earth.
- e) Types of vertical forces with examples.

Q.3 Write short note on any two of the following: 08

- a) What is the igneous rocks? State its types and characteristics.
- b) Describe the world distribution of volcanoes.
- c) Describe the concept of Wegener's theory.

Q.4 Answer any two of the following. 08

- a) State the causes of earthquakes.
- b) Give the types of faults.
- c) Importance of geomorphology.

Q.5 Answer any one of the following. 08

- a) Describe the scientific classification of interior earth with schematic diagram.
- b) Describe the types of fold with schematic diagram.

Set

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B.Sc. (Semester - I) (Old) (CBCS) : Examination March/April - 2025
GEOLOGY (Paper-I)
PHYSICAL GEOLOGY (22221110)

Day & Date: Tuesday, 20-May-2025
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw a neat labelled diagram wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Multiple choose questions.

08

- 1) Low velocity layer is also called _____.
a) Lithosphere b) Mesosphere
c) Asthenosphere d) None of these
- 2) Formation of soil depends upon _____ factor.
a) parent material b) time
c) climate and land form d) all of these
- 3) The planetesimal theory put forward by _____.
a) Chamberlin b) Kant
c) Kant and Laplas d) Chamberlin and moulton
- 4) _____ discontinuity separate core from mantle.
a) Movorovisic b) Conrad
c) Moho d) Gutenberg
- 5) Earthquake waves are also called as _____ wave.
a) Seismic b) Sound
c) Light d) None of these
- 6) Most abundant gas relies from volcano is _____.
a) CO₂ b) Water vapour
c) Sulfur d) None of these
- 7) The highest density layer in earth interior is _____.
a) Crust b) Mantle
c) Inner core d) Outer layer
- 8) Average radius of the earth is _____ km.
a) 5654 b) 6371
c) 7413 d) 6555

- Q.2 Answer any four of the following. 08**
- a) Revolution of earth.
 - b) What is asthenosphere?
 - c) Define focus and isoseismal lines.
 - d) Define weathering.
 - e) What is sima?
- Q.3 Write short note on any two of the following. 08**
- a) Seismic waves.
 - b) Structure of volcano.
 - c) Seismograph.
- Q.4 Answer any two of the following. 08**
- a) Explain the Nebular hypothesis of earth origin.
 - b) Describe central and fissure type of volcanoes.
 - c) Describe causes of earthquake.
- Q.5 Answer any one of the following. 08**
- a) Describe physical types of weathering.
 - b) Describe internal structure of earth.

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B.Sc. (Semester - I) (Old) (CBCS) : Examination March/April - 2025
ELECTRONICS Paper II
Digital Fundamentals(22221119)

Day & Date: Wednesday, 21-May-2025
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Choose the correct alternatives from the options.

08

- 1) The _____ is the base or radix of the Octal Number System.
a) 2
b) 8
c) 16
d) 10
- 2) The ASCII is synonym of _____.
a) American Standard Code for Information Interchange
b) American Standard Code for Inter Interchange
c) American Standard Code for Interchange Information
d) American Standard Code for Information Inter
- 3) In case of Boolean Rules the $(A + B)(A + C) =$ _____.
a) A
b) AB
c) A + B
d) A + BC
- 4) The IC _____ is the two input OR gate.
a) 7432
b) 7400
c) 7408
d) 7404
- 5) The _____ gate is used to reverse the input.
a) NOR
b) EX-OR
c) NAND
d) NOT
- 6) The full adder logic diagram has _____.
a) three input and three output
b) three input and two output
c) two input and three output
d) two input and two output
- 7) The 4 variable K-map has _____.
a) 8 number of cells
b) 16 number of cells
c) three rows and four columns
d) four rows and three columns

- 8) The _____ is an Excess-3 code of the 1001.
- | | |
|---------|---------|
| a) 0111 | b) 1101 |
| c) 1100 | d) 1010 |

Q.2 Write short answers. (Any Four) 08

- Convert the 24_{10} in the binary number.
- Write the 8421 code of decimal number 0 to 9.
- Give the truth table of NAND gate.
- Give the expressions of distributive laws.
- Draw the pin configuration of IC7402.

Q.3 Write short notes. (Any Two) **08**

- Preform the subtraction $1100 - 1000$ by using 1's and 2's complement method.
- Explain in detail ASCII code.
- Prove Boolean equation $(\overline{A} + B) + (A + B) = B$

Q.4 Answer of the following (Any Two) 08

- State and prove the De Morgan's theorems with diagram.
- Explain parallel binary adder with neat diagram.
- Simplify following equation using K-map.

$$Y = \overline{A}\overline{B}\overline{C}\overline{D} + \overline{A}\overline{B}\overline{C}D + \overline{A}\overline{B}C\overline{D} + \overline{A}\overline{B}CD + \overline{A}B\overline{C}\overline{D} + \overline{A}B\overline{C}D + \overline{A}BC\overline{D} + \overline{A}BCD \\ + A\overline{B}\overline{C}\overline{D} + A\overline{B}\overline{C}D + A\overline{B}C\overline{D}$$

Q.5 Answer of the following (Any Two) 08

- a) Why NAND/ NOR gate is called universal building gates? Discuss the basic gates by using NOR and NAND gates.
- b) Write a note on following.
 - 1) Controlled inverter using Ex-OR gate.
 - 2) 8421 code and Excess-3 code.

Seat No.	

Set P

B.Sc. (Semester - I) (Old) (CBCS) Examination: March/April - 2025
Geography Paper II
Geomorphology-II(22221125)

Day & Date: Wednesday, 21-May-2025
 Time: 12:00 PM To 02:00 PM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
 2) Draw neat diagrams and give equations wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of maps stencil is allowed.

Q.1 Choose the correct alternatives from the options.

08

- 1) The action of water and changes in temperature are most important agents of _____.
 a) Biological weathering b) Physical weathering
 c) Chemical weathering d) None of these
- 2) The concept of mass wasting is put forth by Sharp in _____.
 a) 1938 b) 1940
 c) 1942 d) 1944
- 3) Gorge and Canyon are formed by the _____ work of the river.
 a) Transportation b) Depositional
 c) Erosional d) None of these
- 4) _____ are depositional landforms of wind.
 a) Barkhan b) Yardang
 c) Waterfall d) Flood plain
- 5) Carbonation process is _____ type of weathering.
 a) Physical b) Chemical
 c) Biological d) None of these
- 6) The moving ice mass down slope under the impact at gravity is called _____.
 a) Wind b) Glacier
 c) River d) Underground water
- 7) Beaches are the depositional landforms made by _____.
 a) Glacier b) Winds
 c) Ocean waves d) None of these
- 8) The Kettle like small depression found in river valley is called _____.
 a) George b) Delta
 c) Pot holes d) Waterfall

- Q.2 Write short answers. (Any Four) 08**
- a) Write the causes of mass wasting.
 - b) Write the Agents of physical weathering.
 - c) Write the name of erosional landforms made by Aeolian.
 - d) Define Meanders and Ox bow Lake.
 - e) Define Wave Built Platform.
- Q.3 Write short notes. (Any Two) 08**
- a) Bays and head Land
 - b) Waterfall
 - c) Explain Mesa and Butte
- Q.4 Answer of the following (Any Two) 08**
- a) Describe the types of mass wasting.
 - b) Explain the Trio of W. M. Davis.
 - c) Describe the Erosional landforms associated with Glacier.
- Q.5 Answer of the following (Any One) 08**
- a) Describe Erosional landforms made by river with suitable diagram.
 - b) Explain the types of weathering and describe the chemical weathering.

Seat No.	

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B.Sc. (Semester - I) (Old) (CBCS) : Examination March/April - 2025

GEOLOGY Paper-II

PALAEONTOLOGY(22221111)

Day & Date: Wednesday, 21-May-2025

Max. Marks: 40

Time: 03:00 PM To 05:00 PM

- Instructions:** 1) All questions are compulsory.
 2) Draw neat diagrams wherever necessary.
 3) Figures to the right indicate full marks.

Q.1 Choose the correct alternatives from the options.

08

- 1) Fossils are helpful in exploration of _____.
 a) Natural oil deposits b) copper deposits
 c) ground water d) mica deposits
- 2) A branch of geology deals with study of fossils with respect to their origin, uses, distribution is called as _____.
 a) physical geology b) paleontology
 c) petrology d) stratigraphy
- 3) Which of the following suggest modes of preservation?
 a) Petrification b) Mould & casts
 c) Carbonization d) All of these
- 4) Most important conditions of preservation of fossils are _____.
 a) presence of hard parts b) immediate burial
 c) dry climate d) A + B
- 5) Which process of formation of fossils involves molecule by molecule replacement?
 a) Petrification b) Mould & casts
 c) Carbonization d) Imprints
- 6) Conversion of buried plants in to coal by decay and decomposition is called _____.
 a) Petrification b) Mould & casts
 c) Carbonization d) All of these
- 7) Remains of ancient organisms preserved in the rocks are called as _____.
 a) Minerals b) Dyke
 c) Fossils d) Crystals
- 8) Species Nautilus belongs to _____ Class.
 a) Gastropod b) Cephalopoda
 c) Lamellibranches d) None of these

- Q.2 Write short answers. (Any Four) 08**
- a) Define paleontology.
 - b) Name the fossils of trilobites?
 - c) Define suture line in fossil?
 - d) Conditions of fossilization.
 - e) Describe physa.
- Q.3 Write short notes. (Any Two) 08**
- a) Petrification
 - b) Cardium
 - c) Goniatite and nautilus
- Q.4 Answer of the following (Any Two) 08**
- a) Describe the Glossopteris and Gangamopteris.
 - b) Describe the Echinoderm.
 - c) Describe the gastropods.
- Q.5 Answer of the following (Any One) 08**
- a) Describe uses of fossils
 - b) Describe mode of preservation of fossil.

Seat No.	

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B.Sc. (Plain) (Semester - II) (New) (CBCS) Examination: March/April - 2025
English (Comp.)
Communication Skill (22221201)

Day & Date: Thursday, 22-May-2025
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Choose the correct alternative from the options.

08

- 1) What has some men profited by the lack of formal education?
a) Jobs
b) Eminence
c) Hope
d) Money
- 2) What sort of prison did the kings really live in?
a) Dungeon
b) Isolated Towers
c) Gorgeous unreality
d) House arrest
- 3) Who has lynched the lakes?
a) The poet
b) The people
c) Factories
d) Vehicles
- 4) What is the profession of the ideal man described in the poem- Ode on Solitude?
a) Pastor
b) Farmer
c) Cobbler
d) Barber
- 5) What does the poet want the lover not to do?
a) Move on
b) Be happy
c) Grieve
d) Find someone else
- 6) What is described as sceptic dagger?
a) Arsenic pollutants
b) Infected lakes
c) Infected rivers
d) Acid rain
- 7) What is the synonym of the word- Fate?
a) Pleased
b) Useful
c) Destiny
d) Follow
- 8) I _____ grapes yesterday while coming from the office.
a) bring
b) is bringing
c) brought
d) will bring

Q.2 Write the answers in short. (Any Four)**12**

- a) What opinion does the author have of the education system of his time?
- b) What kind of people can achieve the true essence of freedom?
- c) Describe the idea of Niyi Osundar as presented in the poem- Our Earth Will Not Die?
- d) Describe the life of the farmer as described in the poem- Ode on Solitude.
- e) What is the theme of the poem- Remember?
- f) What is the difference between being write and being original?

Q.3 Answer the following questions. (Any One)**10**

- a) Write an application letter for the post of a teacher addressing to, The President, Social Educational Society, Solapur, describing educational qualification and the teaching experience etc. in your CV and send it at Email.. soleducation@gmail.com

OR

- b) Write a letter on invitation to the headmaster of your school and invite him as a chief guest for the opening ceremony of your new showroom of bikes?

Q.4 Write a detail note on various Interpersonal Skills?**10**

Seat No.	

Set P

B.Sc. (Semester - II) (New) (CBCS) : Examination March/April - 2025
CHEMISTRY (Paper - III)
Organic Chemistry (22221208)

Day & Date: Friday, 23-May-2025
 Time: 12:00 PM To 02:00 PM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
 2) Draw neat diagrams and give equations wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of logarithmic table and calculators is allowed.
 (At. Wts.: H=1, C=12, O = 16, N = 14, Na = 23, Cl = 35.5)

Q.1 Choose the correct alternatives from the options.

08

- 1) Resonance is represented by inserting the _____ arrow between each pair of the resonating structures.
 - a) single headed
 - b) double headed
 - c) fish hook
 - d) curved
- 2) Hyperconjugation effect involves the delocalisation of _____.
 - a) σ electrons
 - b) π electrons
 - c) σ and π electrons
 - d) lone pair of electrons
- 3) For the preparation of cycloalkane _____ reaction is used.
 - a) Wurtz
 - b) Internal Wurtz
 - c) Friedal craft's
 - d) None of these
- 4) Which of the following is a conjugated dienes?
 - a) $\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{CH} = \text{CH}_2$
 - b) $\text{CH}_2 = \text{C} = \text{CH}_2$
 - c) $\text{CH}_3 - \text{CH} = \text{C} = \text{CH} - \text{CH}_3$
 - d) $\text{CH}_2 = \text{CH} - \text{CH} = \text{CH}_2$
- 5) The Process of preparing an ozonide and then decomposing it to carbonyl compounds is known as _____.
 - a) Epoxidation
 - b) Ozonolysis
 - c) Hydration
 - d) Hydroxylation
- 6) An atom in a molecule which is attached to _____ different atoms or groups is known as chiral atom or chiral centre.
 - a) 1
 - b) 2
 - c) 3
 - d) 4
- 7) All the carbon atoms of benzene are _____ hybridized.
 - a) sp
 - b) sp^2
 - c) sp^3
 - d) sp^3d

Seat No.	

Set	P

B.Sc. (Semester - II) (New) (CBCS) Examination: March/April - 2025
COMPUTER SCIENCE (Paper-III)
Introduction to Web Designing (22221229)

Day & Date: Friday, 23-May-2025
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Choose the correct alternatives from the options.

08

- Which property is used to change the background color in CSS?
a) bgcolor: b) background-color:
c) color: d) none of these
- JavaScript is not case sensitive language.
a) True b) False
- What is the correct syntax of CSS?
a) selector { property: value } b) selector { property= value }
c) selector (property; value) d) selector (property, value)
- Id attribute is followed by _____ sign.
a) @ b) &
c) # d) .
- How can you make a bulleted list?
a) <list> b)
c) <nI> d)
- Which of the following element is responsible for making the text italic in HTML?
a) <i> b) <italic>
c) <it> d) <pre>
- Which of the following CSS property sets the font size of text?
a) font-size b) text-size
c) text d) size
- Who is inventor of HTML?
a) Tim Burners Lee b) Sir Thomas
c) Charles Babbage d) None of these

- Q.2 Write short answers. (Any Four)** **08**
- a) Explain string concat () in JavaScript.
 - b) What is element selector?
 - c) What is margin properties ?
 - d) Define HTML structure
 - e) Explain Background properties in CSS.
- Q.3 Write short notes. (Any Two)** **08**
- a) 2D animation in CSS
 - b) Multimedia Tag
 - c) Frameset tag in HTML
- Q.4 Answer of the following (Any Two)** **08**
- a) Explain form tag and use different input types with example.
 - b) Explain Heading tags in details with example.
 - c) Explain Id and Class selectors with example.
- Q.5 Answer of the following (Any Two)** **08**
- a) Explain Math Object methods with example.
 - b) Explain History Object methods & properties with example.

Max. Marks: 40

Instructions:

- 1) All questions are compulsory.
- 2) Draw neat diagrams and give equations wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic table and calculator is allowed.

(At. Wts.: H=1, C=12, O=16, N= 14, Na =23, Cl = 35.5)

08

- 1) The reagent of known concentration is called the _____.
a) Titrant b) Titrant
c) Normality d) Standard solution
- 2) _____ is purely constitutive property.
a) Viscosity b) Mass
c) Molecular weight d) Radioactivity
- 3) The distortion Polarization shown by equation _____.
a) $P_D = P_E$ b) $P_D = P_E + P_A$
c) $P_D = P_O + P_E + P_A$ d) $P_D = P_O$
- 4) Snell's Law is nothing but _____.
a) $n = \sin r / \sin i$ b) $n = \sin i / \sin r$
c) $1/\sin r$ d) $R = n - 1/n + 2$
- 5) _____ complex shows the prussian blue precipitate.
a) $Na_4[Fe(CN)_6]$ b) $Fe_4[Fe(CN)_6]$
c) $Na_2[Fe(CN)_5NO]$ d) none of these
- 6) The quantitative analysis of Nitrogen estimated by _____ Method.
a) Carius b) Leibig
c) Kjeldahl's d) Habber
- 7) R_f Value determined by equation _____.
a) Distance moved by Solute/ Distance moved by Solvent
b) Distance moved by Solvent/ Distance moved by Solute
c) Distance moved by solution / Distance moved by Solute
d) Distance moved by solution / Distance moved by Solvent.

- 8) Adulteration detection method include _____ Test.
- a) Visual
 - b) Chemical
 - c) Physical
 - d) All of these

Q.2 Answer any four of the following. 08

- a) Define the term Food Preservation.
- b) Distinguish between Normality and Molarity.
- c) What is induced or distortion polarization?
- d) Write the chemical reaction involved in the detection of Nitrogen by Lassaigne's test.
- e) What are the types of Chromatography?

Q.3 Write short note on any two of the following. 08

- a) Paper Chromatography.
- b) Food adulteration.
- c) Parachor

Q.4 Answer any Two of the following. 08

- a) Define the term Volumetric analysis. What volume of water should be added to 300 mL of 0.5 N NaOH solution so as to get solution of 0.2 M?
- b) Give the Nutritional value of foods. What are the idea about food process and preservation?
- c) What is the empirical formula of a compound containing 40.0% C, 6.71%H, and 53.28% O also calculate their molecular weight?

Q.5 Answer any one of the following. 08

- a) What is Quantitative analysis? Explain the Leibig or combustion method in detail.
- b) What is Surface Tension? Explain determination of surface Tension by drop weight method.

Set

P

B.Sc. (Semester - II) (New) (CBCS) Examination: March/April - 2025
COMPUTER SCIENCE (Paper-IV)
Operating System (22221230)

Day & Date: Saturday, 24-May-2025
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicates full marks.

Q.1 Multiple choice questions.

08

- 1) Interval between the time of submission and completion of the job is called _____.
 - a) Waiting time
 - b) Turn-around time
 - c) Throughput
 - d) Response time
- 2) Resources are allocated to the process on non-sharable basis is _____.
 - a) Mutual exclusion
 - b) Hold and wait
 - c) No preemption
 - d) Circular wait
- 3) The degree of Multiprogramming is controlled by _____.
 - a) CPU Scheduler
 - b) Context Switching
 - c) Long-term Scheduler
 - d) Medium term Scheduler
- 4) There is a guarantee that the critical tasks are completed in given amount of time. That is Called as _____.
 - a) Hard Real time systems
 - b) Soft real time system
 - c) Real time systems
 - d) none of the above
- 5) FIFO scheduling algorithm is _____.
 - a) Preemptive scheduling
 - b) Non- preemptive scheduling
 - c) Deadlock scheduling
 - d) none of these
- 6) _____ is a technique of temporarily removing inactive programs from the Memory of computer system.
 - a) Swapping
 - b) Spooling
 - c) Semaphore
 - d) Scheduler
- 7) The priority scheduling algorithm suffers by _____.
 - a) Starvation
 - b) Aging
 - c) Deadlock
 - d) All of these
- 8) _____ Conditions must be satisfied to solve a critical section problem?
 - a) Bounded Waiting
 - b) Progress
 - c) Mutual Exclusion
 - d) All of these

- Q.2 Answer the following (Any Four) 08**
- a) What is Real time operating system?
 - b) What is mean by Virtual Memory?
 - c) Define the terms Thread?
 - d) What is Deadlock?
 - e) What is mean by paging?
 - f) What is process scheduling?
- Q.3 Write short note of the following (Any Two) 08**
- a) Write short note on System Calls.
 - b) Write Short notes on Semaphores.
 - c) Write Short note on Logical and Physical address Space.
- Q.4 Answer the following (Any Two) 08**
- a) What is process? Explain process state with diagram.
 - b) Explain different characteristic of deadlock.
 - c) Explain priority scheduling with example?
- Q.5 Answer the following (Any One) 08**
- a) Define Process Synchronization? Explain Dinning Philosopher problem?
 - b) What is Operating System? Explain the different Services provided by Operating System?

Seat No.	

Set	P

B.Sc. (Semester - II) (New) (CBCS) Examination: March/April - 2025
PHYSICS (Paper-III)
Heat and Thermodynamics (22221205)

Day & Date: Monday, 26-May-2025
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions:

- 1) All questions are compulsory.
- 2) Draw neat diagrams and give equations wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic table and calculator is allowed.

Q.1 Choose the correct alternatives from the options. 08

- 1) In refrigerator; the liquid used as a refrigerant should have _____.
a) Large latent heat of evaporation
b) Small latent heat of evaporation
c) Constant latent heat of evaporation
d) Zero latent heat of evaporation
- 2) The efficiency of Carnot's Heat engine working between the temperatures 27°C and 227°C is _____.
a) 20%
b) 30%
c) 40%
d) 50%
- 3) The temperature at which Joule-Thomson effect changes its sign is called _____.
a) Inversion temperature
b) Critical temperature
c) Joule temperature
d) Joule-Thomson temperature
- 4) When water vapor condenses into water, its entropy _____.
a) Increases
b) Decreases
c) remains constant
d) zero
- 5) Absolute scale of temperature was given by _____.
a) Kelvin
b) Planck
c) Joule
d) Faraday
- 6) Any device which converts heat into mechanical work is _____.
a) Motor
b) Generator
c) Invertors
d) Heat engine
- 7) In adiabatic demagnetization cooling method, the magnetic salt used is _____.
a) Diamagnetic salt
b) Ferromagnetic salt
c) Paramagnetic salt
d) None of these

- 8) Coefficient of viscosity of any gas _____.
 a) Increases linearly with increase in pressure
 b) Decreases with decrease in pressure
 c) Independent of pressure
 d) Increases exponentially with increase in pressure

Q.2 Answer of the following. (Any Four)

08

- a) Give the principle and application of air conditioner.
 b) What is the effect of temperature on coefficient of viscosity?
 c) Give the properties of liquid helium-II.
 d) Give the physical significance of first law of thermodynamics.
 e) An ideal refrigerator is operating between two reservoirs at -20°C and 40°C respectively.
 Calculate its coefficient of performance.

Q.3 Write short answers. (Any Two)

08

- a) Linde's air liquefier.
 b) Refrigeration cycle
 c) Carnot's heat engine

Q.4 Answer of the following (Any Two)

08

- a) Define coefficient of thermal conductivity and obtain an expression for it on the basis of transport Phenomena.
 b) Describe the working of Otto engine and obtain an expression for its efficiency.
 c) A certain mass of a gas at 0°C is expanded isothermally to three times its volume under adiabatic conditions. Calculate the resulting temperature. (Given- ratio of specific heats $= \gamma = 1.4$)

Q.5 Answer of the following (Any Two)

08

- a) What is adiabatic change? Derive an adiabatic relation between pressure-volume and temperature and volume.
 b) What is liquefaction of gases? Describe Joule- Thomson porous plug experiment.

Day & Date: Monday, 26-May-2025
Time: 03:00 PM To 05:00 PM

Page 1 of 2

- Q.2 Answer the following. (Any Four) 08**
- a) Define enriched and enrichment media
 - b) Define coenzyme
 - c) Define metabolism.
 - d) What is entropy?
 - e) What is the extracellular and intracellular enzyme?
 - f) Draw a neat labeled diagram of t-RNA?
- Q.3 Write short answers. (Any Two) 08**
- a) Define active site. Explain in detail induced fit hypothesis.
 - b) Give a brief account on EMP pathway.
 - c) Define polysaccharide. Discuss in details homopolysaccharide.
- Q.4 Answer the following (Any Two) 08**
- a) Discuss in brief structural level of classification of protein.
 - b) Describe in detail methods of pure culture.
 - c) Discuss in detail fates of pyruvate.
- Q.5 Answer the following (Any One) 08**
- a) Describe in detail Watson crick model of DNA.
 - b) Describe in detail classification of microorganism on the basis of energy and nutrition.

Electricity, Magnetism and Basic Electronics (22221206)

Max. Marks: 40

Time: 12:00 PM To 02:00 PM

4) Neat diagrams must be drawn wherever necessary.

08

- Page 1 of 2

- 8) If the figure of merit of a ballistic galvanometer is $2 \times 10^{-7} \mu\text{A}/\text{mm}$ then current sensitivity of a ballistic galvanometer is ____.
- a) $4.0 \times 10^6 \text{mm}/\mu\text{A}$ b) $5.0 \times 10^6 \text{mm}/\mu\text{A}$
c) $2.5 \times 10^6 \text{mm}/\mu\text{A}$ d) $4.5 \times 10^6 \text{mm}/\mu\text{A}$

Q.2 Answer any FOUR of the following.

08

- a) Draw the circuit diagram of a series resonance circuit and write the formula for resonance frequency.
b) What is damping in the ballistic galvanometer?
c) Write an expression for instantaneous charge stored by capacitor during the charging mode of RC circuit.
d) What is the filter circuit?
e) For the BJT if $\alpha = 0.99$ then calculate β

Q.3 Write short note on any TWO of the following.

08

- a) Owen's Bridge
b) Bridge Rectifier
c) Zener diode voltage regulator

Q.4 Answer any TWO of the following.

08

- a) Derive an expression for the instantaneous current flowing in LR circuit for its growth mode.
b) Describe the anti-resonance circuit.
c) A condenser of capacity $1 \mu\text{F}$ is discharged through a resistor $10 \text{ M}\Omega$. Calculate the time required for half the saturation charge.

Q.5 Answer any ONE of the following.

08

- a) Derive an expression for the magnetic induction at a point along the axis of a straight solenoid finite length and infinite length.
b) Describe the input, output and transfer characteristics of a transistor connected in CB configuration.

Set P

B.Sc. (Semester - II) (New) (CBCS) Examination: March/April - 2025
MICROBIOLOGY (Paper-IV)
Applied Microbiology (22221221)

Day & Date: Tuesday, 27-May-2025
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw a neat labelled diagram wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Multiple choose questions.

08

- 1) _____ is the indicator of fecal pollution.
a) B.coagulans b) B.subtilis
c) E.Coli. d) All of these
- 2) _____ is the only source of carbon in Koser's citrate medium.
a) lactose b) glucose
c) peptone d) Na citrate
- 3) _____ is used to treat sewage on unit scale.
a) Septic tank b) Imhoff tank
c) Trickling filter d) Activated sludge process
- 4) Biodegradable organic matter in sewage is measured by _____.
a) COD b) IMViC test
c) BOD d) Presumptive test
- 5) When the disease is spread all over the world, then it is known as _____.
a) Pandemic b) Epidemic
c) Endemic d) Sporadic
- 6) Cholera is transmitted through _____.
a) Air b) Water
c) Physical contact d) Vector
- 7) The disease condition in which symptoms persist for a long time is _____ infection
a) Acute b) Chronic
c) Congenital d) Iatrogenic
- 8) Vaccine is used for _____.
a) Active immunisation b) Passive immunisation
c) spread of disease d) None of these

- Q.2 Answer any four of the following. 08**
- a) Define COD
 - b) What is etiological agent?
 - c) Define sporadic disease
 - d) What is incubation period?
 - e) Define mixed infection
- Q.3 Write short note on any two of the following. 08**
- a) Eijkman test.
 - b) Municipal water purification process.
 - c) Mode of transmission of disease by contact.
- Q.4 Answer any Two of the following. 08**
- a) What is morbidity and mortality rate.
 - b) Explain MPN in detail.
 - c) Tertiary (biological) sewage treatment method.
- Q.5 Answer any one of the following. 08**
- a) Write in detail IMViC test and give its significance.
 - b) Explain the preventive and control measures for various diseases.

Seat No.	

Set	P

B.Sc. (Plain) (Semester - II) (New) (CBCS) Examination: March/April - 2025
STATISTICS (Paper – III)
Descriptive Statistics - II (22221211)

Day & Date: Wednesday, 28-May-2025
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions:

- 1) All questions are compulsory.
- 2) Draw neat diagrams and give equations wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic table and calculator is allowed.

Q.1 Choose the correct alternatives from the options.

08

- 1) Correlation analysis aims at _____.
 - a) Predicting one variable for a given value of the other variable
 - b) Establishing relation between two variables
 - c) Measuring the extent of relation between two variables
 - d) Both (b) and (c)
- 2) Positive correlation means: _____.
 - a) Increase in one variable followed by increase in other variable
 - b) Increase in one variable followed by decrease in other variable
 - c) Increase in one variable followed by either increase or decrease in other variable
 - d) None of these
- 3) The rank correlation coefficient between the marks in Physics and Statistics for a group of students is 0.4 and the sum of squares of difference in ranks is 72. Then what is the number of students in the group?
 - a) 10
 - b) 8
 - c) 9
 - d) 11
- 4) The two regression lines are perpendicular to each other angle between two regression lines is _____.
 - a) $\frac{\pi}{4}$
 - b) $\frac{\pi}{2}$
 - c) $\frac{\pi}{6}$
 - d) π

- 5) Let b_{yx} and b_{xy} be the regression coefficients. Then which one of the following is wrong?
- a) $b_{yx} = 2, b_{xy} = \frac{1}{8}$ b) $b_{yx} = 5, b_{xy} = \frac{2}{5}$
- c) $b_{yx} = -0.7, b_{xy} = -\frac{1}{28}$ d) $b_{yx} = 3.2, b_{xy} = 0.2$
- 6) Let the two regression lines be $y = -2x + 3$ and $8x = -y + 3$. Then correlation coefficient between x and y is _____.
- a) $\frac{1}{2}$ b) $-\frac{1}{3}$
- c) $\frac{1}{3}$ d) $-\frac{1}{2}$
- 7) Index Numbers are expressed _____.
 a) in percentages b) in ratios
 c) in terms of absolute value d) all the above
- 8) The weights used in Paasche's formula belongs to _____.
 a) The base period b) Arbitrary chosen period
 c) The given period d) None of these

Q.2 Answer of the following. (Any Four)**08**

- a) Define positive correlation and negative correlation.
 b) Define Spearman's rank correlation coefficient and state the limits of R .
 c) What is relation between regression coefficient and correlation coefficient?
 d) If the $V(X) = 25, r_{xy} = 0.25$ and $b_{yx} = 0.5$. Find the covariance between X and Y .
 e) Define Paasche's price index number.

Q.3 Write short notes. (Any Two)**08**

- a) Write a note on Cost of living index number.
 b) What is the effect of change of origin and scale on correlation coefficient?
 c) The two regression lines are having their means and standard deviations 31.6, 38 and 3.72, 6.31 and $r = -0.36$. Find the two regression lines.

Q.4 Answer of the following (Any Two)**08**

- a) Explain the concept of lines of regression.
 b) Write short note on correlation.
 c) Write a short note on index number.

Q.5 Answer of the following (Any One)**08**

- a) Derive the equations of lines of regression of Y on X by the method of least square.
 b) Prove that Karl Pearson coefficient of correlation lies between -1 and $+1$.

- Q.2 Answer the following. (Any Four) 08**
- a) Mesonephrons
 - b) Function of buccal cavity
 - c) Stomach of rat
 - d) Gill of fish
 - e) Swim bladder
- Q.3 Write short answers. (Any Two) 08**
- a) Explain heart of frog and compare it with heart of calottes.
 - b) Describe metanephrons.
 - c) Explain brain of frog and compare it with brain of rat.
- Q.4 Answer of the following (Any Two) 08**
- a) Explain Pronephrones.
 - b) Describe digestive system of frog.
 - c) Brain of scoliodon.
- Q.5 Answer of the following (Any One) 08**
- a) Describe skin of calottes.
 - b) Heart of pigeon.

Seat No.	

Set	P

B.Sc. (Semester - II) (New) (CBCS) Examination: March/April - 2025
STATISTICS (Paper - IV)
Discrete Probability Distribution (22221212)

Day & Date: Thursday, 29-May-2025
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicates full marks.
3) Draw neat & well labelled diagram wherever necessary.
4) Use of Calculator allowed.

Q.1 Fill in the blanks by choosing correct alternatives.

08

- 1) If $P(x)$ is p. m. f. of a discrete r. v. X , then $\sum P(x)$ is equal to _____.
a) One b) Zero
c) Infinity d) None of these
- 2) For a discrete random variable X , the second moment about mean is called as second _____ moment.
a) raw b) factorial
c) central d) none of these
- 3) The mean and Variance of r.v. X are, given by 1 and 2 respectively then $E(3X^2 + 2X)$ is _____.
a) 5 b) 10
c) 12 d) 11
- 4) Let X be a discrete uniform distribution taking values 5,6,7, ... 14, then $P(X > 9)$ is _____.
a) 0.5 b) 0.6
c) 0.4 d) 0.7
- 5) The sex of a new born child is recorded as male or female in a hospital is a real life situation where _____.
a) Binomial distribution is used
b) Discrete uniform distribution is used
c) Bernoulli distribution is used
d) None of these
- 6) The number of parameter of hypergeometric distribution is _____.
a) One b) Two
c) Three d) None of these
- 7) If X is a Poisson r. v. then _____.
a) Mean > Variance b) Mean = Std. Dev
c) Mean = Variance d) Mean < Variance

- 8) In which distribution, mean is always less than its variance is ____.
- a) Poisson distribution b) Binomial distribution
c) Geometric distribution d) None of these

Q.2 Answer any four of the following. **08**

- a) Define cumulative distribution function of r. v. X .
b) Define expectation of function of r. v. X .
c) Define two point distribution.
d) Define Bernoulli distribution.
e) Define negative binomial distribution.

Q.3 Write short note on any Two of the following. **08**

- a) A r. v. X has following probability distribution.

$X:$	-2	-1	0	1	2	3
$P(x):$	0.1	0.1	0.2	0.2	0.3	0.1

Find $E(X)$ and $V(X)$

- b) Find mean and variance of uniform distribution.
c) If $X \sim B(n, p)$ with $E(X) = 16$ and $V(X) = 8$.
Find
1) $P(X = 0)$
2) $P(X = 1)$

Q.4 Answer any Two of the following. **08**

- a) Find mean and variance of hyper-geometric distribution.
b) State and prove additive property of binomial distribution.
c) Find the recurrence relation for probability of Poisson distribution.

Q.5 Answer any One of the following. **08**

- a) A r. v. X takes values $-3, -2, -1, 0, 1, 2, 3, 4$ such that
 $p(X = 0) = p(X < 0) = p(X > 0)$
 $p(X = -1) = p(X = -2) = p(X = -3) = p$
 $P(X = 1) = p(X = 2) = p(X = 3) = p(X = 4) = q$
 1) p
 2) q
 3) p. m. f. of r. v. X
 b) Find p.g.f. of negative binomial distribution. Hence find its mean and variance.

Seat No.	

Set	P

B.Sc. (Semester - II) (New) (CBCS) Examination: March/April - 2025
ZOOLOGY (Paper-IV)
Developmental Biology of vertebrates (22221233)

Day & Date: Thursday, 29-May-2025
 Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Draw a neat labelled diagram wherever necessary.
 3) Figures to the right indicate full marks.

Q.1 Multiple choose questions.

08

- 1) _____ is an embryonic stage where three germinal layers, ectoderm, endoderm and mesoderm are observed.
 - a) Morula
 - b) Gastrula
 - c) Amphimixis
 - d) Somites
- 2) In _____ fertilization is the mode of reproduction in which male fertilize female gamete outside of body.
 - a) internal
 - b) external
 - c) syngamy
 - d) budding
- 3) Two separate eggs are fertilized by two separate sperm, resulting in _____ twins.
 - a) polar
 - b) parasitic
 - c) monozygotic
 - d) dizygotic
- 4) _____ is one of the hormone induce metamorphosis in tadpole.
 - a) Thyroid
 - b) MSH
 - c) Testosterone
 - d) Oxytocin
- 5) Hen egg is _____.
 - a) Mesolecithal
 - b) Alecithal
 - c) Megalecithal
 - d) Microlecithal
- 6) The _____ cleavage furrow divide the entire egg into two blastomers.
 - a) meroblastic
 - b) merospiral
 - c) superficial
 - d) holoblastic
- 7) _____ can differentiate into multiple cell types.
 - a) Stem cell
 - b) Nerve cell
 - c) Glial cell
 - d) Monocytes
- 8) _____ is the sudden loss of a pregnancy before the 20th week.
 - a) Apoptosis
 - b) Aging
 - c) Miscarriage
 - d) Necrosis

- Q.2 Answer any four of the following. 08**
- a) What is Apoptosis.
 - b) Write functions of placenta.
 - c) Define Oogenesis.
 - d) Write causes of miscarriages.
 - e) What is blastulation in embryo.
- Q.3 Write short note on any two of the following. 08**
- a) Describes types of twins.
 - b) Write on steps of implantation of embryo in human.
 - c) Write on any two patterns of cleavage in embryo development.
- Q.4 Answer any two of the following. 08**
- a) Write on applications of ultrasound.
 - b) Write on metamorphosis in tadpole.
 - c) Discuss cellular differentiation.
- Q.5 Answer any one of the following. 08**
- a) Write on detail process spermatogenesis in mammals.
 - b) Define internal fertilization. Explain mechanism of fertilization in human.

Day & Date: Friday, 30-May-2025
Time: 12:00 PM To 02:00 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks

08

- Page 1 of 2

- 8)** The polar equation of $xy = 3$ is _____.
- a) $r = \cos \theta$ b) $r = \sin \theta$
- c) $r^2 \sin 2\theta = 9$ d) $r^2 \cos 2\theta = 9$

Q.2 Answer of the following. (Any Four)

08

- Find Cartesian co-ordinate of a point whose polar co-ordinate are $\left(4, \frac{\pi}{3}\right)$
- Find the equation of sphere whose center at $(1, -2, 3)$ and Radius is 5.
- Identify the conic of equation.
$$4x^2 - 12xy + 9y^2 + 4x + y - 5 = 0$$
- Find the equation of sphere whose center is at $(-1, 2, -3)$ and which passes through the point $(2, -1, -1)$
- Show that the following points are collinear
 $A(3, 2, -4), \quad B(9, 8, -10), \quad C(-2, -3, 1)$

Q.3 Answer of the following . (Any Two)

08

- a)** Find the equation of plane passing through the line of Intersection $x + y + z + 6 = 0$ and $2x + 3y + 4z + 5 = 0$ and perpendicular to plane $x + 2y - z = 8$.
- b)** Show that the plane $2x - 2y + z + 12 = 0$ touches the sphere $x^2 + y^2 + z^2 - 2x - 4y + 2z - 3 = 0$ and also find point of contact.
- c)** If origin is shifted to point (h, k) the equation $x^2 + 3xy + 2y^2 + 5x - 4y + 6 = 0$ will not contain the linear term in x and y then find the point (h, k) .

Q.4 Answer of the following (Any Two)

08

- Find k if $(2, -1, 1)$ lies on the sphere and $x^2 + y^2 + z^2 + 4x + 2y - 2z - k = 0$ with this k hence find center and radius of sphere.
- Find the equation of plane through the points $P(2, 2, -1)$, $Q(3, 4, 2)$ and $R(7, 0, 6)$.
- If by rotation of Axes the expression $\alpha x + \beta y$ changes to $\alpha' x' + \beta' y'$ then prove that $\alpha^2 + \beta^2$ is an invariants.

Q.5 Answer of the following (Any One)

08

- a)** Show that the equation of plane, tangent to the sphere $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$ at point $P(x_1, y_1, z_1)$ is $xx_1 + yy_1 + zz_1 + u(x + x_1) + v(y + y_1) + w(z + z_1) + d = 0$.
- b)** If axes are rotated through an angle θ the equation $ax^2 + 2hxy + by^2$ transform into $a'x'^2 + b'y'^2$ then $\theta = \frac{1}{2} \tan^{-1} \left(\frac{2h}{a-b} \right)$

Set	P

B.Sc. (Semester - II) (New) (CBCS) Examination March/April - 2025
BOTANY (Paper - III)
Plant Ecology (22221202)

Day & Date: Friday, 30-May-2025
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Choose the correct alternatives and rewrite the complete sentence. 08

- 1) Plants grow in water are called _____ plant.

a) xerophytic	b) mesophytic
c) hydrophytic	d) bryophytic
- 2) Environmental factor which deals with the structure of soil are termed as _____ factor.

a) biotic	b) edaphic
c) topographic	d) climatic
- 3) Out of following _____ is biotic component.

a) water	b) soil
c) plant	d) light
- 4) The science dealing with soil is called _____.

a) pedology	b) Aerology
c) geology	d) paleontology
- 5) Ecosystem is a smallest unit of _____.

a) Ionosphere	b) lithosphere
c) biosphere	d) mesosphere
- 6) The source of energy in ecosystem is _____.

a) AMP	b) ATP
c) NADP	d) sunlight
- 7) Succession occur after landslide is called _____.

a) primary	b) secondary
c) tertiary	d) Cyclic
- 8) An organism depends on another organism for their food is called _____.

a) autotroph	b) heterotroph
c) phototroph	d) chemotroph

- Q.2 Answer any four of the following. 08**
- a) Define the term ecology.
 - b) Enlist the different types of climatic factors.
 - c) Define Xerophyte.
 - d) What is food chain?
 - e) What is energy flow?
- Q.3 Write a short note on any two of following. 08**
- a) Light as climatic factor
 - b) Hydrosere
 - c) Food web
- Q.4 Answer any two of the following. 08**
- a) Write chemical properties of soil.
 - b) Define ecosystem. Explain the structure and function of ecosystem.
 - c) Discuss about ecological pyramid.
- Q.5 Answer any one of the following 08**
- a) What is plant community? Explain in brief quantitative characters.
 - b) Explain in brief process of ecological succession.

Seat No.	

Set **P**

B.Sc. (Semester - II) (New) (CBCS) Examination March/April - 2025
MATHEMATICS (Paper - IV)
Differential Equations (22221224)

Day & Date: Monday, 02-June-2025
 Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 Choose the correct alternative for each of the following.**08**

- 1) The general solution of the differential equation $\sqrt{1-y^2} \cdot dx + \sqrt{1-x^2} \cdot dy = 0$ is _____.
 a) $\sin^{-1} x + \sin^{-1} y = c$ b) $\cos^{-1} x + \cos^{-1} y = c$
 c) $\sin^{-1} x + \cos^{-1} y = c$ d) $\sin^{-1} y + \cos^{-1} x = c$
- 2) The differential equation $(2x - 3y + 1)dx + (3x + 4y - 1)dy = 0$, is of the form _____ differential equation.
 a) Homogeneous b) Exact
 c) Non-homogeneous d) Variable separable
- 3) In the differential equation $M(x, y)dx + N(x, y)dy = 0$, if $\frac{\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}}{N} = f(x)$ then the corresponding integrating factor is _____.
 a) $\int f(y)dy$ b) $\int f(x)dx$
 c) $e^{\int f(x)dx}$ d) $e^{\int f(y)dy}$
- 4) The equation $(x^2 - 3xy^2)dx + (1 + 6y^2 - 3x^2y)dy = 0$ is _____ differential equation.
 a) Non-exact b) Homogeneous
 c) Exact d) Linear
- 5) The value of $\frac{1}{D^2}(x^3)$ is _____ (where $D = \frac{d}{dx}$)
 a) $\frac{x^4}{20}$ b) $\frac{x^5}{20}$
 c) $\frac{x^4}{15}$ d) $\frac{x^5}{15}$
- 6) The general solution of the differential equation $(D + 1)^3 y = 0$ is _____.
 a) $y = (c_1 + c_2 + c_3)e^{-x}$ b) $y = (c_1 + c_2x + c_3x^2)e^x$
 c) $y = (c_1 + c_2x + c_3x^2)e^{-x}$ d) $y = c_1x + c_2x^2 + c_3x^3$

- 7) The value of $\frac{1}{D^2+1}[\sin x]$ is _____.
 a) $\frac{x \cos x}{2}$ b) $-\frac{x \cos x}{2}$
 c) $\frac{x \sin x}{2}$ d) $-\frac{x \sin x}{2}$
- 8) The value of $\frac{1}{f(D)}[e^{ax}V] =$ _____.
 a) $e^{ax} \cdot \frac{1}{f(D)} \cdot [V]$ b) $e^{ax} \cdot \frac{1}{f(D-a)} \cdot [V]$
 c) $e^{ax} \cdot \frac{1}{f(D^2)} \cdot [V]$ d) $e^{ax} \cdot \frac{1}{f(D+a)} \cdot [V]$

Q.2 Solve the following. (Any Four)**08**

- a) Solve $xy \log y \, dx + (1 + x^2)dy = 0$
 b) Solve $(\sin x \cdot \cos y + e^{2x}) \, dx + (\cos x \cdot \sin y + \tan y) \, dy = 0$
 c) With usual notation, prove that $\frac{1}{f(D^2)}[\cos ax] = \frac{\cos ax}{f(-a^2)}$, $f(-a^2) \neq 0$
 d) Solve $\frac{dy}{dx} + \frac{2xy}{1+x^2} = \frac{1}{(1+x^2)^2}$
 e) Evaluate $\frac{1}{D+2}(\sin x)$, (where $D = \frac{d}{dx}$)

Q.3 Solve the following. (Any Two)**08**

- a) Solve $y^2 dx + (x^2 - xy)dy = 0$
 b) Explain the method of solving Bernoulli's equation $\frac{dy}{dx} + PY = Qy^n$, where P and Q are functions of x only.
 c) Solve $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = x$

Q.4 Solve the following. (Any Two)**08**

- a) Explain the method of solving non-homogeneous differential equation of the form

$$\frac{dy}{dx} = \frac{ax + by + c}{a'x + b'y + c'}$$

- b) Prove that $\frac{1}{D-a}[X] = e^{ax} \int e^{-ax} \cdot X \cdot dx$
 where $D = \frac{d}{dx}$ and X is a function of x .
 c) Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^x \cdot \sin x$.

Q.5 Solve the following. (Any One)**08**

- a)** State and prove the necessary and sufficient condition for the differential equation $M(x, y)dx + N(x, y)dy = 0$ to be an exact.
- b)** i) Explain the method of finding the particular integral of $f(D)y = e^{ax}$ when $f(a) \neq 0$. (where $D = \frac{d}{dx}$)
- ii) Solve

$$\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = e^{4x}$$

Seat No.	

Set **P**

B.Sc.(Plain) (Semester - II) (New) (CBCS) Examination: March/April - 2025
BOTANY (Paper-IV)
Taxonomy of Angiosperms (22221203)

Day & Date: Monday, 02-June-2025
 Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Draw a neat labelled diagram wherever necessary.
 3) Figures to the right indicate full marks.

Q.1 Multiple choose questions.**08**

- 1) _____ is the standard size for herbarium sheets used to mount plant specimens.

a) 41x29cm	b) 31x19 cm
c) 20x30 cm	d) 29x36cm
- 2) Family Amaranthaceae belongs to subclass _____.

a) Polypetalae	b) Gamopetalae
c) Curvembryae	d) Monochlamydeae
- 3) The term taxonomy was first introduced by _____.

a) A.P. de Candolle	b) G.H.M. Lawrence
c) Adolf Meyer	d) Herman J. LAM
- 4) _____ system of classification was used by Linnaeus.

a) Phylogenetic system	b) Artificial system
c) Natural system	d) APG system
- 5) Sir. J.C. Bose botanical garden is situated at _____.

a) Calcutta	b) Pune
c) Kolhapur	d) Lucknow
- 6) Gynoecium in the family Liliaceae is _____.

a) Monocarpellary	b) Tricarpellary
c) Bicarpellary	d) Polycarpellary
- 7) *Cassia auriculata* belongs to the family _____.

a) Liliaceae	b) Solanaceae
c) Amaranthaceae	d) Caesalpinaceae
- 8) International Code of Botanical Nomenclature is based on the set of _____ principles.

a) Five	b) Six
c) Seven	d) Ten

- Q.2 Answer the following. (Any Four) 08**
- a) Define taxonomy.
 - b) Draw neat labelled diagram of typical structure of flower.
 - c) Write any two merits of Bentham and Hookers system of classification.
 - d) Enlist the name of botanical garden.
 - e) Define herbarium.
- Q.3 Write short note on the following. (Any Two) 08**
- a) Economic importance of family - Solanaceae.
 - b) Lead botanical garden.
 - c) Aims of taxonomy.
- Q.4 Answer the following. (Any Two) 08**
- a) Explain principles of ICBN.
 - b) Write the systematic position of family-Liliaceae.
 - c) Describe advanced characters of flower.
- Q.5 Answer the following. (Any One) 08**
- a) Describe step involved in preparation of herbarium specimens.
 - b) Define classification. Explain types of classification.

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B.Sc. (Semester - II) (New) (CBCS) Examination March/April - 2025
Electronics (Paper - III)
Semiconductor Devices (22221226)

Day & Date: Tuesday, 03-06-2025
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicates full marks.
4) Use of logarithmic table and calculator is allowed.

Q.1 Multiple choice questions.

08

- 1) _____ diode is used as voltage regulator.
a) LED
b) Zener
c) Varactor
d) Tunnel
- 2) The forward voltage drop across silicon diode is about _____.
a) 7V
b) 0.3V
c) 3V
d) 0.7V
- 3) The base of a transistor is _____ doped.
a) Lightly
b) Heavily
c) Moderately
d) None of these
- 4) The energy gap in a semiconductor _____.
a) increases with temperature
b) does not change with temperature
c) decreases with temperature
d) overlapping takes place
- 5) The SCR is the abbreviation of _____.
a) Silicon Conducting Resistor
b) Silicon Controlled Resistor
c) Silicon Controlled Rectifier
d) Silicon Conducting Rectifier
- 6) A pentavalent impurity has _____ valence electrons.
a) 3
b) 4
c) 5
d) 6
- 7) BJT is _____ controlled device.
a) voltage
b) field
c) current
d) power

- 8) P channel JFET current is conducted by _____.
a) only electrons b) both electrons and holes
c) any charges d) only holes

Q.2 Answer the following. (Any Four) 08

- a) Compare semiconductor diode and Zener diode.
- b) State any four applications of LED.
- c) Draw I-V characteristics of a DIAC.
- d) State any two acceptor impurity and any two donor impurity.
- e) Draw symbols of BJT and UJT with labels.

Q.3 Write Short Notes. (Any Two) 08

- a) TRIAC.
- b) Working of N channel JFET.
- c) Varactor diode.

Q.4 Answer the following. (Any Two) 08

- a) Explain the formation PN junction and barrier potential in it.
- b) Explain I-V characteristics of SCR.
- c) Define current gain α & β . Derive relation between them.

Q.5 Answer the following. (Any One) 08

- a) Define all FET parameters and derive relation between them.
- b) Explain input and output characteristics of a transistor in CB configuration.

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Set	P

B.Sc. (Semester - II) (New) (CBCS) Examination March/April - 2025
Physical Geography (Paper - III)
Human Geography I (22221235)

Day & Date: Tuesday, 03-06-2025
 Time: 12:00 PM To 02:00 PM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full Marks.
 3) Draw neat diagrams wherever necessary.
 4) Use of maps stencil is allowed.

Q.1 Choose the correct alternatives from the option.

08

- 1) The _____ Determines color of skin.
 - a) Mithen
 - b) Carbon
 - c) Nitrogen
 - d) Melanin
- 2) Skin of mangolian is _____ colour.
 - a) Black
 - b) Red
 - c) Yellow
 - d) Blue
- 3) _____ is the important festivals of the Christianity.
 - a) Ramjan Eid
 - b) Rosh Hashanah
 - c) Diwali
 - d) Christmas
- 4) The book 'Principle of human Geography' is written by _____.
 - a) Humboldt
 - b) Blache
 - c) Miss Semple
 - d) Ratzel
- 5) _____ is the largest language family and most wide sprade language in the world.
 - a) Austronesian
 - b) Sino Tibetan
 - c) Indo-European
 - d) Hametic-Semits
- 6) Eskimos boat is made from skin of the Reindeer is known as _____.
 - a) Sledge
 - b) Kayak
 - c) Tupic
 - d) Igloo
- 7) The combine living of boys and girls is known as _____ of Naga.
 - a) Gotul
 - b) Bada
 - c) Lonu
 - d) Morung
- 8) Griffith Taylor classified into _____ racial groups of the world.
 - a) Five
 - b) Six
 - c) Seven
 - d) Eight

- Q.2 Answer the following. (Any Four) 08**
- a) State the characteristics of Hinduism.
 - b) Write the branches of human geography.
 - c) Physical characteristics of Naga Tribe.
 - d) State indefinite physical (Phenotypic) Traits.
 - e) State the languages of sino-tibetan family.
- Q.3 Write Short Notes (Any Two) 08**
- a) Explain the region and characteristics of Islam.
 - b) State the economy of Eskimo.
 - c) Define the Human race.
- Q.4 Answer the following. (Any Two) 08**
- a) Explain the importance of Human Geography.
 - b) Explain the language groups in the world.
 - c) State the types of Races on the basis of form of face.
- Q.5 Answer the following. (Any One) 08**
- a) Define the Human geography and explain its Nature.
 - b) Explain the various language families in the world.

Day & Date: Tuesday, 03-06-2025
Time: 03:00 PM To 05:00 PM

Page 1 of 2

- Q.2 Answer the following. (Any Four) 08**
- a) What is outcrop?
 - b) Define Unconformities.
 - c) What is fault plane.
 - d) Distinguish between fault and joint.
 - e) Forces responsible for columnar joints.
- Q.3 Write short notes (Any Two) 08**
- a) Fault terminology.
 - b) Clinometer compass.
 - c) Symmetrical and asymmetrical fold.
- Q.4 Answer the following. (Any Two) 08**
- a) Describe Isoclinal and recumbent fold.
 - b) Explain geometric classification of joints.
 - c) Explain use of contour in topographic maps.
- Q.5 Answer the following. (Any One) 08**
- a) What is fault? Describe any three types of fault.
 - b) What is unconformity? Describe various types of unconformities.

Seat No.	

Set P

B.Sc. (Semester - II) (New) (CBCS) Examination: March/April – 2025
ELECTRONICS (Paper - IV)
Digital Electronics (22221227)

Day & Date: Wednesday, 04-June-2025
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions:

- 1) All questions are compulsory.
- 2) Draw neat diagrams wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of log table and calculator is allowed.

Q.1 Choose the correct alternatives from the options.

08

- 1) TTL NAND gate has inputs at _____ of transistor.

 - a) base
 - b) collector
 - c) drain
 - d) emitter
- 2) When R=1, S=1 then output of R-S flip flop is _____ state.

 - a) set
 - b) Last state
 - c) race
 - d) reset
- 3) _____ is 3 to 8 decoder

 - a) IC 7447
 - b) IC 74138
 - c) IC 14153
 - d) 74147
- 4) In modulus of seven counter minimum _____ flip flops are used.

 - a) 3
 - b) 2
 - c) 7
 - d) 4
- 5) For shifting data left and loading the data parallelly, mode control of IC 7495 should be _____.

 - a) between high and low
 - b) high or low
 - c) low
 - d) high
- 6) The digital logic having only one input and many outputs is called _____.

 - a) decoder
 - b) multiplexer
 - c) demultiplexer
 - d) encoder
- 7) In case of D flip flop when D is 1, then its output is _____.

 - a) minimum
 - b) 1
 - c) 0
 - d) low
- 8) For TTL NAND gate when both inputs are 0 then its output is _____.

 - a) 1
 - b) 0
 - c) either 0 or 1
 - d) neither 0 nor 1

- Q.2 Answer the following questions. (Any Four) 08**
- a) Define fan out and fan in of TTL NAND gate.
 - b) What is Master slave JK flip flop?
 - c) Draw the diagram of 4 to 1 multiplexer using gates.
 - d) What are the types of shift register?
 - e) Draw the pin diagram of IC 7490
- Q.3 Write short notes. (Any Two) 08**
- a) MOD 6 counter
 - b) Three-bit ring counter
 - c) BCD to decimal decoder
- Q.4 Answer the following questions. (Any Two) 08**
- a) Explain serial in and serial out shift register.
 - b) Explain RS flip flop with its truth table.
 - c) What is timing diagram? Explain timing diagrams of divided by 10 counter along with its truth table.
- Q.5 Answer the following questions. (Any One) 08**
- a) Explain terminology of IC 7447 and its use to drive common anode seven segment display.
 - b) Explain any four specifications of TTL NAND gate.

Seat No.	

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B.Sc. (Semester - II) (New) (CBCS) Examination March/April – 2025
PHYSICAL GEOGRAPHY (Paper - IV)
Human Geography II (22221236)

Day & Date: Wednesday, 04-June-2025
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions:

- 1) All questions are compulsory.
- 2) Draw neat diagrams wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of maps stencil is allowed.

Q.1 Choose the correct alternatives from the options.

08

- 1) The UNO declared _____ as world population day.

a) 11 July	b) 11 June
c) 12 July	d) 12 June
- 2) Population density = Total population / _____.

a) Female population	b) Male population
c) Area	d) Birth rate
- 3) High density of population in India is mainly due to _____.

a) Industry	b) Banking
c) Marketing sector	d) Agriculture
- 4) In the first stage of demographic transition the birth rate and death rate are _____.

a) High	b) Medium
c) Low	d) Very low
- 5) _____ is an industrial centre.

a) Oxford	b) Manchester
c) Howard	d) Mecca
- 6) Urbanization is _____ process.

a) Sudden	b) Moderate
c) Gradual	d) Disconnect
- 7) Agriculture is _____ type of economic activity.

a) Primary	b) Secondary
c) Tertiary	d) Quaternary
- 8) _____ type of climatic region is famous for fruit farming in the world.

a) Monsoon	b) Mediterranean
c) European	d) Equatorial

- Q.2 Answer of the following. (Any Four) 08**
- a) Define sex ratio.
 - b) Define age structure.
 - c) Define settlement.
 - d) Define commercial grain farming.
 - e) Write name of shifting cultivation region.
- Q.3 Write short note (Any Two) 08**
- a) Growth of population
 - b) Characteristics of rural settlement
 - c) Problems of agriculture
- Q.4 Answer the following (Any Two) 08**
- a) Write merits and demerits of demographic transition theory.
 - b) Describe the problems of urban settlement.
 - c) Distribution of world population.
- Q.5 Answer the following (Any One) 08**
- a) Explain factor affecting on distribution of world population.
 - b) Explain types and pattern of rural settlement.

Set P

B.Sc. (Semester - II) (New) (CBCS) Examination March/April - 2025
GEOLOGY (Paper - IV) (22221215)
Crystallography

Day & Date: Wednesday, 04-June-2025
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Choose the correct alternatives from the options.

08

- 1) In _____ System, center of symmetry is present.

a) Triclinic	b) Hexagonal
c) Orthorhombic	d) All the above
- 2) Which of the following form belongs to Triclinic system?

a) Tris-octahedron	b) Pyramid
c) Quarter Pyramid	d) Octahedron
- 3) Which of the following statement is TRUE?

a) Cubic system - 9 planes and 9 axes of symmetry present
b) Hexagonal system - 7 planes and 7 axes of symmetry present
c) Monoclinic System - 5 plane and 5 axes of symmetry present
d) All the above
- 4) The general formula of Dodecahedron is _____.

a) (100)	b) (011)
c) (110)	d) (111)
- 5) Which of the following is a type mineral of Monoclinic system?

a) Gypsum	b) Axinite
c) Beryl	d) Galena
- 6) All crystallographic axes cut in _____.

a) pyramid	b) octahedron
c) a & b	d) basal pinacoid
- 7) Smooth, flat surface of crystal is called as _____.

a) edge	b) solid angle
c) face	d) interfacial angle
- 8) Quarter Pyramid constitutes of _____ faces.

a) 2	b) 8
c) 6	d) 4

- Q.2 Answer the following question. (Any Four) 08**
- a) What is a Crystallography?
 - b) Give Elements of Symmetry of Hexagonal System.
 - c) Define Face of crystal.
 - d) Define combined forms of Crystal.
 - e) Define interfacial angle.
- Q.3 Write short note on the following. (Any Two) 08**
- a) Cube & Octahedron
 - b) Contact Goniometer
 - c) Prisms
- Q.4 Answer the following question. (Any Two) 08**
- a) Explain Pinacoid and their types.
 - b) Define Plane and Axes of Symmetry.
 - c) Draw labelled diagrams of crystallographic axes of Cubic and Tetragonal systems.
- Q.5 Answer the following question. (Any One) 08**
- a) Define crystal. Describe Crystallographic axes, Elements of Symmetry and any two forms of Hexagonal System.
 - b) Define crystal. Describe Crystallographic axes, Elements of Symmetry and any two forms of Orthorhombic System.

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Set P

**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
March/April – 2025
CHEMISTRY (Paper - V)
Organic Chemistry (22221330)**

Day & Date: Thursday, 05-June-2025
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
(At. Wts.: H= 1, C=12, O=16, N=14, Na=23, Cl=35.5)

Q.1 Multiple choose questions.

08

- 1) What does the Bathochromic shift in UV spectroscopy indicate?
 - a) A shift to a shorter wavelength
 - b) A shift to a longer wavelength
 - c) Decrease in absorbance
 - d) Increase in absorbance
- 2) Which of the following reactions is associated with the Pinacol-Pinacolone rearrangement?
 - a) Formation of glycerol
 - b) Reaction of ethylene glycol with lead acetate
 - c) Oxidation of ethylene glycol with HIO₄
 - d) Conversion of pinacol to pinacolone
- 3) Which of the following reactions is specific to phenol and not to simple alcohols?
 - a) Acylation
 - b) Oxidation with nitric acid
 - c) Reaction with hydrogen halides
 - d) Fries rearrangement
- 4) Which method is commonly used for the preparation of anisole?

a) Williamson's synthesis	b) HVZ reaction
c) Perkin reaction	d) Reimer-Tiemann reaction
- 5) Which reaction involves the formation of an α, β -unsaturated carbonyl compound?

a) Aldol condensation	b) Cannizzaro's reaction
c) Benzoin condensation	d) Knoevenagel reaction
- 6) Acrylic acid prepared from _____.

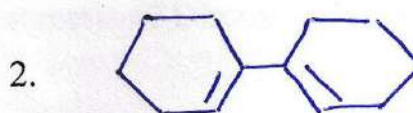
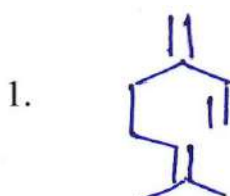
a) maleic acid	b) acrolein
c) glycerol	d) succinic acid

- 7) Which reaction is used to convert monochloroacetic acid into glycine?
- Nucleophilic substitution with ammonia
 - Esterification with ethanol
 - Reduction with sodium borohydride
 - Oxidation with potassium permanganate
- 8) Which of the following is a characteristic feature of conformational isomerism?
- Rotation around a single bond
 - Different connectivity of atoms
 - Presence of chiral centers
 - Restricted rotation around a double bond

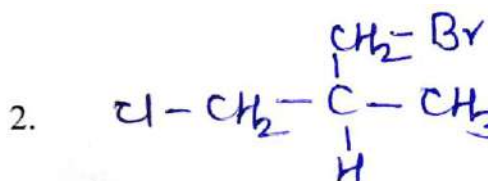
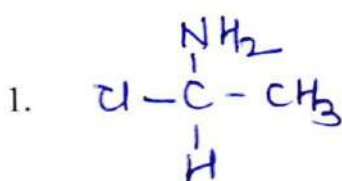
Q.2 Answer the following. (Any Four)

08

- a) Calculate λ_{max} for the following dienes by using Woodward-Fieser rule:



- b) Assign the 'R' and 'S' configuration to the following.



- c) What is the action of following on ethylene glycol?
- HCl
 - HNO₃
- d) Write the general mechanism of nucleophilic addition to carbonyl compound.
- e) What is the action of following on ethylene oxide?
- H₂O/H⁺
 - HBr

Q.3 Write short notes. (Any Two)

08

- Acid catalyzed ring opening of ethylene oxide.
- Preparation of Citric acid.
- Types of electronic transitions involved in UV spectroscopy.

Q.4 Answer the following. (Any Two)**08**

- a) What happens when Succinic acid is reacted with C_2H_5OH/HCl .
Explain with reaction involved.
- b) Define the terms with example:
 - i) Bathochromic shift
 - ii) Hypsochromic shift
 - iii) Hyperchromic shift
 - iv) Hypochromic shift
- c) Explain in detail Knoevenagel condensation reaction with mechanism.

Q.5 Answer the following. (Any One)**08**

- a) What is meant by conformational isomerism? Discuss conformational isomers in n-butane. Draw the various conformers.
- b) Explain Perkin reaction with mechanism?

Seat No.	

Set P

B.Sc. (Semester - III) (New) (CBCS) Examination: March/April - 2025
Computer Science (Paper - V)
Data Structure (22221320)

Day & Date: Thursday, 05-June-2025
 Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Draw neat diagrams and give equations wherever necessary.
 3) Figures to the right indicates full marks.

Q.1 Multiple choice questions.

08

- 1) Which of the following is a linear data structure?
 - a) Array
 - b) AVL tree
 - c) Binary tree
 - d) Graph
- 2) Which of the following is not the type of queue?
 - a) priority queue
 - b) single-ended queue
 - c) circular queue
 - d) ordinary queue
- 3) When a pop() operation is called on an empty queue, what is the condition called?
 - a) Overflow
 - b) syntax error
 - c) underflow
 - d) garbage value
- 4) Which of the following data structures finds its use in recursion?
 - a) stack
 - b) Linked List
 - c) queue
 - d) Array
- 5) The node of the tree, which doesn't have any child node, is called a _____ node?
 - a) Parent
 - b) child
 - c) non leaf
 - d) Leaf
- 6) In a _____ the value of the left node must be smaller than the parent node and the value of the right node must be greater than the parent node.
 - a) Full binary tree
 - b) Complete binary tree
 - c) Binary search tree
 - d) Balanced binary tree
- 7) Which of the following Data structure is used to implementation of Breadth First Search in graph?
 - a) Stack
 - b) Queue
 - c) Linked List
 - d) Tree

- 8) Which of the following sorting algorithm is of divide and conquer type?
- a) Bubble sort
 - b) Insertion sort
 - c) Merge sort
 - d) Selection sort?

Q.2 Answer the following question. (Any Four) 08

- a) What is an array?
- b) What is ADT?
- c) What is graph?
- d) What is AVL tree?
- e) What are the differences between static & dynamic representation.

Q.3 Write short note on the following. (Any Two) 08

- a) Tree traversals (preorder, inorder, postorder).
- b) Circular queue.
- c) Stack operations.

Q.4 Answer the following. (Any Two) 08

- a) Explain how to convert infix to postfix using stack?
- b) Write a program to implement operations of queue.
- c) What is tree? Explain types of tree.

Q.5 Answer the following. (Any One) 08

- a) What is Linked List? Explain types of Linked List.
- b) What is sorting? Explain types of sort.

Seat No.	

Set	P

B.Sc. (Semester - III) (New) (CBCS): Examination March/April – 2025
CHEMISTRY (Paper - VI)
Inorganic Chemistry (22221331)

Day & Date: Friday, 06-June-2025
 Time: 12:00 PM To 02:00 PM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
 2) Draw neat diagrams and give equations wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of logarithmic table and calculator is allowed.

Q.1 Choose the correct alternatives from the options.

08

- 1) The IUPAC nomenclature of $K_4[Ni(CN)_6]$ _____.
 a) Potassium hexacyanide nickel (II)
 b) Potassium hexacyanonickelate (II)
 c) Tetrapotassium hexacyanide nickel (II)
 d) Tetrapotassium hexacyanonickel (II)
- 2) Geometrical isomerism is also called as _____ isomerism.
 a) optical
 b) symmetric
 c) cis-trans
 d) mirror-image
- 3) Highest oxidation state +7 is shown by _____.
 a) Copper
 b) Chromium
 c) Zinc
 d) Manganese
- 4) Second transition series starts with _____ and ends with _____ element.
 a) Yttrium, Cadmium
 b) Yttrium, Mercury
 c) Lanthanum, Mercury
 d) Lanthanum, Cadmium
- 5) Chelating agents having four acidic and two coordinating groups is _____.
 a) Glycine
 b) EDTA
 c) DMG
 d) Ethylenediamine
- 6) In the formation of NH_4^+ , H^+ acts as _____.
 a) Lewis base
 b) Donor
 c) Lewis acid
 d) Chelating agent
- 7) According to Pearson's HSAB concept soft acid prefer combine with _____ to form stable complex.
 a) Soft acid
 b) Soft base
 c) Hard acid
 d) Hard base

- 8) The term chelate was first used by _____ and _____.
a) G.T. Morgan and H.D. Drew
b) G.T. Morgan and Alfred Werner
c) H. D. Drew and Pauling
d) Alfred Werner and Pauling

Q.2 Answer of the following. (Any Four)

08

- a) Define terra EAN. Calculate Effective atomic number for Fe in $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ and comment on stability of complex.
b) Give the name and structure of two bidentate chelating agents.
c) Write analytical applications of DMG.
d) Define acid and base according to Lewis concept, with example.
e) Find out oxidation state of Mn in KMnO_4 and Cr in $\text{K}_2\text{Cr}_2\text{O}_7$
f) Give limitations of HSAB concept.

Q.3 Answer of the following. (Any Two)

08

- a) Distinguish between double salt and complex salt
b) Give structural requirement of chelate formation.
c) Explain complex forming ability of d-block elements with suitable example.

Q.4 Answer the following. (Any Two)

08

- a) Write a short note on geometrical isomerism.
b) Give the classification of Lewis acids.
c) Write a short note on oxidation state of 3d- block elements.

Q.5 Answer the following. (Any One)

08

- a) What are the postulates of VBT. Explain the complex $[\text{Fe F}_6]^{3-}$ on the basis of VBT. Comment on the stability and magnetic property of complex.
b) Write names, symbols and electronic configuration of first and second transition series.

Seat No.	

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B.Sc. (Semester - III) (New) (CBCS) Examination: March/April – 2025
COMPUTER SCIENCE (Paper - VI)
Software Engineering (22221321)

Day & Date: Friday, 06-June-2025
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Choose the correct alternatives from the options. 08

- 1) System performs well through such circumstances like incorrect input, malfunctioning of hardware then the software system is _____.
 - a) Reliable
 - b) Robust
 - c) Efficient
 - d) Portable
- 2) Which tool is use for structured designing?
 - a) Program flowchart
 - b) Structure chart
 - c) Data-flow diagram
 - d) Module
- 3) Agile Software Development is based on _____.
 - a) Incremental Development
 - b) Iterative Development
 - c) Linear Development
 - d) Both Incremental and Iterative Development
- 4) How many feasibility studies is conducted in Requirement Analysis?
 - a) Two
 - b) Three
 - c) Four
 - d) None of the mentioned
- 5) The testing in which code is checked.
 - a) Black box testing
 - b) White box testing
 - c) Red box testing
 - d) Green box testing
- 6) Which is NOT a software characteristic?
 - a) Software does not wear out
 - b) Software is flexible
 - c) Software is not manufactured
 - d) Software is always correct
- 7) Level-O DFD is similar to _____.
 - a) Use case diagram
 - b) Context diagram
 - c) System diagram
 - d) none of the above

- 8) What threatens the quality and timeliness of the software to be produced?
- a) Known risks
 - b) Business risks
 - c) Project risks
 - d) Technical risks

Q.2 Answer the following. (Any Four) 08

- a) Define the term:
 - i) Entity
 - ii) Attribute
- b) Write the advantages of HIPO.
- c) Define the term Risk.
- d) What is software?
- e) What are the types of decision table?
- f) What is Software Testing?

Q.3 Write short notes. (Any Two) 08

- a) Explain various symbols used in DFD.
- b) Explain V-shape model of SDLC.
- c) What is system maintenance? State the importance of maintenance.

Q.4 Answer the following (Any Two) 08

- a) Differentiate between Physical and Logical DFD.
- b) Draw a Decision tree for following case study.

A Co-operative bank XYZ will grant loans under the following conditions:

 - i) If a customer has an account with the bank and has no loan outstanding, loan will be granted.
 - ii) If a customer has an account with the bank but some amount is outstanding from previous loan, then loan will be granted if special management approval is obtained.
 - iii) Reject loan application in all other cases.
- c) What is Data Dictionary? Explain the importance of DD.

Q.5 Answer the following (Any One) 08

- a) Discuss the different methods of conversions from old system to new system in brief.
- b) Explain the various types of system in detail.

Seat No.	

Set **P**

B.Sc. (Semester - III) (New) (CBCS) Examination: March/April - 2025
PHYSICS (Paper - V)
General Physics and Sound (22221304)

Day & Date: Monday, 09-June-2025
 Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 Multiple choice questions.**08**

- 1) Scalar triple product is also known as _____.
 a) volume product b) box product
 c) plane product d) cross product
- 2) If divergence of vector field is zero, then vector field is called as _____.
 a) solenoidal vector b) scalar field
 c) non-solenoidal vector d) unit vector field
- 3) In a pure precessional motion, nutation is _____.
 a) infinity b) very small
 c) large d) absent
- 4) Gyrocompass is used to determine _____.
 a) angle of dip
 b) geographic north south direction
 c) distance between two places
 d) magnetic north south
- 5) When a wire is twisted _____ comes into picture.
 a) Young's modulus b) Bulk Modulus
 c) Modulus of rigidity d) Poisson's ratio
- 6) The C.G.S. unit of viscosity is _____.
 a) kg/m.s b) poise
 c) gm.cm/s d) N.s/m²
- 7) Microphone converts _____ energy into electrical energy.
 a) Sound b) Optical
 c) mechanical d) heat
- 8) Decay of sound energy in a hall is _____.
 a) Constant b) Linear
 c) exponential d) Zero

- Q.2 Answer the following question. (Any Four) 08**
- a) Determine the critical velocity of disc of radius 30 cm rolling over a horizontal surface. ($g = 980 \text{ cm/s}^2$)
 - b) What is precessional motion?
 - c) Draw a neat labelled diagram showing plane of bending and neutral axis.
 - d) Define coefficient of viscosity.
 - e) What is transducer?
 - f) What is reverberation time?
- Q.3 Attempt the following question. (Any Two) 08**
- a) What is gradient of scalar field? Explain its physics significance.
 - b) Explain any two application of gyroscope motion in brief.
 - c) Calculate bending moment in case of metal wire of 0.4 mm radius, bent to form an arc of radius of curvature 5 cm. (Y for metal = $5 \times 10^{11} \text{ dyne/cm}^2$)
- Q.4 Attempt the following question. (Any Two) 08**
- a) What are requirements of good acoustics?
 - b) Obtain an equation for period of gyroscope.
 - c) Derive an expression for bending moment of a uniformly bent beam.
- Q.5 Attempt the following. (Any One) 08**
- a) What is curl of vector field? Explain the physical significance of the curl of vector field.
 - b) Describe Searle's method to determine the viscosity of highly viscous liquid.

Set	P

B.Sc. (Semester - III) (New) (CBCS) Examination: March/April - 2025
Bio-Chemistry (Paper - I)
Biomolecules (22221306)

Day & Date: Monday, 09-June-2025
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Multiple choice questions.

08

- 1) Glyceraldehyde is the example of _____.
a) tetrose b) hexose
c) pentose d) triose
- 2) _____ is a phospholipid.
a) Lecithin b) cholesterol
c) Sterol d) Steroid
- 3) Haloenzyme contains _____ plus coenzyme.
a) Isoenzyme b) Vitamin
c) Apoenzyme d) Prosthetic group
- 4) In phospholipids a phosphate group is attached to _____.
a) -NH₂ group b) -OH group
c) -COOH group d) >C=O group
- 5) Number of primary alcoholic (-CH₂OH) in fructose are _____.
a) 2 b) 4
c) 5 d) 6
- 6) _____ acid forms Zwitterions.
a) Keto b) Amino
c) Nitric d) Sulphuric
- 7) _____ is the simplest amino acid.
a) Asparagine b) Tyrosine
c) Alanine d) Glycine
- 8) _____ colour is developed in ninhydrin test.
a) black b) yellow
c) purple d) White

- Q.2 Answer the following question. (Any Four) 08**
- a) Write two physical properties of amino acids.
 - b) Define proteins.
 - c) Write the two functions of t-RNA.
 - d) What is prosthetic group?
 - e) Write biochemical role of thiamine
 - f) Write the deficiency disorders of pyridoxine.
- Q.3 Write short note on the following. (Any Two) 08**
- a) Write the structure and role of cellulose.
 - b) Define lipids. Write structure and functions of phospholipids.
 - c) Write Classification of enzymes with examples.
- Q.4 Answer the following question. (Any Two) 08**
- a) Explain Zwitterions.
 - b) Write structures of ribulose, mannose, maltose and fructose.
 - c) Write the classification of lipids with examples.
- Q.5 Answer the following question. (Any One) 08**
- a) What are nucleosides? Explain Watson-Crick model of DNA.
 - b) Write the structure, biochemical role and deficiency disorder of riboflavin.

Major crops and methods of integrated plant protection (22221312)

Max. Marks: 40

Q.1 Multiple choice questions.

08

- Page 1 of 2

- Q.2 Answer the following question.(Any Four) 08**
- a) Enlist the significance of plant protection.
 - b) Give the role of organic farming of agriculture.
 - c) Give the benefits of shading to the plants.
 - d) What is crop dragging?
 - e) What is crop hygiene?
 - f) What is netting?
- Q.3 Write short note on the following. (Any Two) 08**
- a) Biofertilizers
 - b) Fungicides
 - c) Soil Solarization
- Q.4 Answer the following. (Any Two) 08**
- a) Write on- bagging
 - b) Write on – Use of sticky bands
 - c) Write on – resistant varieties
- Q.5 Answer the following. (Any One) 08**
- a) Give the crop identification, Soil type, tillage, Seed rate and Spacing, Intercultural operations, fertilizers, irrigation & intercropping, yields economic importance of Grapevine.
 - b) Give the crop identification, soil type, tillage, seed rate & Sabina, intercultural operations, fertilizers, irrigation, intercropping, yield & economic importance of soyabean.

Seat No.	

Set	P

B.Sc. (Semester - III) (New) (CBCS) Examination: March/April - 2025
Physics (Paper - VI)
Electronic Devices and Applications (22221305)

Day & Date: Tuesday, 10-June-2025
 Time: 12:00 PM To 02:00 PM

Max. Marks: 40

- Instructions: 1) All questions are compulsory.
 2) Draw neat diagrams and give equations wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of calculator or log table is allowed.

Q.1 Multiple choice questions.

08

- 1) A differential amplifier is used to amplify _____.
 a) d. c. signals b) a. c. signals
 c) both d.c. and a.c. signal d) none of these
- 2) An oscillator employs _____ feedback.
 a) negative b) positive
 c) no d) all
- 3) What is the value of voltage gain of differential amplifier, when input voltage are $V_1 = 5$ volt and $V_2 = 2$ volt and output voltage $V_o = 30$ volt ?
 a) 6 b) 15
 c) 10 d) 1
- 4) In phase shift oscillator, three RC networks produce total phase shift of _____.
 a) 90° b) 60°
 c) 360° d) 180°
- 5) The logical circuit used to perform addition of two binary bits is called as _____.
 a) half adder b) full adder
 c) flip-flop d) parallel adder
- 6) FET is a _____.
 a) Current controlled device b) Voltage controlled device
 c) Power controlled device d) None of these
- 7) In the toggle mode of JK flip-flop, both J and K input must be _____.
 a) low b) high
 c) compliments of each other d) none of these

- 8) In CRT, time base circuit produces _____ waveform.
- a) sine
 - b) saw-tooth
 - c) square
 - d) rectangular

Q.2 Answer of the following. (Any Four) 08

- a) What is feedback? Define positive feedback.
- b) State the Barkhausen criterion for sustained oscillator.
- c) Write any two uses of CRO in detail.
- d) Draw a logical circuit diagram of Half adder
- e) A differential amplifier has an open-circuit voltage gain of 100. The input signal are $V_1 = 6.25$ volt and $V_2 = 6$ volt. Calculate the output voltage of differential amplifier?
- f) What is the difference between FET and BJT?

Q.3 Write short answers. (Any Two) 08

- a) Describe the construction and working of J-K flip-flop.
- b) With neat diagram, explain working of FET.
- c) Write a short note on colpitts oscillator.

Q.4 Answer of the following (Any Two) 08

- a) State and prove Demorgan's First theorem.
- b) Write a short note on phase shift oscillator.
- c) In UJT relaxation oscillator, charging resistance is $22\text{ K}\Omega$ and capacitor is $0.01\mu\text{F}$, Calculate the frequency of saw tooth wave form produced by relaxation oscillator. (Given $\eta=0.6$).

Q.5 Answer of the following (Any One) 08

- a) Explain transistor RC coupled amplifier with advantage and disadvantage.
- b) Draw the Block diagram of CRO and explain the function of each block.

Seat No.	

Set	P

B.Sc. (Semester - III) (New) (CBCS) Examination: March/April - 2025:
Bio-Chemistry (Paper-II)
Biochemical Techniques (22221307)

Day & Date: Tuesday, 10-June-2025
 Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Draw neat diagrams and give equations wherever necessary.
 3) Figures to the right indicate full marks.

Q.1 Multiple choice question:

08

- 1) _____ is not a benefit of BLAST.

a) Speed	b) Statistical rigor
c) Handling of gaps	d) More sensitive
- 2) Silica Gel is used in _____.

a) Column Chromatography
b) Gas Chromatography
c) Thin Layer Chromatography
d) HPLC
- 3) Iodine number of cholesterol is _____.

a) 1	b) 2
c) 3	d) 4
- 4) In iodine chamber which colour spot are seen in TLC _____.

a) Red	b) Brown
c) Yellow	d) Green
- 5) The degree of unsaturation of lipid can be measured as _____.

a) Saponification number	b) iodine number
c) Acid number	d) Potassium number
- 6) Scientist _____ created the first bioinformatics database.

a) Dayhoff	b) Richard Durbin
c) Pearson	d) Mickel J. Dunn
- 7) In electrophoresis, the rate of migration can be controlled by controlling _____.

a) pH	b) heat
c) temperature	d) pressure
- 8) _____ technique separates charged particles using electric field.

a) Hydrolysis	b) Electrophoresis
c) Protein synthesis	d) Protein denaturing

- Q.2 Answer the following. (Any Four) 08**
- a) Write two factors affecting electrophoretic mobility.
 - b) Write the meaning of molar and specific absorbance.
 - c) Write three applications of polymerase chain reaction.
 - d) Write important applications of polyacrylamide gel electrophoresis.
 - e) Write three applications of bioinformatics.
 - f) Define acid value
- Q.3 Write short answers. (Any Two) 08**
- a) Write important applications and advantages of agarose gel electrophoresis.
 - b) Explain Liberman Burchard method for cholesterol estimation.
 - c) Explain principle and technique of Gel permeation chromatography.
- Q.4 Answer the following. (Any Two) 08**
- a) What is bioinformatics and write applications of bioinformatics.
 - b) Explain BCA assay for protein.
 - c) Write important applications & advantages of thin layer chromatography.
- Q.5 Answer the following. (Any One) 08**
- a) Write difference between photoelectric colorimeter and spectrophotometer. Write advantages of spectrophotometer.
 - b) Explain ELISA technique & write its applications.

Day & Date: Tuesday, 10-June-2025
Time: 03:00 PM To 05:00 PM

Instructions: 1) All questions are compulsory.
2) Draw a well diagram wherever necessary.
3) All question carry equal marks.

08

- Page 1 of 2

- Q.2 Answer of the following. (Any Four) 08**
- a) Mention Causal organism
 - b) Symptom
 - c) Write the control measures of Rust of Soybean.
 - d) Mention any two symptoms of mycoplasma diseases.
 - e) Write Quarantine Act.
 - f) Write host plant of fungal diseases.
- Q.3 Write short answers. (Any Two) 08**
- a) Symptoms of Downy mildew of Grapes.
 - b) Kitch's Postulates
 - c) Methods of inoculation
- Q.4 Answer of the following. (Any Two) 08**
- a) Write on classification of plant diseases.
 - b) Write on Rust of ground nut.
 - c) Describe the Grain smut of Jawar.
- Q.5 Answer of the following (Any One) 08**
- a) Describe in details about Citrus canker.
 - b) Write the control measures of plant disease.

B.Sc. (Semester - III) (New) (CBCS) Examination: March/April - 2025
STATISTICS (Paper - V)
Probability Distributions (22221308)

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full Marks.
3) Use of Calculator is allowed.

08

- 1)** Let the joint probability mass function of two random variables X and Y be $P(x, y) = \frac{x+y}{21}$; $x = 1, 2, 3$, $y = 1, 2$.
Then $P(X = 3, Y = 1)$ is _____.
- a) $\frac{1}{7}$ b) $\frac{4}{21}$
- c) $\frac{1}{21}$ d) $\frac{3}{21}$
- 2)** If X and Y are two r.v.s then $V(X - Y) =$ _____.
- a) $V(X) + V(Y) - 2Cov(X, Y)$ b) $V(X) + V(Y) + 2Cov(X, Y)$
- c) $V(X) + V(Y)$ d) $V(X) - V(Y)$

3) The probability density function of X is given by
 $f(x) = \begin{cases} 0.5 & ; -1 < x < 1 \\ 0 & ; \text{otherwise} \end{cases}$ then $P(X < 0) = \underline{\hspace{2cm}}$.

a) $P(X > 0)$ b) $\frac{1}{4}$

c) $\frac{3}{4}$ d) None of these

- 4)** The probability density function (p.d.f) of r.v. X is given by
 $f(x) = \begin{cases} kx^2 & ; 0 < x < 1 \\ 0 & ; \text{otherwise} \end{cases}$ then the value of k is ____.
- a) 1 b) 2
c) 3 d) None of these
- 5)** If $M_x(t)$ is m. g. f. of a continuous r. v. X , then $M_x(0) =$ ____
- a) 0 b) 1
c) t d) None of these

- [illegible]

Q.2 Answer any four of the following.

08

- Define marginal probability distribution of Y , when (X, Y) be a two-dimensional discrete random variable.
- Let (X, Y) be a two-dimensional discrete random variable. Define conditional expectation of Y given $X = x$.
- Let X be a continuous r. v., define median.
- Define joint probability density function of continuous r. v. (X, Y) .
- Define covariance in case of continuous random variable (X, Y) .

Q.3 Write short note on any two of the following.

08

- Let (X, Y) be two-dimensional discrete random variable, state and prove multiplication theorem on expectation.
- If X is a continuous random variable with probability density function

$$\text{given by } f(x) = \begin{cases} kx & 0 < x < 2 \\ 2k & 2 < x < 4 \\ k(6-x) & 4 < x < 6 \\ 0 & \text{otherwise} \end{cases}$$

Find

- i) The value of k
ii) Mean of X
- c)** The joint density function of X and Y is
- $$f(x, y) = \begin{cases} 6e^{-2x}e^{-3y} & ; 0 < x < \infty, 0 < y < \infty \\ 0 & ; \text{otherwise} \end{cases}$$
- are X and Y independent.

Q.4 Answer any two of the following.**08**

- a) The joint probability distribution of (X, Y) is _____.

$$p(x, y) = \begin{cases} \frac{2x + 3y}{72} & ; \quad x = 0, 1, 2, y = 1, 2, 3 \\ 0 & ; \quad \text{otherwise} \end{cases}$$

Find Marginal probability distribution of X and Y .

- b) State the any four properties of cumulative distribution function.
 c) Two random variable X and Y have a joint probability density function

$$f(x, y) = \begin{cases} \frac{12}{5}x(2 - x - y) & , \quad 0 < x < 1, 0 < y < 1 \\ 0 & , \quad \text{otherwise} \end{cases}$$

Find the marginal density function of X and Y .

Q.5 Answer any one of the following.**08**

- a) If the probability density function of a continuous random variable X is given by

$$f(x) = \begin{cases} k & ; \quad -3k \leq x \leq k \\ 0 & ; \quad \text{otherwise} \end{cases}$$

Find

- i) The value of k
- ii) Mean of X
- iii) Standard deviation of X

- b) The random variable X and Y have a joint density function given by

$$f(x, y) = \begin{cases} \frac{k}{5} + c y & ; \quad 0 < x < 1 \quad 1 < y < 5 \\ 0 & ; \quad \text{otherwise} \end{cases}$$

Compute $Cov(X, Y)$

Day & Date: Wednesday, 11-June-2025
Time: 03:00 PM To 05:00 PM

Instructions:

- 1) All questions are compulsory.
- 2) Draw neat diagrams and give equations wherever necessary.
- 3) Figures to the right indicates full marks.
- 4) Use of logarithmic table and calculator is allowed.

08

- Page 1 of 2

- Q.2 Answer any four of the following. 08**
- a) Types of air masses.
 - b) Regional climatology?
 - c) Define climatology?
 - d) Elements of weather.
 - e) Define monsoon.
 - f) What is mean by general circulation?
- Q.3 Write short note on any two of the following. 08**
- a) Structure of the atmosphere.
 - b) Explain branches of Climatology.
 - c) Sources region of air masses.
- Q.4 Answer any two of the following. 08**
- a) Explain general circulation in northern hemisphere.
 - b) Explain climatology and its branches.
 - c) Explain the element of climate.
- Q.5 Answer any one of the following. 08**
- a) Give an account of Composition of the atmosphere.
 - b) Explain in brief the modification of air masses.

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw net diagram wherever necessary.
3) Figures to the right indicates full marks.

08

- Page 1 of 2

- Q.2 Answer any four of the following. 08**
- a) What is lattice energy?
 - b) Write the atomic weights of nitrogen and chlorine.
 - c) Write the molecular formula of propene and pentane.
 - d) Definition of gel and emulsion.
 - e) Definition for degree of freedom.
 - f) Write the structures of cyclohexane and benzene.
- Q.3 Write short note on any two of the following. 08**
- a) Write homologues series of alkanes and alkynes up to 10 carbon atoms.
 - b) Explain idea of radii for common ions in rock forming minerals.
 - c) Write four examples for component and phase.
- Q.4 Write short notes on any two of the following. 08**
- a) Explain of Gibb's phase rule.
 - b) An organic compound contains 32% carbon. 4% hydrogen and remaining oxygen. Calculate its empirical formula.
 - c) Explain for optical properties of colloids.
- Q.5 Write short notes on any one of the following. 08**
- a) Explain mechanical dispersion method and electrical dispersion method.
 - b) Explain lattice energy of crystals and explain structure of sodium chloride with coordination number, unit cell and stoichiometry.

B.Sc. (Semester - III) (New) (CBCS) Examination: March/April - 2025
Zoology (Paper-V)
Cell Biology (22221322)

Max. Marks: 40

08

- Page 1 of 2

- Q.2 Answer the following. (any four) 08**
- a) Symport
 - b) Virus
 - c) RER
 - d) Functions of mitochondria.
 - e) Microfilaments.
- Q.3 Write short notes on. (any two) 08**
- a) Describe ultrastructure and functions of Lysosomes.
 - b) Explain eukaryotic cell.
 - c) Describe ultrastructure and functions of nucleus.
- Q.4 Answer the following. (any two) 08**
- a) Explain structure and function of SER.
 - b) Describe Singer and Nicolson model of plasma membrane.
 - c) Functions of plasma membrane.
- Q.5 Answer the following. (any one) 08**
- a) Describe chromosomes and describe 4 type of chromosomes.
 - b) Define meiosis and explain prophase I stage in meiosis.

Seat No.	

Set P

B.Sc. (Semester - III) (New) (CBCS) Examination: March/April - 2025
STATISTICS (Paper - VI)
Statistical Methods - I (22221309)

Day & Date: Thursday, 12-June-2025
 Time: 12:00 PM To 02:00 PM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
 2) Draw neat & well labelled diagram wherever necessary
 3) Figures to the right indicate full marks.
 4) Use of logarithm tables and calculator is allowed

Q.1 Choose the correct alternative from the options.

08

- 1) Probability of including a specified unit in a sample of size n selected out of N units is _____
 - a) $\frac{1}{N}$
 - b) $\frac{n}{N}$
 - c) $\frac{1}{N-1}$
 - d) $\frac{1}{n}$
- 2) The range of $R_{1.23}$ lies between _____
 - a) -1 to 1
 - b) 0 to 1
 - c) $-\infty$ to ∞
 - d) 0 to ∞
- 3) The disadvantage of C.B.R. is _____
 - a) it ignores age and sex distribution
 - b) it underestimates fertility rate
 - c) it provides very approximate fertility rate
 - d) all the above
- 4) Vital statistics is a branch of biometry which deals with data and laws of _____
 - a) births
 - b) deaths
 - c) marriage
 - d) All the above
- 5) The number of possible samples of size n from a population of N units by using SRSWR is _____
 - a) N^n
 - b) N^2
 - c) $n!$
 - d) All of above
- 6) The Corr ($X_{1.3}$, $X_{2.3}$) is _____
 - a) r_{12}
 - b) r_{13}
 - c) $r_{12.3}$
 - d) $r_{13.2}$

- 7)** In India, the child bearing age is _____.
a) 20-24 years b) 15-49 years
c) 13-48 years d) 20-29 years
- 8)** In case of SRSWOR of size 10 with population size 50. Probability of selecting unit no.5 at 3rd draw is _____.
a) $\frac{1}{5}$ b) $\frac{1}{50}$
c) $\frac{1}{10}$ d) $\frac{1}{48}$

Q.2 Answer the following question. (Any Four)

08

- Define C.D.R.
- Define sample and population.
- Define partial correlation.
- Define ASFR
- State variance of sample mean in case of SRSWR.
- State the plane of regression equation of X_1 on X_2 and X_3 .

Q.3 Write short notes on the following. (Any Two)

08

- Explain SRSWR and SRSWOR.
- State and prove any two properties of residuals.
- Define G.F.R. and T.F.R.

Q.4 Answer the following question. (Any Two)

08

- Define G.R.R. and N.R.R. and also state limitations of G.R.R.
- With usual notations prove that, $1 - R^2_{1.23} = (1 - r^2_{12})(1 - r^2_{13.2})$
- Show that probability of selecting a specified unit at any draw is same as it is being selected at first draw.

Q.5 Answer the following question. (Any One)

08

- a) Define partial correlation coefficient and derive the formula for partial correlation coefficient.
- b) With usual notations, prove that
$$\text{Var}(\bar{y}_n)_{\text{wr}} = \frac{N-1}{Nn} S^2$$

Day & Date: Thursday, 12-June-2025
Time: 03:00 PM To 05:00 PM

Instructions:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw neat diagrams and give equations wherever necessary.
- 4) Use of logarithm tables and calculator is allowed.

08

- Page 1 of 2

- 7) During launching of a satellite, the rocket must overcome _____.
a) gravitational force to go up in addition to the atmospheric drag
b) electrostatic force
c) electromagnetic force
d) magnetic force
- 8) In energy technology, useful energy is called as _____.
a) synergy
b) exergy
c) anergy
d) work

Q.2 Answer the following question. (Any Four)**08**

- a) What are effects of scattering?
b) Describe ozone in the troposphere.
c) What are different types of frames of reference?
d) Mention effects of Coriolis force in nature.
e) A photovoltaic cell has maximum voltage and current of 0.4 V and 0.1 A respectively.
Calculate maximum useful power of the cell.
f) A force of 5 N displaces a body by 7 meters. Calculate the work done.

Q.3 Answer the following questions. (Any Two)**08**

- a) Explain general composition of the Earth's atmosphere.
b) Discuss pseudo forces.
c) What is a geo-synchronous satellite?

Q.4 Answer the following questions. (Any Two)**08**

- a) Write short note on 'Tephigram'
b) What is geostrophic wind?
c) Discuss interrelation between energy, man, and environment.

Q.5 Answer the following questions. (Any One)**08**

- a) Explain in detail scattering, reflection, and absorption of solar radiations in the Earth's atmosphere.
b) Discuss Ozone formation in the stratosphere and photochemical processes.

Seat No.	

Set	P

B.Sc. (Semester - III) (New) (CBCS) Examination: March/April - 2025
Geo-Chemistry (Paper-II)
Introduction to Solar System and Geo-Sphers (22221329)

Day & Date: Thursday, 12-June-2025
 Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat & well labelled diagram wherever necessary
 4) Use of logarithmic tables and calculator is allowed
 (At. Wts.: H=1, C=12, O=16, N= 14, Na =23, Cl = 35.5)

Q.1 Multiple choice question.

08

- 1) _____ constituent increases at the third stage of evolution of primeval atmosphere.
 - a) CH_4
 - b) H_2
 - c) O_2
 - d) All of the above
- 2) The major dissolved constituent in the sea water is _____
 - a) Cl, Br, SO_4 , F
 - b) Cl, Br, SO_4 , HCO_3
 - c) Cl, Br, SO_4 , H_3BO_3
 - d) Cl, Br, SO_4 , Mg
- 3) The upper layer of crust is made up of?
 - a) Silicon and Iron
 - b) Silicon and Aluminum
 - c) Iron and magnesium
 - d) Silicon and magnesium
- 4) Which is the first solid to separate from sea water by evaporation under natural condition:
 - a) Barium chloride
 - b) Calcium carbonate
 - c) Calcium chloride
 - d) Calcium sulphate
- 5) The atmosphere is being made up almost entirely of the following elements:
 - a) Nitrogen and Argon
 - b) Nitrogen and oxygen
 - c) Nitrogen, oxygen and Argon
 - d) Chlorine, Hydrogen and carbon dioxide
- 6) Increase in temperature as increase in altitude, occurs in _____
 - a) Troposphere
 - b) Stratosphere
 - c) Mesosphere
 - d) None of these

- 7)** The average pH value of rivers is between _____
 a) 6 & 8
 b) 7 & 9
 c) 5 & 7
 d) 8 & 9
- 8)** In seawater composition dissolve gases are _____
 a) $\text{SO}_4 > \text{Cl} > \text{HCO}_3$
 b) $\text{HCO}_3 > \text{SO}_4 > \text{Cl}$
 c) $\text{Cl} > \text{HCO}_3 > \text{SO}_4$
 d) $\text{Cl} > \text{SO}_4 > \text{HCO}_3$

Q.2 Answer the following question. (Any Four)

08

- a) What is the structure of Siderites?
- b) What is the average composition of Terrestrial water?
- c) Names the major constituents of Atmosphere.
- d) What is the average composition of Mantle?
- e) Name the geochemical elements which have the affinity towards silicates.
- f) What is the composition of meteorites?

Q.3 Write notes on the following. (Any Two)

08

- Salinity and chlorinity of oceanic water
- Composition of earth as whole.
- Aerolites

Q.4 Answer the following question. (Any Two)

08

- Describe the nature of hydrosphere with gains and losses of elements in the oceanic water.
- Explain in brief geochemical classification of the elements.
- Discuss in brief a composition of sun, Add note on cosmic abundance of the elements.

Q.5 Answer the following question. (Any One)

08

- Describe the evolution of the atmosphere. Add note on the composition of the primeval atmosphere.
- Explain with suitable diagram the interior structure of the earth with composition of crust.

Seat No.	

Set P

B.Sc. (Semester - III) (New) (CBCS) Examination: March/April - 2025
ZOOLOGY (Paper-VI)
Principles of Ecology (22221323)

Day & Date: Thursday, 12-June-2025
 Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagram wherever necessary

Q.1 Multiple choice questions.

08

- 1) _____ is an abiotic factor in an ecosystem.

a) Producers	b) Consumers
c) Temperature	d) Decomposers

- 2) A group of individuals of a plant or animal species, inhabiting a given area is called _____.

a) Biome	b) Population
c) Ecosystem	d) Community

- 3) The final stable community in an ecological succession is called as _____.

a) final community	b) ultimate community
c) seral community	d) climax community

- 4) _____ trophic level in an ecosystem represents the primary producers.

a) Herbivores	b) Carnivores
c) Producers	d) Decomposers

- 5) The biotic component of an ecosystem includes _____.

a) air, water, and soil
b) sunlight and minerals
c) Producers, consumers, and decompose
d) Humidity

- 6) The natural place of an organism or community is known as _____.

a) Niche	b) biome
c) Habitat	d) Habit

- 7) The transfer of energy and nutrients between trophic levels in an ecosystem is known as _____.

a) Decomposition	b) food chain
c) Biomagnification	d) Photosynthesis

- 8) Energy flow in ecosystem is _____.
a) Unidirectional b) Bidirectional
c) Multidirectional d) Cyclic

Q.2 Answer the following question. (Any Four) 08

- a) Parental care in fishes
- b) Density
- c) Soil- Abiotic factor
- d) Species richness
- e) Genetic diversity
- f) Define the term of ecology

Q.3 Write short notes on the following. (Any Two) 08

- a) Explain marine water ecosystem.
- b) Describe the effect of temperature and water on animals.
- c) Describe biodiversity hotspots in India.

Q.4 Answer the following question. (Any Two) 08

- a) Describe the concept of Ecotone and Edge effect.
- b) Describe the loss of biodiversity.
- c) Give an account on predation and parasitism

Q.5 Answer the following question. (Any One) 08

- a) Describe the fresh water ecosystem.
- b) What is community? Describe components of community.

Day & Date: Friday, 13-June-2025
Time: 12:00 PM To 02:00 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

08

- Page 1 of 3

Q.5 Attempt the following. (Any One)

- a) Explain the Lagrange's method of multipliers to find the extreme values of $u = f(x, y, z)$ subject to the condition $\phi(x, y, z) = 0$
- b) If u, v, w are implicit function of x, y, z
i.e. $f_i(u, v, w, x, y, z) = 0, \quad i = 1, 2, 3$
then prove that

$$\frac{\partial(u, v, w)}{\partial(x, y, z)} = \frac{(-1)^3 \frac{\partial(f_1, f_2, f_3)}{\partial(x, y, z)}}{\frac{\partial(f_1, f_2, f_3)}{\partial(u, v, w)}}$$

Seat No.	

Set	P

B.Sc. (Semester - III) (New) (CBCS) Examination: March/April - 2025
BOTANY (Paper-V)
Plant Anatomy (22221302)

Day & Date: Friday, 13-June-2025
 Time: 03:00 PM To 05:00 PM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
 2) Draw neat diagrams and give equations wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of logarithmic table and calculator is allowed.

Q.1 Multiple choice questions.

08

- 1) Based on functions, the meristems are classified into _____ groups.

a) One	b) Two
c) Three	d) Four
- 2) Collenchyma is a _____ tissue.

a) Meristematic	b) Simple living
c) Simple dead	d) Complex
- 3) Porous and hard wood plants belong to _____ group.

a) Monocots	b) Gymnosperms
c) Dicots	d) Pteridophytes
- 4) The scattered vascular bundles are found in _____ stem.

a) Monocotyledonous	b) Dicotyledonous
c) Both	d) None of these
- 5) Nonporous and soft wood is found in _____.

a) Gymnosperms	b) Dicots
c) Monocots	d) Ferns
- 6) _____ are lignified simple cells.

a) Tracheids	b) Collenchyma
c) Sclereids	d) Vessels
- 7) Anomalous Secondary growth is found in _____.

a) <i>Annona</i>	b) Sunflower
c) <i>Pinus</i>	d) <i>Bignonia</i>
- 8) In square stem the mechanical tissues are present at _____.

a) Center	b) Corners
c) Lateral side	d) Apex

- Q.2 Answer the following question. (Any Four) 08**
- a) Define meristem tissues.
 - b) Give the composition of epidermal tissues system
 - c) Enlist the elements of phloem tissue.
 - d) Mention the types of meristems based on origin.
 - e) What is meant by permanent tissue?
 - f) Define anomalous secondary growth.
- Q.3 Write notes on the following. (Any Two) 08**
- a) Classification of meristem based on Position.
 - b) Functions of permanent tissues.
 - c) Describe Internal structure of dicotyledonous stem with diagram.
- Q.4 Answer the following question. (Any Two) 08**
- a) What is periderm? Describe in brief its development, structure, and functions.
 - b) Describe the types of stomata with suitable diagram.
 - c) Describe anomalous secondary growth in *Dracaena* stem with suitable diagram.
- Q.5 Answer the following question. (Any One) 08**
- a) Describe the distribution of mechanical tissues in different plant organs.
 - b) Explain the structure of xylem elements with neat, labelled diagrams.

Seat No.	

Set	P

B.Sc. (Semester - III) (New) (CBCS) Examination: March/April - 2025
MATHEMATICS (Paper - VI)
Laplace Transform (22221317)

Day & Date: Saturday, 14-June-2025
 Time: 12:00 PM To 02:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 Choose the correct alternative for each of the following.

08

1) Find $L\{\sin t \cdot \cos t\} = \underline{\hspace{2cm}}$.

a) $\frac{2}{p^2 + 4}, p > 0$

b) $\frac{1}{2} \frac{2}{p^2 + 4}, p > 0$

c) $\frac{1}{p^2 + 4}, p > 0$

d) $\frac{2}{p^2 + 2}, p > 0$

2) If $L^{-1}\{f(p)\} = F(t)$, then $L^{-1}\{f(p - a)\} = \underline{\hspace{2cm}}$.

a) $e^{-at} L^{-1}\{f(p)\}$

b) $e^{at} L^{-1}\{f(p)\}$

c) $e^{-t} L^{-1}\{f(p)\}$

d) $e^t L^{-1}\{f(p)\}$

3) Find $L\left\{\frac{e^{-at}t^{n-1}}{(n-1)!}\right\} = \underline{\hspace{2cm}}$.

a) $\frac{1}{(p + a)^{n+1}}$

b) $\frac{1}{(p - a)^{n+1}}$

c) $\frac{1}{(p - a)^n}$

d) $\frac{1}{(p + a)^n}$

4) Find $L^{-1}\left\{\frac{1}{p^2 - 6p + 10}\right\} = \underline{\hspace{2cm}}$.

a) $e^{3t} \sin t$

b) $e^{3t} \sin 3t$

c) $e^{-3t} \sin t$

d) $e^{-t} \sin 3t$

5) Find $L\{t^n e^{at}\} = \underline{\hspace{2cm}}$.

a) $\frac{1}{(p - a)^{n+1}}, p > a$

b) $\frac{n!}{(p - a)^n}, p > a$

c) $\frac{n!}{(p - a)^{n+1}}, p > a$

d) $\frac{(n + 1)!}{(p - a)^{n+1}}, p > a$

- 6)** Find $L^{-1}\left\{\frac{1}{(p+a)^3}\right\} = \underline{\hspace{2cm}}$.
- a) $e^{at} \frac{t^2}{2}$ b) $e^{at} \frac{t^3}{3!}$
- c) $e^{-at} \frac{t^3}{3!}$ d) $e^{-at} \frac{t^2}{2}$
- 7)** If $\frac{d^2y}{dx^2} + y = 0$ under the condition that $y = (0), y'(0) = 0$ Find $L\{y\} = \underline{\hspace{2cm}}$
- a) $\frac{p}{p^2 + 1}$ b) $\frac{1}{p^2 + 1}$
- c) $\frac{p}{p^2 - 1}$ d) $\frac{1}{p^2 - 1}$
- 8)** If $y(x, t)$ is a function of x and t then $L\left\{\frac{\partial y}{\partial x}\right\} = \underline{\hspace{2cm}}$.
- a) $\frac{dy}{dx}$ b) $\frac{d\bar{y}}{dx}$
- c) $\frac{dy}{dt}$ d) $\frac{d\bar{y}}{dt}$

Q.2 Attempt the following question. (Any Four)

08

- Show that $1*1*1*....*1$ (n times) $= \frac{t^{n-1}}{(n-1)!}$ where $n = 1, 2, 3, ...$
- Find $L^{-1}\left\{\frac{p}{p^2+2} + \frac{6p}{p^2-16} + \frac{3}{p-3}\right\}$
- Evaluate $L\{t(3 \sin 2t - 2 \cos 2t)\}$
- Find $L\{e^{-t}(3 \sinh 2t - 5 \cosh 2t)\}$
- Evaluate $L^{-1}\left\{\frac{3p-2}{p^2-4p+20}\right\}$
- If $L\{F(t)\} = \frac{p^2-p+1}{(2p+1)(p-1)}$; Applying the change of scale property.

Show that $L\{F(2t)\} = \frac{p^2 - 2p + 4}{4(p+1)^2(p-2)}$

Q.3 Attempt the following question. (Any Two)

08

- a)** If $L\{F(t)\} = f(p)$, then $L\left\{\frac{1}{t}F(t)\right\} = \int_p^{\infty} f(x)dx$
 Provided $\lim_{t \rightarrow 0} \left\{\frac{1}{t}F(t)\right\}$ exist.
- b)** Using Heaviside's expansion formula find $L^{-1}\left\{\frac{3p+1}{(p-1)(p^2+1)}\right\}$
- c)** Solve $(D+2)^2y = 4e^{2t}$, $y(0) = -1$ and $y'(0) = 4$

Q.4 Attempt the following question. (Any Two)**08**

- a) Let $F(t)$ be continuous for all $t \geq 0$ and be of exponential order as $t \rightarrow \infty$ and $F'(t)$ is of class A, then

$$\lim_{t \rightarrow 0} F(t) = \lim_{p \rightarrow \infty} p L\{F(t)\}$$

- b) Evaluate $L^{-1}\left\{\frac{3}{p^2-3} + \frac{3p+2}{p^3} - \frac{3p-27}{p^2+9} + \frac{6-30\sqrt{p}}{p^4}\right\}$

- c) Solve $(D^2 + 3D + 2)y = 0, y = y_0$ and $Dy = y_1$ at $t = 0$.

Q.5 Attempt the following question. (Any One)**08**

- a) i) Solve $(D^2 - 3D + 2)y = 1, y = 1, Dy = 0$ when $t = 0$.

- ii) If $L\{\sin \sqrt{t}\} = \frac{\sqrt{\pi}}{2p^{3/2}} e^{-\frac{1}{4p}}$, using Derivative show that

$$L\left\{\frac{\cos \sqrt{t}}{\sqrt{t}}\right\} = \sqrt{\frac{\pi}{p}} e^{-\frac{1}{4p}}$$

- b) State and prove Convolution theorem by inverse Laplace transform.

Day & Date: Saturday, 14-June-2025
Time: 03:00 PM To 05:00 PM

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.

08

- Page 1 of 2

- Q.2 Answer the following question. (Any Four) 08**
- a) Give the Nomenclature of enzyme.
 - b) Non-symbiotic nitrogen fixation.
 - c) Enlist growth promoters and growth Inhibitor.
 - d) Define Carbohydrate.
 - e) Define macronutrient.
- Q.3 Write short note on the following. (Any Two) 08**
- a) Write note on lock and key hypothesis.
 - b) Write note on nitrogen cycle.
 - c) Give the properties of oligosaccharides.
- Q.4 Answer the following question. (Any Two) 08**
- a) Discuss physiological role of cytokinin.
 - b) Explain the mechanism of enzyme action.
 - c) Write a note on significance of biological nitrogen fixation.
- Q.5 Answer the following question. (Any One) 08**
- a) Explain the role and deficiency symptoms of Macronutrients.
 - b) Explain brief classification and properties of carbohydrates.

Day & Date: Monday, 16-June-2025
Time: 12:00 PM To 02:00 PM

Instructions:

- 1) All questions are compulsory.
- 2) Draw neat diagram and give equations wherever necessary
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic table and calculator is allowed.

08

- Page 1 of 2

- 8) In Colpitt's oscillator the _____ tapped tank circuit is used.
- a) Inductor
 - b) Transformer
 - c) Resistor
 - d) Capacitor

Q.2 Answer the following question. (Any Four) 08

- a) What is rectification? What are its types?
- b) What is biasing? What are its types?
- c) Find the gain of a two stage RC coupled amplifier if the voltage gain of the first stage is 5 dB and second stage is 3 dB.
- d) What is mean by feedback? Give their types.
- e) What is the condition for sustained oscillations?

Q.3 Write notes on the following. (Any Two) 08

- a) Explain the working of full wave rectifier.
- b) Explain the basic action of transistor as an amplifier.
- c) Explain in brief the working of two stage RC coupled amplifier.

Q.4 Answer the following question. (Any Two) 08

- a) Derive the expression for gain of the amplifier with negative feedback.
- b) Explain working of Phase shift oscillator.
- c) A Hartley oscillator $C = 0.01 \mu\text{F}$ and $L_1 = 6 \text{ mH}$ $L_2 = 14 \text{ mH}$. Find frequency of oscillations, feedback fraction and voltage gain.

Q.5 Answer the following question. (Any One) 08

- a) Explain Wein bridge oscillator. Determine frequency of oscillation If $R = 1.2 \text{ K}\Omega$ and $C = 0.1 \mu\text{F}$.
- b) What is mean by transistor biasing? Explain voltage divider bias. Derive an expression for stability factor.

Day & Date: Monday, 16-June-2025
Time: 12:00 PM To 02:00 PM

Instructions:

- 1) All questions are compulsory.
- 2) Draw neat diagrams & give equations wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of maps and stencil is allowed.

- 1) _____ is the study of climate and how it changes over time.

a) Climatology	b) Geomorphology
c) Oceanography	d) Geology
- 2) The percentage of _____ gas in atmosphere is more.

a) Oxygen	b) Nitrogen
c) Carbon	d) Helium
- 3) _____ is considered as the lowest layer of Earth's atmosphere.

a) Stratosphere	b) Exosphere
c) Troposphere	d) None of these
- 4) Varied colors of red and orange at sunrise and sunset are caused by _____.

a) Water vapor	b) dust particles
c) Gases	d) Isolation
- 5) The term "Monsoon" is derived from the _____ word "Mausim" which means seasons.

a) Greek	b) Roman
c) Arabic	d) Australian
- 6) The intensity of isolation depend on _____.

a) altitude	
b) latitude	
c) nature of the earth's surface	
d) winds	
- 7) Wind velocity is measured by _____.

a) Barograph	b) Wind vane
c) Cup anemometer	d) Aneroid barometer

- 8) _____ are fast flowing, narrow, meandering air currents in the atmospheres of the Earth.
- a) Insolation
 - b) Heat budget
 - c) Jet streams
 - d) None of these

Q.2 Answer the following question. (Any Four) 08

- a) What is climate?
- b) What is atmosphere?
- c) What is Humidity?
- d) What is air pressure?
- e) What is doldrum?

Q.3 Write notes on the following. (Any Two) 08

- a) Weather
- b) Importance of Climatology
- c) Temperature

Q.4 Answer the following question. (Any Two) 08

- a) Explain the horizontal distribution of Air Pressure?
- b) Describe the factors affecting on winds?
- c) Describe the Monsoon?

Q.5 Answer the following question. (Any One) 08

- a) Explain the elements of weather?
- b) Explain the Horizontal Distribution of Insolation?

Set

P

B.Sc. (Semester - III) (New) (CBCS) Examination: March/April - 2025
GEOLOGY (Paper-V)
Mineralogy (22221310)

Day & Date: Monday, 16-June-2025
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagram wherever necessary
3) Figures to the right indicate full marks.

Q.1 Multiple choice question.

08

- 1) Which of the following mineral shows twinkling property?

a) Andalusite	b) Calcite
c) Phlogopite	d) None of these
- 2) Mineral Lucite is _____

a) Anisotropic	b) Pleochroic
c) Isotropic	d) none of these
- 3) The refractive index of ordinary ray is _____

a) 1.658	b) 1.737
c) 1.576	d) 1.666
- 4) Lower nicol prism is called as _____

a) Polarizer	b) Analyzer
c) Condenser	d) Pillar
- 5) Feldspar shows _____ sets of cleavages.

a) I	b) II
c) III	d) None
- 6) _____ mineral belongs to the mica group.

a) Orthoclase	b) Plagioclase
c) Biotite	d) All of these
- 7) Cleavages in calcite is _____ set.

a) 1	b) 3
c) 2	d) 8
- 8) Diamond mineral having _____ hardness.

a) 10	b) 7
c) 5	d) 6

- Q.2 Answer the following question. (Any Four) 08**
- a) Define streak of mineral? How can it determine.
 - b) Name the parts of upper nicol prism?
 - c) Define fracture of minerals
 - d) Name feldspar group of minerals
 - e) What is pleochroism of minerals?
 - f) Define mineral.
- Q.3 Write notes on the following. (Any Two) 08**
- a) What is Hardness and Mohs' scale of hardness
 - b) Describe twinning of minerals
 - c) Explain relief of minerals.
- Q.4 Answer the following question. (Any Two) 08**
- a) Describe the form of mineral in physical properties of minerals.
 - b) Describe the isomorphism and polymorphism minerals.
 - c) Describe any two silicate structure.
- Q.5 Answer the following question. (Any One) 08**
- a) Describe luster, cleavage and Hardness of minerals
 - b) Describe optical properties form, twinkling and extension of minerals.

Seat No.	

Set	P

B.Sc. (Semester - III) (New) (CBCS) Examination: March/April - 2025
MICROBIOLOGY (Paper-V)
Bacterial Cytology, Physiology and Metabolism (22221314)

Day & Date: Monday, 16-June-2025
 Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Draw neat labelled diagram wherever necessary.
 3) Figures to the right indicate full marks.

Q.1 Choose the correct alternative and rewrite the sentences again. 08

- 1) A movement of molecule across the cell membrane along the concentration gradient is called as _____.
 a) Active transport b) Passive transport
 c) Diffusion d) Osmosis

- 2) The growth phase of bacteria where number of bacteria increases exponentially is called as _____ phase.
 a) Lag b) Logarithmic
 c) Stationary d) Death

- 3) The bacteria which are able to grow at temperature range between 20-45 °C called _____.
 a) Psychrophile b) Mesophile
 c) Thermophile d) Acidophile

- 4) The arrangement of flagella all over surface of the body is called as _____ flagella.
 a) Monotrichous b) Lophotrichous
 c) Amphitrichous d) Peritrichous

- 5) _____ enzymes regulate the glyoxylate cycle.
 a) Isocitrate lyase & Malate Synthase
 b) Isocitrate lyase & citrate synthase
 c) Isocitrate dehydrogenase & Malate Synthase
 d) Isocitrate dehydrogenase & Malate dehydrogenase

- 6) _____ is a terminal cytochrome responsible for donating electron to oxygen.
 a) Cytochrome a₁ b) Cytochrome a₃
 c) Cytochrome b d) Cytochrome c

- 7) _____ are the class of enzymes which catalyses' transfer of a group between two substrates.
- | | |
|-----------------|------------|
| a) Hydrolases | b) Lyases |
| c) Transferases | d) Ligases |
- 8) Electrons from the excited chlorophyll molecules of PS-II are first accepted by _____
- | | |
|-----------------|-----------------|
| a) Ferredoxin | b) Pheophytin |
| c) Cytochrome b | d) Cytochrome f |

Q.2 Define any four of the following.**08**

- a) Define germination of endospore
- b) What is a role of gas vacuoles?
- c) What is photo phosphorylation?
- d) Define active transport
- e) Define diauxic growth.
- f) What is oligodynamic effect?

Q.3 Write notes on the following. (Any Two)**08**

- a) Give a detailed account on bacterial growth phases in batch culture.
- b) Enlist component of ETC and discuss in brief mechanism of oxidative phosphorylation
- c) Describe in brief glyoxylate pathway

Q.4 Answer the following question. (Any Two)**08**

- a) Describe in brief classification of enzymes.
- b) Describe in brief ultra-structure of flagella. Add a note on its function.
- c) Give a detailed account on effect of temperature on growth of bacteria.

Q.5 Answer the following question. (Any One)**08**

- a) Discuss in detail fluid mosaic model of cell membrane.
- b) Explain in detail factors affecting on enzyme activity.

Seat No.	

Set P

**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
March/April - 2025
ELECTRONICS (Paper – VI)
Pulse & Switching Circuits (22221319)**

Day & Date: Tuesday, 17-June-2025
Time: 12:00 PM To 02:00 PM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculator is allowed

Q.1 Select the correct alternatives from the options.

08

- 1) Applications of IC 555 are _____.
a) astable multi vibrator b) monostable multi vibrator
c) automatic battery charger d) all of these
- 2) A transistor used as a switch is operated in _____.
a) active region b) cut off region
c) saturation region d) cut of and saturation region
- 3) Formulae for gate width of mono stable multi vibrator using IC 555 is _____.
a) $0.69 R C$ b) $1.1 R C$
c) $0.49 R C$ d) $1.01 R C$
- 4) The circuit that makes use of _____ for wave shaping is called linear wave shaping.
a) resistor, capacitor, inductor b) resistor, capacitor, transistor
c) diode, transistor, resistor d) diode capacitor, resistor
- 5) Bistable multi vibrator is called as _____ multi vibrator.
a) scale of 2 b) scale of 3
c) scale of 5 d) None
- 6) Output of differentiator is $V_o =$ _____.
a) $RC \int V_i dt$ b) $1/RC \int V_i dt$
c) $RC dV_i/dt$ d) $1/RC dV_i/dt$
- 7) The time required for the transistor collector current to rise to 10% to 90% of its maximum saturation value is called _____.
a) rise time b) delay time
c) turn on time d) fall time

- 8) The voltage across charging capacitor C is _____.
 a) $V_o = V_{cc} e^{-t/RC}$ b) $V_o = V_{cc} (e^{-t/Rc} - 1)$
 c) $V_o = V_{cc} (1 - e^{-t/RC})$ d) $V_o = V_{cc} t/RC$

Q.2 Answer any four of the following. 08

- What is need of wave shaping circuit?
- Define ideal ramp and practical ramp.
- Define off time of switching transistor.
- Give the formulae of frequency for astable multi vibrator using gates.
- Draw the diagram of Boot strap circuit.

Q.3 Write short notes on any two of the following. 08

- Concept of RC time base circuit
- Diode as negative clipper
- Battery charger using Ic 555

Q.4 Answer any two of the following. 08

- Explain monostable multi vibrator using IC 74121.
- Explain positive clamping circuit by using diode.
- Explain Hysteresis curve. If $UTP = 0.9V$ and $LTP = 0.4V$ Calculate Hysteresis voltage.

Q.5 Answer any one of the following **08**

- Explain astable multi vibrator using IC 555 along with necessary wave forms and derive formulae for its frequency and duty cycle.
- Explain construction and working of monostable multi vibrator using BJT and derive its formulae for gate width.

Day & Date: Tuesday, 17-June-2025
Time: 12:00 PM To 02:00 PM

Instructions: 1) All questions are compulsory.
2) Draw neat diagram wherever necessary.
3) Use of stencil is allowed.

08

- Page 1 of 2

- Q.2 Answer any four of the following** **08**
- a) What is Soil?
 - b) What is Resource?
 - c) What is Primary Activity?
 - d) What is Religion?
 - e) What is Tribe?
- Q.3 Write notes on any two of the following** **08**
- a) Location of India
 - b) Information Technology
 - c) Age-Structure
- Q.4 Answer any two of the following** **08**
- a) Explain the Population Growth of India?
 - b) Explain the Great Plain of India?
 - c) Explain the Tropical Evergreen Forests?
- Q.5 Answer any one of the following** **08**
- a) Explain the physical factors affecting on population distribution?
 - b) Explain the Petroleum distribution of India?

Seat No.	

Set	P

B.Sc. (Semester - III) (New) (CBCS) Examination: March/April - 2025
GEOLOGY (Paper-VI)
Igneous Petrology (22221311)

Day & Date: Tuesday, 17-June-2025
 Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Draw neat diagram wherever necessary
 3) Figures to the right indicated full marks.

Q.1 Multiple choice question.

08

- 1) Granite is _____ Igneous rock.
 - a) Intrusive
 - b) Volcanic
 - c) Extrusive
 - d) None of these
- 2) _____ is fine grained igneous rock.
 - a) Basalt
 - b) Trachyte
 - c) Rhyolite
 - d) all of these
- 3) The essential mineral in Basalt rock are _____
 - a) Quartz, feldspar
 - b) Quartz, Augite
 - c) Quartz, olivine
 - d) olivine. Augite
- 4) Unicomponent rocks are extremely _____
 - a) Abundant
 - b) Moderate
 - c) Rare
 - d) None of these
- 5) Quartz is absent in _____ rock.
 - a) Acidic
 - b) Ultrabasic
 - c) Basic
 - d) None of these
- 6) The ultra basic magma, poor contains of _____
 - a) Si, Na and K
 - b) Ca, Mg and Fe
 - c) K, Mg and Fe
 - d) Fe and Mg
- 7) The partially developed crystal faces in Igneous rock are called _____
 - a) Euhedral
 - b) Anhedral
 - c) Subhedra
 - d) None of these
- 8) The first product of continues reaction relation in magma is _____
 - a) Olivine
 - b) Pyroxene
 - c) Plagioclase
 - d) Quartz

- Q.2 Answer any four of the following** **08**
- a) Define discordant forms?
 - b) What is acidic and basic magma ?
 - c) What is eutectic point?
 - d) What is isotherm?
 - e) Define holohyaline texture
 - f) Define texture in igneous rock
- Q.3 Write notes on any two of the following** **08**
- a) Describe the sill and laccoliths
 - b) Describe hypabyssal igneous rock
 - c) Describe the glass and crystals
- Q.4 Answer any two of the following** **08**
- a) Describe the plutonic igneous rock.
 - b) Describe any two discordant forms of igneous rock.
 - c) Describe the crystallization of bicomponent magma.
- Q.5 Answer any one of the following** **08**
- a) Describe structures of igneous rock
 - b) Describe the assimilation process in magma

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B.Sc. (Semester - III) (New) (CBCS) Examination: March/April - 2025
MICROBIOLOGY (Paper-VI)
Fundamentals of Bacterial Genetics (22221315)

Day & Date: Tuesday, 17-June-2025
 Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Draw neat diagram and equations wherever necessary
 3) Figures to the right indicated full marks.
 4) Use of a logarithmic table and calculator is allowed.

Q.1 Multiple choice question.

08

- 1) Which of the following enzymes is responsible for unwinding the DNA double helix during replication?

a) DNA polymerase	b) Helicase
c) Ligase	d) Topoisomerase

- 2) In the Hershey and Chase experiment, which component of the T2 bacteriophage was labeled with radioactive sulfur?

a) DNA	b) RNA
c) Protein coat	d) Both DNA and protein coat

- 3) The term "genotype" refers to _____.

a) The physical expression of traits in an organism
b) The genetic makeup of an organism
c) The sequence of amino acids in a protein
d) The process of copying DNA into RNA

- 4) Which model of DNA replication was confirmed by the Meselson and Stahl experiment?

a) Conservative	b) Semi-conservative
c) Dispersive	d) Fragmentary

- 5) Which enzyme is responsible for joining the Okazaki fragments on the lagging strand?

a) Helicase	b) DNA ligase
c) DNA polymerase	d) Primase

- 6) Which of the following is a physical mutagen that can cause mutations in bacterial DNA?

a) 5-Bromouracil	b) 2-Aminopurine
c) Hydroxylamine	d) Ultraviolet (UV) rays

- 7) A mutation that changes a codon for an amino acid into a stop codon is called a _____
- | | |
|----------------------|----------------------|
| a) Missense mutation | b) Nonsense mutation |
| c) Silent mutation | d) Neutral mutation |
- 8) Which type of plasmid is primarily responsible for antibiotic resistance in bacteria?
- | | |
|----------------|---------------|
| a) F plasmid | b) R plasmid |
| c) Col Plasmid | d) Ti plasmid |

Q.2 Answer any four of the following **08**

- a) Define Gene
- b) What is Genome?
- c) Define Phenotype
- d) Define Mutation
- e) Enlist the different types of Plasmids
- f) Define Recon

Q.3 Write notes on any two of the following **08**

- a) Define Genetic code and write the properties of genetic code
- b) Explain the Basic concept of Transcription
- c) Write a note on the Griffith Experiment

Q.4 Answer any two of the following **08**

- a) Describe the various properties of plasmid
- b) Draw a neat labeled diagram of Watson and Crick's model of DNA
- c) Describe the isolation of mutants by the Replica plate technique

Q.5 Answer any one of the following **08**

- a) Enlist the various enzymes involved in replication and explain in detail the Mechanism of DNA replication
- b) Enlist the various types of Mutation and explain the Nonsense mutation and Silent mutation

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B.Sc. (Semester - IV) (New) (CBCS) Examination : March/April - 2025
CHEMISTRY (Paper - VII)
Physical Chemistry (22221444)

Day & Date: Wednesday, 30-April-2025
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagram and give equations wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Choose the correct alternatives from the given options.

08

- Multiple extraction is _____ efficient as compared to single extraction.
 - less
 - same
 - more
 - can't say
- If transport number of H^+ is 0.82, then that of Cl^- is _____.
 - 0.18
 - 1.82
 - 1.18
 - 0.00
- When a solid melts to liquid, entropy _____.
 - decreases
 - remains constant
 - increases
 - none of these
- The number of atoms in a simple cubic unit cells are _____.
 - 1
 - 2
 - 4
 - 6
- The unit cell of NaCl crystal lattice is _____.
 - FCC
 - BCC
 - simple cubic
 - none of these
- Which of the following salt is a sparingly soluble salt?
 - NaCl
 - $BaSO_4$
 - $NiSO_4$
 - KCl
- For the study of distribution law, the two solvents should be _____.
 - miscible
 - non-miscible
 - volatile
 - reacting with each other
- On dilution, equivalent conductivity _____.
 - increases
 - decreases
 - remains unaltered
 - none of these

- Q.2 Answer the following. (Any Four) 08**
- a) Define the term specific conductance. What is its unit?
 - b) State law of constancy of interfacial angles.
 - c) State Third law of thermodynamics.
 - d) What is meant by unit cell of a crystal?
 - e) State Nernst's distribution law.
- Q.3 Write short notes. (Any Two) 08**
- a) Variation of specific and equivalent conductance with dilution.
 - b) Miller and Weiss indices.
 - c) Entropy of mixing of two gases A and B.
- Q.4 Answer the following questions. (Any Two) 08**
- a) The specific conductance of a saturated aqueous solution of AgBr after subtracting that of water is $1.17 \times 10^{-7} \text{ ohm}^{-1} \text{ cm}^{-1}$ at 298 K. What is the solubility of AgBr in g/dm^3 ?
($\lambda_{\text{Ag}^+}^0 = 61.9$, $\lambda_{\text{Br}^-}^0 = 78.4 \text{ ohm}^{-1} \text{ cm}^2$ At. wts.: Ag = 108, Br = 80)
 - b) Explain in brief the applications of distribution law.
 - c) Derive Bragg's equation.
- Q.5 Answer the following questions. (Any One) 08**
- a) Describe how the absolute entropy can be calculated using third law of thermodynamics.
 - b) Define transport number. Explain the moving boundary method for determination of transport number with schematic diagram of moving boundary apparatus.

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B.Sc. (Semester - IV) (New) (CBCS) Examination: March/April - 2025
COMPUTER SCIENCE (Paper VII)
Core Java (22221429)

Day & Date: Friday, 02-May-2025
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right place indicate full marks.

Q.1 Multiple choice question.

08

- Which of the following is used to call stored procedure?
a) Statement b) PreparedStatement
c) CallableStatement d) CalledStatement
- Which class serves as the foundation for all Swing components?
a) JButton b) JComponent
c) JTextField d) None of these
- Which of these methods deletes all the elements from invoking collection?
a) clear() b) reset()
c) delete() d) refresh()
- Which of the following is a type of polymorphism in Java Programming?
a) Multiple polymorphism b) Compile time polymorphism
c) Multilevel polymorphism d) Execution time polymorphism
- What decides thread priority?
a) Process b) Process scheduler
c) Thread d) Thread scheduler
- Which part of code gets executed whether exception is caught or not?
a) finally b) try
c) catch d) throw
- Which environment variable is used to set the java path?
a) MAVEN_Path b) JavaPATH
c) JAVA d) JAVA_HOME
- Which of the following is not a class method?
a) Non-static b) Static
c) Bounded d) Unbounded

- Q.2 Answer any four of the following. 08**
- a) Use of final keyword.
 - b) What is swing?
 - c) What is variable?
 - d) Use of this keyword.
 - e) What is thread?
 - f) What is collection?
- Q.3 Answer any two of the following. 08**
- a) What is exception? Explain user defined exception.
 - b) Difference between AWT & Swing.
 - c) Explain Vector & ArrayList.
- Q.4 Answer any two of the following. 08**
- a) Explain thread life cycle.
 - b) Explain JButton & JLabel.
 - c) Write a program for file reader & writer.
- Q.5 Answer any one of the following. 08**
- a) What is inheritance? Explain method overriding, final keyword & ADT with example.
 - b) What is JDBC? Explain architecture of JDBC.

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B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April - 2025
CHEMISTRY (Paper – VIII)
Analytical & Industrial Inorganic Chemistry (22221445)

Day & Date: Saturday, 03-May-2025
 Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagram and give equation whenever necessary.

Q.1 Choose the correct alternatives from the options. 08

- 1) Solo chrome black is _____ indicator.

a) metallochromic	b) auto
c) redox	d) acid base
- 2) Ageing is nothing but process of _____.

a) digestion	b) ignition
c) nucleation	d) coagulation
- 3) Barium sulphate is mostly _____ precipitate.

a) amorphous	b) crystalline
c) gelatinous	d) curdy
- 4) In L.D. process dry and pure oxygen is passed from _____ of the L.D. converter.

a) bottom	b) right side
c) top	d) left side
- 5) The suitable catalyst for contact process is _____.

a) V_2O_5	b) Ni
c) Fe_2O_3	d) steam
- 6) The best method for manufacture of ammonia is _____.

a) Mont Cenis	b) American
c) Electrical	d) Haber's
- 7) Earth crust contain _____ percentage of iron.

a) 72	b) 70
c) 5	d) 7
- 8) Sulphide ore are concentrated by _____ process.

a) magnetic separation	b) gravity separation
c) froth flotation	d) None of these

- Q.2 Answers any Four of the following. 08**
- a) Give the PH of phenolphthalein and methyl orange indicator.
 - b) Explain the term nucleation.
 - c) What is meant by heavy chemicals?
 - d) Why V_2O_5 is better catalyst than platinum?
 - e) Give four ores of iron.
- Q.3 Write short notes on any Two of the following. 08**
- a) Explain the term ageing of the precipitate.
 - b) Draw and explain the gravity separation process.
 - c) What are the physico-chemical principles of manufacture of H_2SO_4 by contact process?
- Q.4 Answer any Two of the following. 08**
- a) Explain co-precipitation and post precipitation.
 - b) Explain neutralization curve between strong acid and strong base.
 - c) What is refining of metal? Explain electrolytic refining of copper.
- Q.5 Answer any One of the following. 08**
- a) What is steel? Explain manufacture of steel by Bessemer process.
 - b) Explain the neutralization curve and choice of indicator for titration between strong acid and weak base.

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Set P

B.Sc. (Semester - IV) (New) (CBCS) Examination: March/April - 2025
COMPUTER SCIENCE (Paper - VIII)
DBMS Using Oracle (22221430)

Day & Date: Monday, 05-May-2025
 Time: 09:00 AM To 11:00 AM

Total Marks :40

- Instructions:** 1) All questions are compulsory.
 2) Draw neat diagrams and give equations wherever necessary
 3) Figures to the right indicate full marks.

Q.1 Choose the correct alternatives from the options. 08

- 1) In _____ state, the transaction will be wait for the final statement has been executed.
 - a) Active
 - b) Failed
 - c) Aborted
 - d) partially committed
- 2) The two-phase locking protocol includes _____ and _____ phase.
 - a) Growing, Shrinking
 - b) Growing, Release
 - c) Rollback, Commit
 - d) None of these
- 3) Deadlock prevention that requires each transaction to locks all its data items before it begins _____.
 - a) Initialization
 - b) Execution
 - c) Evaluation
 - d) Processing
- 4) In log-based recovery, all updates are recorded in _____.
 - a) Blocks
 - b) Logs
 - c) Disks
 - d) Main memory
- 5) In _____ technique a transaction does not modify the database until it has committed.
 - a) Deferred-modification
 - b) Late-modification
 - c) Immediate-modification
 - d) Undo
- 6) The overall description of a database is called _____.
 - a) Data integrity
 - b) Data manipulation
 - c) Database schema
 - d) Data definition
- 7) Aggregate functions are take a _____ as input and return a single value.
 - a) Collection of values
 - b) Single value
 - c) Aggregate value
 - d) Both a and b

- 8) By default, the order by clause lists items in _____ order.
- a) Descending
 - b) Any
 - c) Same
 - d) Ascending

Q.2 Answer any four of the following **08**

- a) What is a cursor?
- b) Define tuples and attributes in relational model.
- c) What is IN parameter and OUT parameter in procedure?
- d) Write a list of different types of relationships.
- e) Write the use and syntax of the grant statement.

Q.3 Write short notes on any two of the following **08**

- a) What is the ER model? Explain notations used in the ER model.
- b) What is the trigger? Explain with an example.
- c) Explain the two phase locking protocol.

Q.4 Answer any two of the following **08**

- a) What is a transaction? Explain properties of transactions.
- b) Explain network and hierarchical data models.
- c) What are DML statements? Explain DML statements with examples.

Q.5 Answer any one of the following **08**

- a) Explain Generalization, Specialization, and Aggregation in detail.
- b) What is normalization? Explain 1NF, 2NF and 3NF in detail.

Day & Date: Tuesday, 06-May-2025
Time: 09:00 AM To 11:00 AM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Neat diagrams must be draw wherever necessary.
4) Use of logarithmic table and calculator is allowed.

08

- Page 1 of 2

- 7) The substances which rotate the plane of vibration of polarized light towards the right are known as _____.
 a) optical active
 b) laevo-rotatory
 c) dextro-rotatory
 d) leavo as well as dextro-rotatory
- 8) The distance of an object and its image from the corresponding focal points are 16 cm and 4 cm respectively for a thick lens in air, its focal length is _____.
 a) 7 cm
 b) 8 cm
 c) 9 cm
 d) 10 cm

Q.2 Answer any four of the following**08**

- a) Define
 i) Polarization and
 ii) Plane of polarization
 b) Sketch the structure of optical fiber with proper naming?
 c) Define resolving power of grating and prism.
 d) What is Lagrange's relation?
 e) Why second glass plate is used in Michelson's interferometer?

Q.3 Write short notes on any two of the following.**08**

- a) State the superiority points of F-P interferometer over Michelson's interferometer.
 b) Describe Fresnel's half period zone
 c) The sodium D lines of-mean wavelength $5893 \text{ \AA}$ is a doublet having components $5896 \text{ \AA}$ and $5890 \text{ \AA}$. Find the minimum number of lines necessary for a grating to resolve this doublet in the first order.

Q.4 Attempt any two of the following.**08**

- a) What is diffraction? Explain diffraction at straight edge.
 b) Describe construction of Michelson's interferometer with neat diagram.
 c) The numerical aperture of an optical fibre is 0.345, when the fibre is placed in air, then calculate the angle of acceptance.

Q.5 Attempt any one of the following.**08**

- a) Describe the polarimeter experiment to determine specific rotation of an optically active material.
 b) Obtain the relation between lateral, longitudinal and angular magnification of an optical system.

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B.Sc. (Semester - IV) (New) (CBCS) Examination: March/April - 2025
Bio-Chemistry (Paper - III)
Nutrition and Metabolism (22221408)

Day & Date: Wednesday, 07-May-2025
 Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Draw neat diagrams and give equations wherever necessary.
 3) Figures to the right indicate full marks.

Q.1 Multiple choice questions

08

- 1) In adult, human contains about _____ water.
 a) 50% b) 60%
 c) 30% d) 40%
- 2) What is the net gain through the beta oxidation of palmitic acid?
 a) 131 ATP b) 130 ATP
 c) 129 ATP d) 132 ATP
- 3) _____ is a saturated fatty acid.
 a) Linoleic acid b) Erucic acid
 c) Palmitic acid d) Oleic acid
- 4) In urea cycle, ammonia combines with HCO_3^- - to form _____
 a) carbamoyl phosphate b) ornithine
 c) citrulline d) Aspartate
- 5) For each turn of the TCA cycle, _____ ATP molecules are produced.
 a) 2 b) 11
 c) 12 d) 21
- 6) _____ amino acid is involved in urea cycle.
 a) Tyrosine b) Valine
 c) Glycine d) Arginine
- 7) _____ is the purine base of nucleic acid.
 a) Uracil b) Thymine
 c) Cytosine d) Adenine
- 8) Oxidative phosphorylation means production of ATP by _____
 a) Calvin cycle b) respiration
 c) glycolysis d) glycogenolysis

- Q.2 Answer any four of the following. 08**
- a) What is Bioenergetics?
 - b) What do you mean by lipid metabolism?
 - c) What is fermentation?
 - d) Define transamination.
 - e) What are sources of the atoms in the purine?
 - f) What is basal metabolic rate?
- Q.3 Write short notes any two of the following. 08**
- a) Write note on β -oxidation of palmitic acid.
 - b) Explain inhibitors of electron transport chain.
 - c) Write note on amino acid metabolism.
- Q.4 Answer any two of the following. 08**
- a) Write note on Lactic acid fermentation.
 - b) What is Glycolysis? Write note on its regulations.
 - c) Write note on endergonic reactions.
- Q.5 Answer any one of the following. 08**
- a) What is Nutrition? Write note on calorific values of food and its measurement.
 - b) Write note on biosynthesis and degradation of purines.

Day & Date: Wednesday, 07-May-2025
Time: 09:00 AM To 11:00 AM

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- Q.2 Answer any four of the following** **08**
- a) What are aquatic weeds?
 - b) What are wetland weeds?
 - c) What is biological control?
 - d) What are slugs?
 - e) What are nematodes?
- Q.3 Write short notes on any two of the following.** **08**
- a) Parasitic weeds
 - b) Field sanitation
 - c) Write on – nature of damage & management caused by birds.
- Q.4 Attempt any two of the following.** **08**
- a) Give the classification of weeds based on ontogeny.
 - b) Give the properties, mode of action & use of Mira-71.
 - c) Explain – crop rotation.
- Q.5 Attempt any one of the following.** **08**
- a) Give the gross morphology, reproduction, ecology, dispersal & management of *Cynodon dactylon*.
 - b) Give the properties, mode of action, formulation & use of 2,4 - D.

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Set **P**

B.Sc. (Semester - IV) (New) (CBCS) Examination: March/April - 2025
PHYSICS (Paper - VIII)
Modern Physics (22221406)

Day & Date: Thursday, 08-May-2025
 Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat & well labelled diagram wherever necessary.
 4) Use of logarithm tables and calculator is allowed.
 (N.B. - Data given: Velocity of light, $c = 3 \times 10^8$ m/s)

Q.1 Multiple choice questions.**08**

- 1) Space quantization is quantization of electron orbits with respect to _____.
 a) only direction
 b) only magnitude
 c) magnitude and direction
 d) neither magnitude nor direction

- 2) The relation between phase velocity u of a matter wave and the corresponding particle velocity v is given by _____.
 a) $u = v/c^2$
 b) $u = c^2/v$
 c) $u = v/c$
 d) $u = c/v$

- 3) Inertial frame of reference is _____ frame of reference.
 a) a rotating
 b) a vibrating
 c) an accelerated
 d) un accelerated

- 4) The magnitude of the Compton wavelength is _____.
 a) $0.0484 \text{ \AA}$
 b) $0.0242 \text{ \AA}$
 c) $0.0212 \text{ \AA}$
 d) $0.0121 \text{ \AA}$

- 5) A clock will appear to run more and more slow if the relative velocity between clock and observer _____.
 a) becomes zero
 b) remains same
 c) increases
 d) decreases

- 6) Bragg's law is given by the equation _____.
 a) $2d \sin \theta = n\lambda$
 b) $d \sin \theta = n\lambda$
 c) $2d \sin \theta = \lambda$
 d) $d \sin 2\theta = n\lambda$

- 7) The velocity with which the individual matter wave associated with a particle move is called _____ velocity.
 a) particle
 b) group
 c) phase
 d) critical

- 8) The maximum change in wavelength of scattered radiation is for scattering angle _____
- a) 180°
 - b) 0°
 - c) 90°
 - d) 45°

Q.2 Answer any four of the following. 08

- a) State the properties of matter waves.
- b) State Pauli's exclusion principle
- c) Write Lorentz transformation equations.
- d) Give applications of X-rays.
- e) Show the experimental set up used in Stern - Gerlach experiment.

Q.3 Write notes on any two of the following. 08

- a) X-ray production by Coolidge tube
- b) Heisenberg's uncertainty principle
- c) L-S and J-J coupling

Q.4 Answer any two of the following. 08

- a) Obtain Bohr's quantum condition on the basis of matter waves.
- b) Explain in brief normal and anomalous Zeeman effect.
- c) At what speed will the mass of a body be double its rest mass?

Q.5 Answer any one of the following. 08

- a) Describe Michelson - Morley experiment and comment on its negative result.
- b) Obtain an expression for change in wavelength for scattered photon.

Max. Marks: 40

O.1 Multiple choice questions.

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- Q.2 Answer any four of the following. 08**
- a) Write types of properties of antibodies.
 - b) What is prokaryotes?
 - c) Define Phagocytosis and pinocytosis.
 - d) Write two cloning vectors.
 - e) What is K_m and V_{max} ?
- Q.3 Write short notes on any two of the following. 08**
- a) What is insulin gene cloning?
 - b) Explain irreversible and competitive Enzyme inhibition.
 - c) Write mechanism of action for didanosine.
- Q.4 Answer any Two of the following. 08**
- a) Explain factors affecting enzyme activity.
 - b) What are B cells and T cells.
 - c) Write immunological abnormalities in AIDS.
- Q.5 Answer any One of the following. 08**
- a) What are types of diabetes mellitus, explain hyperglycemia and hypoglycemia,
 - b) Explain replication of DNA and translation in prokaryotes.

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Set **P**

B.Sc. (Semester - IV) (New) (CBCS) Examination: March/April - 2025
PLANT PROTECTION (Paper - VIII)
Insect Pests and their Management (22221418)

Day & Date: Friday, 09-May-2025
 Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Draw a well diagram wherever necessary.
 3) All question carries equal marks.

Q.1 Multiple Choice Question:**08**

- 1) Developmental stage from birth to adult is called _____.
 a) Gametogenesis b) Metamorphosis
 c) Homogenises d) Evolution
- 2) Carbamates include _____.
 a) Fungicides, herbicides and insecticides
 b) Insecticides only
 c) Herbicides, insecticides and nematocides
 d) Insecticides and rodenticides
- 3) Rocker Sprayer is also called as _____.
 a) Knapsack Sprayer b) Hand sprayer
 c) Gator Pump d) Spray guns
- 4) Cultural controls of insects include which of the following _____.
 a) crop rotation
 b) tillage methods
 c) resistant or tolerate varieties
 d) all of the above
- 5) The use of legislative restriction to control pests is called _____.
 a) plant quarantine b) Plant law
 c) Plant enclosure d) Plant protection
- 6) _____ Scientific name of stem borer
 a) *Chillo zonellus* b) *Heliothis armigera*
 c) *Sitophilus oryzae* d) *Chrotogonus trachyptnus*
- 7) _____ legs and _____ wings present in insect body.
 a) 3 pairs & 2 pairs b) 2 pairs & 3 pairs
 c) 3 pairs & 3 pairs d) 2 pairs & 2 pairs

- 8) Insect body divided into _____ parts.
- | | |
|------|------|
| a) 3 | b) 6 |
| c) 2 | d) 4 |

Q.2 Answer any Four of the following. 08

- a) Metamorphosis.
- b) Mention two name of stored grain insect pest.
- c) Write the classification of insecticides.
- d) Write any two chemical pest control.
- e) Mention nature of formulation in the pest management.
- f) Write the host plants of stem borer.

Q.3 Write short note on any Two of the following. 08

- a) Nature of damage of fruit borer
- b) Control measures of trips of rose plant
- c) Repellents

Q.4 Answer any Two of the following. 08

- a) General characters of typical insect pest.
- b) Give an account on classification of insect pest
- c) Write the principles of insect pest control.

Q.5 Answer any One of the following. 08

- a) Describe in details about pulse beetle.
- b) Give an account on Woolly aphids of sugarcane.

- 8) If X_i 's are independent $N(0,1)$ r. v. then distribution of X^2 is _____.
 a) Chi-square with 1 d. f. b) Chi-square with n d. f.
 c) Normal distribution d) None of these

Q.2 Attempt any Four of the following. 08

- State mean and variance of $U[a, b]$ distribution.
- State relation between $N(0,1)$ and χ^2 - distribution with n d.f.
- Write definition of Student's t - distribution
- Write definition of $\beta_1(n, m)$ distribution.
- State m.g.f. of $\exp(\theta)$ distribution.

Q.3 Attempt any Two of the following questions. 08

- Find mode of χ^2 - distribution with n d.f.
- Find mean of beta distribution of first kind.
- State and prove lack of memory property of exponential distribution.

Q.4 Attempt any Two of the following questions. 08

- Find C.D.F. of $U[a, b]$ distribution.
- If $X \sim \beta_1(m, n)$, then find distribution of $1 - X$.
- If $X \sim N(\mu, \sigma^2)$ then find $E(X)$.

Q.5 Attempt any One of the following questions. 08

- Derive the pdf of student's t -distribution.
- If $X \sim G(\alpha, \lambda_1)$ and $Y \sim G(\alpha, \lambda_2)$ and X & Y are independent variates then find distribution of $\frac{X}{Y}$

Day & Date: Tuesday, 13-May-2025
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- 8) A medium-range weather forecast typically covers _____ days.
- a) 15 to 30
 - b) 3 to 7
 - c) 30 to 45
 - d) 60 to 120

Q.2 Answer of the following. (Any Four) 08

- a) What is Agro-climate?
- b) Define regional climatology.
- c) What is body comfort?
- d) Explain heat island.
- e) Which are local winds?

Q.3 Write short notes on. (Any Two) 08

- a) Modification of weather for-casting
- b) Offshore drilling
- c) Fishing activities

Q.4 Answer of the following. (Any Two) 08

- a) Describe the importance of climate in industrial activities.
- b) Explain the interrelations between telecommunications and air.
- c) Describe the effect of climate on agriculture.

Q.5 Answer of the following. (Any One) 08

- a) Describe the historical background of weather forecasting.
- b) Give an account of NE monsoon in India.

Seat No.	

Set	P

B.Sc. (Semester - IV) (New) (CBCS) Examination: March/April - 2025
GEO-CHEMISTRY (Paper - III)
Principles of Geochemistry (22221441)

Day & Date: Tuesday, 13-May-2025
 Time: 09:00 AM To 11:00 AM

Max. Marks:40

Instructions: 1) All questions are compulsory.
 2) Draw neat diagrams and give equations wherever necessary.
 3) Figures to the right indicate full marks.

Q.1 Multiple choice questions

08

- 1) $p^H + p^{OH} = \underline{\hspace{2cm}}$
 - a) 7
 - b) 10
 - c) 14
 - d) 16
- 2) At chemical equilibrium $\underline{\hspace{2cm}}$
 - a) $R_f > R_b$
 - b) $R_f < R_b$
 - c) $R_f = R_b$
 - d) $R_f \neq R_b$
- 3) According to Bronsted-Lowery theory, Acid is $\underline{\hspace{2cm}}$
 - a) proton acceptor
 - b) proton donar
 - c) electron paid donar
 - d) electron pair acceptor
- 4) In which type of rocks are coal and petroleum found?
 - a) Granite
 - b) Igneous
 - c) Metamorphic
 - d) Sedimentary
- 5) The example of aromatic compound is $\underline{\hspace{2cm}}$
 - a) benzene
 - b) Ethane
 - c) pentane
 - d) propane
- 6) $\underline{\hspace{2cm}}$ is the example of strong acid.
 - a) H_2SO_4
 - b) CH_3COOH
 - c) C_6H_5COOH
 - d) CCl_3COOH
- 7) Chemical equilibrium is independent of $\underline{\hspace{2cm}}$
 - a) time
 - b) temperature
 - c) pressure
 - d) concentration
- 8) Lechatalier's principle is not affected on $\underline{\hspace{2cm}}$
 - a) concentration
 - b) temperature
 - c) pressure
 - d) catalyst

- Q.2 Answer any four of the following. 08**
- a) Write Van't Hoff isotherm equation.
 - b) What is radiogenic isotope?
 - c) Write the formula for benzene and cyclohexane.
 - d) What is sedimentation?
 - e) Define chemical equilibrium.
 - f) Define acids according to Arrhenius theory.
- Q.3 Write short notes on any two of the following 08**
- a) Explain elements of geochemical thermodynamics.
 - b) Write note on stable isotopes.
 - c) Write geological usage of acids and bases.
- Q.4 Answer any two of the following. 08**
- a) Explain estimation of ionic concentration.
 - b) Explain lead as a stable isotope.
 - c) Write note on organic reactivity for acids and bases.
- Q.5 Answer any one of the following 08**
- a) Explain chemical equilibrium with hydrogen chloride and calcium sulphate.
 - b) Write note on igneous rocks, sedimentary rocks and metamorphic rocks.

Seat No.	

Set P

B.Sc. (Semester - IV) (New) (CBCS) : Examination March/April - 2025
ZOOLOGY (Paper - VII)
Fundamentals of Biochemistry (22221432)

Day & Date: Tuesday, 13-May-2025
 Time: 09:00 AM To 11:00 AM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 Multiple choice question.

08

- 1) Carbohydrates are also known as _____.
 a) Hydrates of carbon b) Carbonates
 c) Glycolipids d) Polysaccharides
- 2) _____ is the name the major storage form of carbohydrates in animals.
 a) Cellulose b) Chitin
 c) Glycogen d) Starch
- 3) _____ of the following is an example of unsaturated fatty acids.
 a) Lauric or Dodecanoic b) Linoleic or octadecatrienoic
 c) Palmitic or hexadecanoic d) Myristic or tetradecanoic
- 4) _____ among the following is a non-essential amino acid.
 a) Serine b) Threonine
 c) Lysine d) Histidine
- 5) _____ of the following is not the classified form of conjugated proteins.
 a) Lipoproteins b) Glycoproteins
 c) Metalloproteins d) Complete proteins
- 6) The monomeric unit of nucleic acid are called _____.
 a) Nucleotides b) Nucleosides
 c) Pyrimidines d) Purines
- 7) Nucleic acid were discovered by _____.
 a) Watson and Crick b) Griffith
 c) Friedrich Miescher d) Walter Gilbert
- 8) Deficiency of _____ vitamin causes Beri-Beri.
 a) Vitamin B12 b) Vitamin B2
 c) Vitamin B6 d) Vitamin B1

- Q.2 Answer any four of the following. 08**
- a) General Properties of enzymes
 - b) Write any two vitamin B deficiency diseases.
 - c) Biological significance of Calcium
 - d) Write significance of CO₂, NO.
 - e) Importance of Polysaccharides
 - f) Differentiate between Purines and Pyrimidines.
- Q.3 Attempt any two of the following. 08**
- a) Write types and general properties of α -amino acids.
 - b) Explain Denaturation and Renaturation of DNA.
 - c) Define Bioelements and write introduction and significance of O₂.
- Q.4 Answer any two of the following. 08**
- a) Define Ribonucleic Acid and explain structure and types of it.
 - b) Write in detailed Simple and conjugate proteins with examples.
 - c) Explain the structure and biological significance of Monosaccharides.
- Q.5 Answer any one of the following. 08**
- a) Explain in detailed Mechanism of enzyme action and write Factors affecting enzyme actions.
 - b) Define vitamins and write the classification with one example each and functions.

Seat No.	

Set **P**

B.Sc. (Semester - IV) (New) (CBCS) Examination: March/April - 2025
STATISTICS (Paper - VIII)
Statistical Methods - II (22221412)

Day & Date: Wednesday, 14-May-2025
 Time: 09:00 AM To 11:00 AM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
 2) Draw neat diagram and give equations wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of logarithmic table and calculator is allowed.

Q.1 Choose the correct alternatives from the options.**08**

- 1) Level of significance is _____.
 a) probability of type-II error b) probability of type-I error
 c) both a) and b) d) none of these
- 2) In moving average method, we cannot find trend values of some _____.
 a) end points b) middle points
 c) starting and end periods d) starting periods
- 3) If X_i are iid $N(0, \sigma^2)$ r. v. then limiting distribution of $Z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$ is $N(0, 1)$.
 a) $Z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$ b) $\sqrt{n} \bar{x}$
 c) $\bar{x}$ d) None of these
- 4) Rejecting H_0 when H_0 is false leads to _____.
 a) type-I error b) type-II error
 c) power d) none of these
- 5) Least square method _____.
 a) reduces the calculations
 b) does not give estimate for future
 c) reduces error sum of squares
 d) is subjective
- 6) Equality of two population means is tested by using _____ test.
 a) t b) Z-test
 c) both a) & b) d) none of these
- 7) A fire in a factory delaying production for some weeks is due to _____.
 a) Seasonal variations b) Secular trend
 c) Cyclical variations d) Irregular variation

- 8) Which of the following is large sample test?
- a) t-test
 - b) χ^2 - test
 - c) F- test
 - d) Z-test

Q.2 Attempt any Four of the following.

08

- a) Define Null and Alternative hypotheses.
- b) State Central Limit Theorem
- c) Write definition of time series.
- d) Define Type-I & Type- II errors.
- e) A r. v. X is such that $E(X) = 4$ and $V(X) = 9$, then find lower bound for $P(|X - 4| < 6)$.

Q.3 Attempt any Two of the following questions.

08

- a) Describe the least square method.
- b) Write the procedure to test the hypothesis $H_0: \mu = \mu_0$ v/s $H_1: \mu \neq \mu_0$ when population variance (σ^2) is known.
- c) A symmetric dice is thrown 600 times. Find the lower bound for the probability of getting 80 to 120 sixes.

Q.4 Attempt any Two of the following questions.

08

- a) Describe the procedure of testing equality of two population proportions.
- b) Write in details components of time series.
- c) Suppose X is exp(1) r. v. then find least value for $P(|X - 1| < 2)$.

Q.5 Attempt any One of the following

08

- a) Obtain the seasonal indices for the quarters by simple average method assuming that trend is absent.

Year	Quarters No.			
	I	II	III	IV
2017	37	41	33	35
2018	37	39	36	36
2019	40	41	33	31
2020	33	44	40	40

- b) State and prove central limit theorem.

Day & Date: Thursday, 15-May-2025
Time: 09:00 AM To 11:00 AM

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- 8) In a thermocouple, at _____ temperature the thermos-e.m.f. reverses its direction.
- a) 0°C
 - b) 100 °C
 - c) neutral
 - d) inversion

Q.2 Answer the following question (Any four) 08

- a) Determine the common temperature shown by centigrade (C) scale and Rankin (Ra) scale.
- b) What are advantages of a barograph over a Fortin's barometer?
- c) How are constants of cup anemometer determined?
- d) How is Hook's anemometer calibrated?
- e) For a Fe-Cu thermocouple, inversion temperature is 480 °C. Calculate its neutral temperature.

Q.3 Write short notes of the following (Any two) 08

- a) With neat diagram explain construction and working of automatic siphon gauge.
- b) Two unknown wind velocities 40 km/hr and 60 km/hr are measured using a cup anemometer and the respective linear velocities of rotating cups are 25 m/s and 40 m/s. Determine constants of the cup anemometer.
- c) Explain in detail Seebeck effect.

Q.4 Answer the following question (Any two) 08

- a) Draw neat labelled diagram of Aneroid barometer.
- b) With neat diagram explain construction and working of Hooke's anemometer.
- c) Explain the construction and working of dry and wet bulb thermometers.

Q.5 Answer the following question (Any one) 08

- a) Write a note on "The different temperature scales."
- b) With neat diagram explain construction and working of mercury barometer.

Seat No.	

Set P

B.Sc. (Semester - IV) (New) (CBCS) : Examination March/April - 2025
GEO-CHEMISTRY (Paper-IV)
Chemistry of the Earth (22221442)

Day & Date: Thursday, 15-May-2025
 Time: 09:00 AM To 11:00 AM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
 2) Draw neat diagram and give equations wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of logarithmic table and calculator is allowed.
 (At. Wts.: H=1, C=12, O=16, N=14, Na=23, Cl=35.5)

Q.1 Multiple choice questions.

08

- 1) Which of the following radioactive element has half-life of 5730 years?
 - a) $^{235}\text{Uranium}$
 - b) Thorium
 - c) ^{14}C
 - d) 160
- 2) In the periodic table of elements, the elements are arranged in order of _____.
 - a) Decreasing atomic weight
 - b) Increasing atomic number
 - c) Increasing volume
 - d) Decreasing atomic number
- 3) Radiometric dating is possible if a rock contains a measurable amount of _____.
 - a) only parent isotopes
 - b) only daughter isotopes
 - c) both parent and daughter isotopes
 - d) either parent and daughter isotopes
- 4) According to Clarke (1971), _____ is the most abundant sedimentary rocks in average composition of crust.
 - a) Shale
 - b) Sandstone
 - c) Limestone
 - d) None of the above
- 5) Elements are those of the B subgroup whose ions have 18-electron in the outer shell are _____.
 - a) Lithophile
 - b) Siderophile
 - c) Chalcophile
 - d) Atmophile
- 6) Chondrites are consisting primarily of _____.
 - a) Olivine only
 - b) Pyroxene only
 - c) Olivine and/or pyroxene
 - d) Iron and Nickle

- 7) Which of the following are the main constituents of acid rain?
- a) Carbon, nitrogen
 - b) Sulphur, nitrogen
 - c) Sulphur, oxygen
 - d) Nitrogen, hydrogen
- 8) Uranium-238 decays to which of the following daughter isotopes?
- a) Rubidium – 87
 - b) Uranium – 234
 - c) Lead – 206
 - d) Nitrogen – 14

Q.2 Answer the following question (Any Four) 08

- a) Give the example of chain silicate structure.
- b) Give the examples of lithophiles.
- c) List the dating method of radiogenic isotopes.
- d) Name the elements of LILE.
- e) Give the two examples of Ionic bonding.
- f) Name the eight elements make up nearly 99% of the total Earth's crust.

Q.3 Write short notes on the following (Any Two) 08

- a) Radioactive decay
- b) Classification of Geochemical elements
- c) Chemical composition of Igneous rocks

Q.4 Answer the following question (Any Two) 08

- a) Describe the types of silicate structures with suitable diagram.
- b) Explain in brief the classification of meteorites.
- c) Discuss in brief different types of clay minerals with structural diagram.

Q.5 Answer the following question (Any One) 08

- a) Describe in the products of sedimentation. Add note on order of stability of minerals.
- b) Discuss in short chemical bonding and its types with suitable diagram. Add note on coordination number.

Set

P

B.Sc. (Semester - IV) (New) (CBCS): Examination March/April - 2025
ZOOLOGY (Paper-VIII)
Physiology Control & Coordination (22221433)

Day & Date: Thursday, 15-May-2025
Time: 09:00 PM To 11:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat labeled diagrams and wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Multiple choice questions

08

- 1) Adipose tissue is the _____ type of tissue.

a) nervous	b) connective
c) epithelial	d) muscle
- 2) The places where neurons connect and communicate with each other are called as _____

a) sinusoids	b) glomerulus
c) s-s bridge	d) synapses
- 3) _____ helps to form blood clots to slow or stop bleeding and to help wounds heal

a) Platelets	b) R.B.Cs
c) Glial cells	d) Nephrons
- 4) _____ is a hormone that supports menstruation and maintaining a pregnancy.

a) ADH	b) Progesterone
c) Testosterone	d) Oxytocin
- 5) _____ is the pancreatic disorder caused by low levels of insulin.

a) Goiter	b) Albinism
c) Dwarfism	d) Diabetes
- 6) Muscle tissue contains special contractile proteins _____

a) chitin	b) thrombin
c) keratin	d) myosin
- 7) _____ is the device put into uterus to prevent pregnancy.

a) Diaphragm	b) IUD
c) Hormonal patch	d) Contraceptive implant
- 8) _____ hormone secreted by adrenal gland.

a) FSH	b) LH
c) Glucocorticoid	d) Prolactin

- Q.2 Answer the following question (Any Four) 08**
- a) What is erythropenia?
 - b) Name the hormones secreted by pancreas
 - c) Define neuron.
 - d) Write applications of In Vitro Fertilization technique.
 - e) Sketch and label T.S. of liver
- Q.3 Write short notes of the following question (Any Two) 08**
- a) Draw and discuss T.S. of testis.
 - b) Write composition of blood.
 - c) Write on hormonal secretion, function and disorder of thyroid gland.
- Q.4 Answer of the following question (Any Two) 08**
- a) Write on types and functions of epithelial tissue.
 - b) Write on any two male contraception method.
 - c) Discuss structure on neuron.
- Q.5 Answer of the following question (Any One) 08**
- a) Write on hormonal control in pregnancy, parturition and lactation.
 - b) Explain types of muscles in detail.

Seat No.	

Set **P**

B.Sc. (Semester - IV) (New) (CBCS): Examination March/April - 2025
MATHEMATICS (Paper - VII)
Differential Equations (22221423)

Day & Date: Friday, 16-May-2025
 Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 Choose the correct alternative for each of the following. **08**

1) The solution of the differential equation $P^2 - 7P + 12 = 0$ is _____.

- a) $(y - 3x - c)(y + 4x - c) = 0$
- b) $(y + 3x - c)(y - 4x - c) = 0$
- c) $(y - 3x - c)(y - 4x - c) = 0$
- d) $(y + 3x - c)(y + 4x - c) = 0$

2) The solution of the differential equation

$\cos y \cdot \cos px + \sin y \cdot \sin px = p$ is _____.

- a) $y = cx + \sin^{-1}(c)$
- b) $y = cx - \sin^{-1}(c)$
- c) $y = cx - \cos^{-1}(c)$
- d) $y = cx + \cos^{-1}(c)$

3) If $1 + P + Q = 0$ then the one known solution of the complimentary function of the equation $\frac{d^2y}{dx^2} + P \frac{dy}{dx} + QY = R$ is $y =$ _____.

(Where P, Q, R are function of x only)

- a) x
- b) x^2
- c) e^x
- d) e^{-x}

The one known solution of the differential equation

4) $x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 3y = 0$ is _____.

- a) x
- b) x^2
- c) e^x
- d) e^{-x}

5) The differential equation $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + y = x^2$ is _____ equation.

- a) non-homogeneous linear
- b) homogeneous linear
- c) linear differential equation with constant coefficients
- d) exact differential equation

6) One of the solutions of the differential equation $\frac{dx}{y^2} = \frac{dy}{x^2} = \frac{dz}{x^2y^2z^2}$

- a) $x^2 - y^2 = c_1$
- b) $x^3 + y^3 = c_1$
- c) $x^2 + y^2 = c_1$
- d) $x^3 - y^3 = c_1$

- 7)** The differential equation of the form $P dx + Q dy + R dz = 0$ (where P, Q and R are functions of x, y, z) is called as _____ equation.
- a) Total differential b) Clairaut's equation
c) Simultaneous differential d) Homogeneous linear equation
- 8)** By using the substitution $x = e^z$ the value of $x^3 \frac{d^3y}{dx^3}$ in the homogeneous linear equation is _____. (where $D = \frac{d}{dz}$)
- a) D^3y b) $D(D - 1)y$
c) $D(D + 1)y$ d) $D(D - 1)(D - 2)y$

Q.2 Attempt any Four of the following.

08

- Define Clairaut's differential equation and explain the method of solving it.
- Solve $x^2 p^2 + xyp - 6y^2 = 0$
- Solve $x^2 \frac{d^2 y}{dx^2} + 2x \frac{dy}{dx} - 2y = 0$
- Solve $\frac{dx}{mz - ny} = \frac{dy}{nx - lz} = \frac{dz}{ly - mx}$
(Where l, m, n are constant)
- Test the condition of integrability for the differential equation.
 $y^2 dx - z dy + y dz = 0$

Q.3 Attempt any Two of the following.

08

- Solve $y = 2px + p^3 y^2$
- Solve $\frac{dx}{z} = \frac{dy}{-z} = \frac{dz}{z^2 + (x+y)^2}$
- State and prove the necessary condition for the integrability of the total differential equation $P dx + Q dy + R dz = 0$ (where P, Q and R are functions of x, y, z)

Q.4 Attempt any Two of the following.

08

- Solve $(3x + 4) \frac{d^2y}{dx^2} - 6(3x + 4) \frac{dy}{dx} - 36y = x$
- Solve $2x \, dx + 2y \, dy + (x^2 + y^2 + e^z) \, dz = 0$
- Explain the method of solving the equation $\frac{d^2y}{dx^2} + P \frac{dy}{dx} + Qy = R$ by changing the independent variable.
(where P, Q and R are functions of x only)

Q.5 Attempt any One of the following.

08

- a)** 1) Explain the method of solving homogeneous linear equation

$$x^n \frac{d^n y}{dx^n} + c_1 x^{n-1} \frac{d^{n-1} y}{dx^{n-1}} + \dots + c_{n-1} x \frac{dy}{dx} + c_n y = X$$
Where $c_1, c_2, \dots, c_n$ are constants and X is a function of x
- 2) Solve $x^2 \frac{d^2 y}{dx^2} - 3x \frac{dy}{dx} + 4y = x$

- b)** Explain the method of solving the equation $\frac{d^2y}{dx^2} + P \frac{dy}{dx} + Qy = R$ by removal of the first order derivative by changing the dependent variable y to v .
(where P, Q and R are functions of x)

Set	P
1	1
2	1
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100	1

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April - 2025
BOTANY (Paper-VII)
Plant Physiology (22221402)**

Day & Date: Saturday 17-05-2025
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat diagrams and give equations wherever necessary.
4) Use of logarithmic table and calculator is allowed.

Q.1 Multiple choice questions.

08

- 1) In photorespiration, glycine is converted into serine and carbon dioxide in _____.
a) Mitochondria b) Chloroplast
c) Vacuoles d) Peroxisomes
- 2) The enzyme that helps in fixing CO₂ into mallic acid in C₄ plants
a) RuBP carboxylase b) PEP carboxylase
c) Pentosephosphatase d) Fructosephosphatise
- 3) Phloem unloading occurs from _____.
a) High concentration to low concentration
b) Low concentration to high concentration
c) Isotonic to hypertonic solution
d) Transfer of solute with equal concentration
- 4) During glycolysis, _____ catalyses the phosphorylation of glucose.
a) phosphoglucomutase b) phosphoglucoisomerase
c) hexokinase d) phosphorylase
- 5) Photoperiodic stimulus is perceived by _____.
a) Leaves b) Stem
c) Roots d) Apical bud
- 6) The reduction of NADP occurs during the process of _____.
a) Non cyclic photophosphorylation
b) Cyclic photophosphorylation
c) Oxidative phosphorylation
d) Transpiration
- 7) The term vernalization is used by _____.
a) Koog b) Benda
c) Lysenko d) Weiner

- 8) Number of ATP gain during anaerobic degradation of glucose to pyruvate is ____.
- a) 1 ATP
 - b) 3ATP
 - c) 2 ATP
 - d) None of the above

Q.2 Answer any Four of the following. 08

- a) What are phytochromes?
- b) What is vernalization?
- c) What are first stable compounds synthesized during C_3 and C_4 pathway?
- d) What is the site of photorespiration?
- e) What is apoplast?

Q.3 Write short notes on any Two of the following. 08

- a) CAM pathway
- b) Source - sink relationship
- c) Significance of vernalization

Q.4 Answer any Two of the following. 08

- a) Give the difference between C_3 and C_4 pathway.
- b) Explain the mechanism of photorespiration.
- c) Explain the florigen concept

Q.5 Answer any One of the following. 08

- a) Explain mass flow hypothesis with suitable diagram.
- b) Explain the TCA cycle.

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**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
March/April - 2025
MATHEMATICS (Paper– VIII)
Abstract Algebra–I (22221424)**

Day & Date: Monday, 19-May-2025
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Choose the correct alternative of the following.

08

- 1) $(\mathbb{Z}, -)$ is not a group since it does not satisfy _____.
a) Closed b) Associativity
c) Identity d) Inverse
- 2) Order of symmetric group S_n is _____.
a) $n!$ b) $n!/2$
c) n d) $n - 1$
- 3) If p & q are prime numbers then $\gcd(p, q)$ is _____.
a) 1 b) p
c) q d) 0
- 4) A one-one and onto mapping is known as _____.
a) Bijection b) Injection
c) Surjection d) None of these
- 5) Cyclic group of order 8 has _____ generators.
a) 2 b) 3
c) 4 d) 8
- 6) In a Group G the element a and a^{-1} has _____ order.
a) Same b) Different
c) Zero d) None of these
- 7) If ϕ is Euler ϕ function then $\phi(15) =$ _____.
a) 14 b) 4
c) 8 d) 5
- 8) If $f = G \rightarrow G'$ be homomorphism then $\ker f =$ _____.
a) $\{x \in G / f(x) = e'\}$ b) $\{x \in G / f(x) = e\}$
c) $\{x \in G' / f(x) = e\}$ d) $\{x \in G / f(x) = 1\}$

- Q.2 Answer any four of the following. 08**
- Define equivalence relation.
 - Explain Congruence Modulo n .
 - If G is a group then prove that the identity element of G is unique.
 - Prove that every cyclic group is abelian.
 - Determine the right co sets of $\langle [3] \rangle$ in Z_{12} .
- Q.3 Answer any two of the following. 08**
- If a, b are any two elements of a group G and H any subgroups of G then $a \in Ha \Leftrightarrow Ha = Hb$
 - Solve the equation $x \cdot (1 \ 3 \ 2) = (1 \ 3)$
 - State & prove Lagrange's Theorem.
- Q.4 Answer any two of the following. 08**
- Show that a set $G = \{1, -1, i, -i\}$ of a complex number form a group under complex multiplication.
 - Find gcd of 1001 and 357 and express $(1001, 357) = 1001x + 357y$.
 - Show that $(Z_n, \oplus_n)$ is a Abelian Group with respect to addition modulo n .
- Q.5 Answer any one of the following. 08**
- State & Prove Cayley's Theorem.
 - If $f: G \rightarrow G'$ be an onto group homeomorphism then G' is isomorphic to a quotient group G (i.e. $G' \cong G/\ker f$).

Seat No.	

Set	P

B.Sc. (Semester - IV) (New) (CBCS) Examination: March/April - 2025
BOTANY (Paper–VIII)
Embryology Of Angiosperms

Day & Date: Tuesday, 20-May-2025
 Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Figures to right indicate full marks.

Q.1 Choose the correct alternative from the given options. 08

- 1) In the angiosperms, the endosperm is formed _____.
 a) Before fertilization b) After fertilization
 c) Along with fertilization d) None of the above

- 2) The thalamus elongated between gynoecium and androecium is called _____.
 a) Anthophore b) Androphore
 c) Gynophore d) Carpophore

- 3) Generative nucleus divides to form _____.
 a) Two male nuclei b) Three male nuclei
 c) Two female nuclei d) Three female nuclear

- 4) The typical embryo sac is made up of _____ cells.
 a) Three b) Five
 c) Seven d) Nine

- 5) Capsella bursa pastoris shows type of development.
 a) Crucifer b) Solanad
 c) Carophyllad d) Chenopodial

- 6) Sporopollenin, the highly resistance substance is found in _____.
 a) Outer layer of anther b) Inner layer of anther
 c) Outer layer of d) Inner layer of pollengrains
 pollengrains

- 7) Winged seeds occur in _____.
 a) Moringa b) Ulmus
 c) Shorea d) Hiptage

- 8) The process of double fertilization was discovered by ____.
- a) Strasburger
 - b) Robert Koch
 - c) Nawaschin
 - d) Drouchet

Q.2 Answer the following. (Any Four) 08

- a) Enlist all whorls of flower.
- b) What is meant by hypogynous?
- c) Define embryology.
- d) Define triple fusion.
- e) What is meant by Anemophily?
- f) Sketch and label monocotembryo

Q.3 Write short note. (Any Two) 08

- a) The process of double fertilization and state its significance.
- b) The development of monosporic embryo.
- c) The entry of pollen tube through style.

Q.4 Answer the following. (Any Two) 08

- a) Describe the structure of tetrasporangiate anther.
- b) Explain the structure and development of embryo in dicotyledons.
- c) Define pollination. Mention agents for pollination.

Q.5 Answer the following. (Any One) 08

- a) Define endosperm. Explain the types of endosperms.
- b) What is seed dispersal? Explain types of seed dispersal.

Seat No.	

Set **P****B.Sc. (Semester - IV) (New) (CBCS) : Examination March/April - 2025****Geography Paper–VII****Economic Geography(22221435)**

Day & Date: Wednesday, 21-May-2025

Max. Marks: 40

Time: 09:00 AM To 11:00 AM

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat diagrams and give equations wherever necessary
 4) Use of maps stencil is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. 08

- 1) _____ are among the states where magnetite can be found.

a) Karnataka	b) Andhra Pradesh
c) T.N	d) all of these
- 2) Economic geography is the branch of _____ Geography.

a) Natural	b) Human
c) Geomorphology	d) Oceanography
- 3) According to _____ “Economic activity is the production, Distribution and consumption of commodities”.

a) Raich	b) Hetner
c) Alecxandar	d) Chisholm
- 4) _____ is the father of economic geography.

a) Weber	b) Hetner
c) Alecxandar	d) Chisholm
- 5) In Primary sector _____ coloured workers are observed.

a) Blue	b) White
c) Pink	d) Red
- 6) _____ has the largest number of cotton textile mills in the country, for this reason its called “Cotton polis of India”

a) Maharashtra	b) Gujarat
c) Tamilnadu	d) Kolkata
- 7) _____ formulated a theory of industrial location in which an industry is located Where the transportation costs of raw materials and final product is a minimum.

a) Alferd Weber	b) Vonthunen
c) Strabo	d) Ritter

- 8) Example of primary activities is _____
- a) Agriculture
 - b) Hunting
 - c) Mining
 - d) All of these

Q.2 Answer any four of the following **08**

- a) Write down the branches of economic geography (only names).
- b) In which state (Only name) the cotton textile is located in India?
- c) Define the hunting.
- d) Write down the example of tertiary activity (only names).
- e) Definition of subsistence agriculture?

Q.3 Write short notes on any two of the following. **08**

- a) Fishing
- b) Primary activity.
- c) Commercial agriculture.

Q.4 Answer Any Two of the following **08**

- a) Define the secondary activity and explain it?
- b) Explain the nature and scope of economic geography?
- c) Describe the Concept of iron ore industry and Explain it's distribution.

Q.5 Answer any one of the following **08**

- a) Describe the industrial location theory by Weber with critic?
- b) Describe the definition of economic geography and Explain it's importance?

Seat No.	

Set **P**

**B.Sc. (Semester - IV) (New) (CBCS): Examination March/April - 2025
ELECTRONICS Paper–VII (22221426) Operational Amplifier and
Applications**

Day & Date: Wednesday, 21-May-2025
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
2) Figures to the right indicate full marks & use logarithmic table and calculator is allowed.
3) Draw neat diagrams and give equations wherever necessary.

Q.1 Choose correct answer.**08**

- 1) Which pins of IC 741 are necessary to construct offset null circuit?
 - a) pin 2 and +Vcc
 - b) pin 1 and 5
 - c) pin 2 and 5
 - d) pin 3 and – Vcc
- 2) Open loop configuration of OpAmp circuits has _____ bandwidth.
 - a) almost infinity
 - b) in audio frequency range
 - c) almost zero
 - d) in radio frequency range
- 3) Which parameter of OpAmp is responsible to consider the speed of various circuits?
 - a) offset voltage
 - b) PSRR
 - c) CMRR
 - d) slew rate
- 4) Which configuration of OpAmp has less than one gain to construct various application?
 - a) both inverting & differential
 - b) Differential
 - c) non-inverting
 - d) inverting
- 5) The capacitor is connected _____ path, to construct the OpAmp as differentiator circuit.
 - a) in feedback
 - b) at the non-inverting terminal
 - c) at the inverting terminal
 - d) in designer chosen
- 6) The input voltage is 9 mV for OpAmp inverting amplifier in closed loop with feedback resistance is 50 KOhm and input resistance is 5 KOhm. Find the out voltage!
 - a) +250mV
 - b) -10mV
 - c) -90mV
 - d) -250mV

- 7) How much the reference voltage is needed to construct zero crossing detector using OpAmp?
- a) +zero Volt
 - b) zero volt
 - c) -zero Volt
 - d) Both a & c
- 8) The Current to Voltage converter using OpAmp is also called _____ amplifier.
- a) Transconductance
 - b) Buffer
 - c) Transresistance
 - d) Conductance

Q.2 Answer Any Four of the following 08

- a) The differential mode gain and common mode gain are 25000 and 0.50 respectively, then find the CMRR in dB?
- b) Mention two non-linear application of OpAmp.
- c) Define parameter input offset voltage and slew rate?
- d) Sketch equivalent circuit of OpAmp with neat labelling.
- e) Mention the characteristics of OpAmp 741.
- f) What is virtual ground concept in OpAmp?

Q.3 Answer Any Two of the following 08

- a) Write a note on astable multivibrator using OpAmp.
- b) Discuss Schmitt trigger circuit using OpAmp.
- c) Construct and explain the subtractor circuit using OpAmp.

Q.4 Answer Any Two of the following 08

- a) Construct and explain the Integrator circuit using OpAmp.
- b) Write a note on current mirror bias circuit needed for transistor differential amplifier.
- c) Construct and explain the Precision half wave rectifier using OpAmp.

Q.5 Answer any one of the following 08

- a) What are various configurations of OpAmp? What is need of closed loop configuration in OpAmp applications? Find out gain equation of closed loop non-inverting configuration?
- b) Construct and explain
 - a. Triangular wave generator circuit using OpAmp 741.
 - b. Voltage to current converter using OpAmp 741.

Seat No.	

Set	P

B.Sc. (Semester - IV) (New) (CBCS) : Examination March/April - 2025
GEOLOGY Paper-VII
SEDIMENTARY AND METAMORPHIC PETROLOGY(22221414)

Day & Date: Thursday, 22-May-2025
 Time: 09:00 AM To 11:00 AM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
 2) Draw neat diagrams and give equations wherever necessary.
 3) Figures to the right indicate full marks.

Q.1 Multiple choice question.

08

- 1) _____ is residual sedimentary rock.

a) Sandstone	b) Limestone
c) Shale	d) Laterite
- 2) Argillaceous rocks having _____ sediments.

a) Boulder	b) Cobble
c) Pebble	d) Clay
- 3) _____ rocks contains fossils.

a) Sandstone	b) Limestone
c) Marble	d) Shelly limestone
- 4) _____ is a thermal metamorphic rocks

a) Slate	b) Phyllite
c) Schist	d) Marble
- 5) In _____ rocks, pressure is predominant.

a) Cataclastic	b) Dynamo thermal
c) Thermal	d) Regional
- 6) Slaty structure developed in _____ metamorphic rocks.

a) Cataclastic	b) Regional
c) Dynamo thermal	d) Thermal
- 7) Schistose structure developed in _____ metamorphic rock.

a) cataclastic	b) dynamo thermal
c) thermal	d) plutonic
- 8) wavy undulations on the sedimentary rocks are called as _____.

a) ripple marks	b) graded bedding
c) rain print	d) mud cracks

- Q.2 Answer the following (Any Four) 08**
- a) Name two rudaceous sedimentary rocks.
 - b) Sediments in argillaceous rock.
 - c) Minerals in zeolite facies.
 - d) Define metamorphic facies.
 - e) Sediments in sandstone.
- Q.3 Write short notes of the following (Any Two) 08**
- a) Shelly Limestone
 - b) Green schist Facies
 - c) Residual rocks with its varieties.
- Q.4 Answer the following (Any Two) 08**
- a) Describe the Lamination and ripple marks structures.
 - b) Describe the Eclogite facies.
 - c) Formation of Arenaceous sedimentary rock.
- Q.5 Answer any one of the following 08**
- a) Describe Schist, Gneiss, Slaty, structures in metamorphic rock.
 - b) Describe weathering, erosion, transportation, deposition, compaction, cementation process in the formation of sedimentary rock.

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B.Sc. (Semester - IV) (New) (CBCS): Examination March/April - 2025
MICROBIOLOGY Paper-VII
Immunology & Medical Microbiology (22221420)

Day & Date: Thursday, 22-May-2025
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat diagrams and give equations wherever necessary.

Q.1 Choose the correct alternative and rewrite the sentences again. 08

- 1) Immunity that exist at birth is called as _____ immunity.

a) Passive	b) Active
c) Artificial	d) Innate
- 2) Incomplete antigen is called as _____

a) Hapten	b) Iso-antigen
c) Auto-antigen	d) Adjuvant
- 3) _____ is present on Antigen

a) Adjuvant	b) Epitope
c) Light chain	d) WBC
- 4) The reaction between a soluble antigen and a solution of antibody is known as _____

a) Precipitation	b) Agglutination
c) Haemagglutination	d) Complement fixation
- 5) Causative agent of enteric fever is _____

a) <i>E. coli</i>	b) <i>P. aeruginosa</i>
c) <i>B. subtilis</i>	d) <i>S. typhi</i>
- 6) Dengue is a _____ disease.

a) Bacterial	b) Protozoan
c) Viral	d) Fungal
- 7) Antigen which shows both immunogenicity and immunologic specificity is called _____

a) Complete antigen	b) Hapten
c) Auto-antigen	d) Iso-antigen
- 8) _____ antibody is pentamer.

a) IgG	b) IgE
c) IgM	d) IgA

- Q.2 Define Any Four of the following** **08**
- a) Immunity
 - b) Antigen
 - c) Antibody
 - d) Hapten
 - e) Disease
- Q.3 Write short notes on Any Two of the following.** **08**
- a) Acquired immunity
 - b) Types of Antigen
 - c) IgG antibody.
- Q.4 Answer Any Two of the following** **08**
- a) Agglutination test
 - b) Explain structure and function of IgA
 - c) Write a note on factor affecting antigenicity.
- Q.5 Answer Any One of the following** **08**
- a) Explain in detail – ‘Dengue’ disease.
 - b) Describe various agglutination techniques in details with example.

Day & Date: Friday, 23-May-2025
Time: 09:00 AM To 11:00 AM

Page 1 of 2

- Q.2 Answer the following (Any Four) 08**
- a) What is Aquatic Biome?
 - b) What is Pollution?
 - c) What is Environmental Geography?
 - d) What is Ecosystem?
 - e) What is Food Chain?
- Q.3 Write short notes of the following (Any Two) 08**
- a) Importance of Environmental Geography
 - b) Types of Environments
 - c) Chipko Movement
- Q.4 Answer the following (Any Two) 08**
- a) Explain the Nature of Environmental Geography
 - b) Explain the Forest Ecosystem
 - c) Environmental Protection Act, 1986
- Q.5 Answer the following (Any One) 08**
- a) Explain the impact of Man on Environment
 - b) Explain the Scope of Environmental Geography.

Day & Date: Friday, 23-May-2025
Time: 09:00 AM To 11:00 AM

08

- Page 1 of 2

Q.2 Answer Any Four of the following **08**

- Give the classification of semiconductor memory.
- Define the term resolution and accuracy of DAC.
- State the role of HL register pair.
- State four machine control group of instructions.
- Define an absolute and a linear address decoding technique.

Q.3 Write short notes on Any Two of the following. 08

- a) Non-volatile Memory.
b) SAR type ADC.
c) Write the functions of following pin.
a) ALE b) $\overline{IO/\overline{M}}$ c) $\overline{WR}$ d) $\overline{RD}$

Q.4 Answer Any Two of the following **08**

- a) Write the addressing modes of following instructions
- | | |
|---------------------------|-----------------------|
| 1) ADD M | 2) STA 16-bit address |
| 3) LXI Rp, 16-bit address | 4) RAR |
- b) With a neat diagram, explain the generation of $\overline{\text{MEMR}}$, $\overline{\text{MEMW}}$, $\overline{\text{IOR}}$ and $\overline{\text{IOW}}$ control signals by using OR gates.
- c) Calculate the analog O/P voltage for Binary Weighted DAC if digital data is 111110 For logic 1= 10 Volt and for logic 0 = 0 volts.

Q.5 Answer any one of the following **08**

- a) Write assembly language program to perform addition and subtraction of two 8-bit numbers stored at ML 4020 and 4021 and put result at ML 4022.
- b) State the salient features of 8085 processor and explain ALU, Accumulator, and flag register of 8085 processor.

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equations wherever necessary
3) Figures to the right indicate full marks.

08

- Page 1 of 2

- 8) Glossopteris is a plant fossil is known from the rocks of
- a) Upper Gondwana
 - b) Middle Gondwana
 - c) Lower Gondwana
 - d) Rajmahal inter trappen beds

Q.2 Answer any four of the following **08**

- a) What is principle of Uniformitarianism?
- b) Name the major group in the Vindhyan Supergroup.
- c) Define stratigraphy.
- d) Write the sequence of period of paleozoic era.
- e) What is age of Deccan trap.

Q.3 Write short notes on any two of the following. **08**

- a) Write stratigraphic sequence of western Dharwar craton.
- b) Write down the economic importance of Gondwana formation.
- c) Explain in brief Extra peninsular region in India.

Q.4 Answer Any Two of the following **08**

- a) Describe lithostratigraphy and life of Jurassic of Kutch.
- b) Explain stratigraphy of Cuddapah supergroup.
- c) Describe Bagh beds formation.

Q.5 Answer any one of the following **08**

- a) Discuss in detail seven principles of stratigraphy
- b) Describe lithology , distribution , plant fossil , age and economic importance of Gondwana supergroup.

Seat No.	

Set **P**

B.Sc. (Semester - IV) (New) (CBCS) Examination: March/April - 2025
MICROBIOLOGY (Paper–VIII)
Introduction to Industrial Microbiology (22221421)

Day & Date: Saturday, 24-May-2025
 Time: 09:00 AM To 11:00 AM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Draw neat diagrams and give equations wherever necessary
 3) Figures to the right indicate full marks.

Q.1 Rewrite the following sentences by selecting correct answers from given alternatives. 08

- 1) Crowded plate technique is used for primary screening of _____ producers.

a) Enzyme	b) Organic acid
c) Growth factors	d) Antibiotic
- 2) _____ is a waste product of sugar industry.

a) Molasses	b) Starch
c) Whey	d) SWL
- 3) Vortex formation during fermentation process is prevented by _____.

a) Antifoam agents	b) Spargers
c) Impellers	d) Baffles
- 4) _____ is used for production of Penicillin.

a) <i>S.cerevisiae</i>	b) <i>P.chrysogenum</i>
c) <i>A.niger</i>	d) <i>B.subtilis</i>
- 5) Purification and recovery of product after fermentation is called _____.

a) Upstream	b) Middle stream
c) End	d) Down stream
- 6) _____ is used for preservation of industrially important organisms.

a) Incubation	b) Lyophilization
c) Inoculation	d) Streaking
- 7) Genetic engineering is used for strain _____.

a) Improvement	b) Incubation
c) Preservation	d) Eradication

- 8) _____ are used for controlling foam during fermentation'
- a) Acids
 - b) Alkalis
 - c) NaCl
 - d) Antifoam agents

Q.2 Answer any four of the following **08**

- a) Define Synthetic media.
- b) What is submerged culture fermentation?
- c) What is Chemostat?
- d) Define Cryopreservation
- e) Define dual or multiple fermentation.

Q.3 Write short notes on any two of the following. **08**

- a) Primary Screening of Antibiotic producers.
- b) Inoculum media.
- c) Scale up of fermentation.

Q.4 Answer Any Two of the following **08**

- a) Describe in detail Alcohol fermentation.
- b) Describe in brief Fermenter and uses of its parts.
- c) Write in brief methods for strain improvement.

Q.5 Answer any one of the following **08**

- a) Discuss in detail Penicillin production.
- b) Describe in detail fermentation media.

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B.Sc. (Semester - V) (New) (CBCS) : Examination March/April - 2025
English (Compulsory)
Literary Mindscapes–I (22221500)

Day & Date: Wednesday, 30-April-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 40

Q.1 Choose the correct alternatives from the given options.

08

- 1)** In which year did Dr. Kalam deliver his speech?
a) 2010 b) 2011
c) 2015 d) 2020
- 2)** Who is Phatik?
a) Clerk b) Coach
c) Manager d) Group leader
- 3)** Who wrote the poem ‘Money Madness’?
a) John Keats b) D. H. Lawrence
c) Sarojini Naidu d) William Shakespeare
- 4)** What does queen Gulnaar desire?
a) More jewellery b) A rival
c) More money d) More clothes
- 5)** What did the schoolmaster love above all?
a) Prayer b) Singing
c) Discipline d) Playing
- 6)** The poem ‘All the World is a Stage’ is taken from _____.
a) Julius Caesar b) Othello
c) Macbeth d) As You Like It
- 7)** Vanita ate a mango. (Choose the correct passive voice)
a) A mango is eaten by Vanita.
b) A mango was eaten by Vanita.
c) A mango was being eaten by Vanita.
d) A mango shall be eaten by Vanita.
- 8)** My brother usually _____ till late on Sundays. (Use appropriate phrasal verb).
a) Sleeps away b) Sleeps near
c) Sleeps on d) Sleeps in

Q.2 Answer the following questions. (Any Four) 12

- a) How was a Phatik found in the morning?
- b) Discuss in short three visions of Dr. Kalam for India.
- c) Explain the title 'The Queen's Rival'.
- d) Describe the character of the village school master.
- e) Write in short the theme of 'Money Madness' by D. H. Lawrence?
- f) Describe various stages described by William Shakespeare in the poem 'All the World Stage'.

Q.3 Answer the following questions. (Any One) 10

Write a detailed note on 21st century skills.

OR

What are the benefits of 21st century skills?

Q.4 Write in detail about the four Cs. 10

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Physics Paper-IX
Mathematical Physics & Statistical Physics (22221509)

Day & Date: Sunday, 18-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagram wherever necessary.
 3) Figure to right indicate full marks.
 4) Use of log table and calculator is allowed.

Q.1 A) Multiple choice questions.**10**

- 1) Integration of a vector along a curve is called _____.
 a) volume integral b) closed integral
 c) line integral d) surface integral
- 2) The microstates which are allowed under given restriction are called _____.
 a) allowed microstates b) accessible microstates
 c) permitted microstates d) disallowed microstates
- 3) The entropy has its maximum value for thermodynamic assembly in _____ state.
 a) an equilibrium b) an inequilibrium
 c) a normal d) non homogeneous
- 4) In _____ coordinate system the coordinate surfaces are mutually perpendicular.
 a) orthogonal curvilinear b) cylindrical
 c) spherical polar d) urvilinear
- 5) The most probable speed for the molecules in assembly on Maxwell Boltzmann distribution law is _____.
 a) $v_{mp} = \sqrt{\frac{2KT}{m}}$ b) $v_{mp} = \sqrt{\frac{3KT}{2m}}$
 c) $v_{mp} = \sqrt{\frac{KT}{2m}}$ d) $v_{mp} = \sqrt{\frac{3KT}{m}}$
- 6) Maxwell Boltzmann distribution law for the most probable distribution of molecules is based on the following conditions _____.
 a) Total volume of assembly is constant
 b) Total number of molecules and total energy of assembly is constant
 c) Temperature of system is constant.
 d) Total entropy is constant.

- 7)** The ratio of most probable speed and average speed of gas molecule is _____.
 a) $\frac{\sqrt{\pi}}{2}$ b) $\frac{\sqrt{\pi}}{4}$
 c) 1 d) π
- 8)** The Bose- Einstein distribution law is _____.
 a) $n_i = \frac{g_i}{e^{\alpha} e^{u_i/KT} + 1}$ b) $n_i = \frac{g_i}{e^{\alpha} e^{u_i/KT} - 1}$
 c) $n_i = \frac{g_i}{e^{\alpha} e^{u_i/KT}}$ d) $n_i = \frac{g_i}{e^{\alpha} e^{u_i}}$
- 9)** Rayleigh-Jean's law agrees well with the experimental results at _____ wavelengths.
 a) all b) longer
 c) shorter d) none of these
- 10)** Fermi-Dirac distribution law is widely applied in the _____.
 a) band theory of solids
 b) free electrons theory of metals
 c) Debye theory of specific heat
 d) classical theory

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. 06

- 1) Stoke's theorem gives the relation between line integral with _____.
- 2) The three coordinates of cylindrical coordinate system are _____.
- 3) If W is the probability of state of system, then which of the following is the statistical definition of entropy.
- 4) Which of the formula agrees well with the experimental results Lummer and Pringsheim for all the frequencies?
- 5) Fermi-Dirac statistics is based on _____.
- 6) The Fermi Dirac distribution law is _____.

Q.2 Solve the following (Any Eight) 16

- a) State Gauss divergence theorem with mathematical relation.
- b) Define
 - i) Macrostate
 - ii) Microstate of a system
- c) What do you mean by an ensemble?
- d) For given volume V find $\iint r \cdot ds$ where r is position vector.
- e) What is phase space?
- f) Write Laplacian operator ∇^2 in orthogonal curvilinear co-ordinates.
- g) Deduce Wien's displacement law from Planck's radiation formula.
- h) Write basic postulates of Fermi-Dirac statistics.
 - i) What are bosons? Which statistics is used to study them?
 - j) Define surface integral and volume integral.

Q.3	A)	Attempt the following (Any Two) 1) Describe microcanonical and canonical ensemble. 2) Obtain the relation for average speed of gas molecules. 3) Define thermodynamic probability. Obtain an expression for thermodynamic probability.	10
	B)	Short note/ Solve. Derive an expression for Maxwell-Boltzmann distribution law.	06
Q.4	A)	Attempt the following (Any Two) 1) Obtain the expression for curl of vector field in orthogonal curvilinear coordinates. 2) What are the thermodynamic functions? Express them in terms of Boltzmann partition function. 3) Compare M.B, B.E and F. D. statistics.	08
	B)	Describe/Explain/Solve. Deduce Green's theorem from Gauss Divergence theorem.	08
Q.5	Attempt the following (Any Two)		16
	a)	Derive Plank's radiation formula in terms of frequency and wavelength.	
	b)	State and prove Stoke's theorem in vector field.	
	c)	Derive an expression for Fermi-Dirac distribution law.	

Seat No.	

Set P

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Chemistry (Special Paper-IX)
Physical Chemistry (22221505)

Day & Date: Sunday, 18-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagram wherever necessary.
 3) Figure to right indicate full marks.
 4) Use of log table and calculator is allowed.

Q.1 A) Multiple choice questions. 10

- 1) Certain living organisms like proteins or Grignard reagents exhibit the phenomenon called _____.
 a) Fluorescence b) phosphorescence
 c) Chemiluminescence d) Delayed fluorescence
- 2) For a reaction that obeys Einstein law _____.
 a) $\phi = 1$ b) $\phi > 1$
 c) $\phi < 1$ d) $\phi = 0$
- 3) The temperature at which one crystalline form changes to another crystalline form is known as _____.
 a) eutectic point b) cryohydric point
 c) transition point d) melting point
- 4) The dotted lines in the phase diagram represent _____.
 a) most stable equilibria b) metastable equilibria
 c) true equilibria d) false equilibria
- 5) The emf of Daniell cell is 1 volt at 25°C. Hence ΔG for its cell reaction is _____.
 a) $2 \times 96500 \text{ J}$ b) $- 2 \times 96500 \text{ J}$
 c) $1 \times 96500 \text{ J}$ d) $- 1 \times 96500 \text{ J}$
- 6) Which of the following electrode can be used to measure pH?
 a) Calomel b) Glass
 c) Silver chloride d) Platinum
- 7) When the cell reaction is reached equilibrium, the E° value _____.
 a) Increases b) equals to zero
 c) decreases d) none of these

- 8) According to IUPAC convention, single vertical line in cell representation indicates _____.
 a) indirect contact
 b) direct contact
 c) separated with each other
 d) all of these

- When a beam of light of sufficient high frequency is allowed to strike a metal surface, electrons are ejected from the metal surface. This effect is known as _____.
 9)

- a) Compton effect b) Raman effect
 c) Photoelectric effect d) Einstein effect

- 10) Ψ^2 in Schroedinger's equation represents _____.
 a) wave function
 b) eigen values
 c) probability of finding the electron at a given point in a space
 d) Orbit

B) Fill in the blank/definitions/one sentence answer/one word answer/Give name/predict the product. 06

- 1) State Wein's displacement law.
- 2) What is quantum efficiency?
- 3) What are the characteristics of triple point in phase diagram?
- 4) The standard electrode potential for hydrogen gas electrode is _____ V.
- 5) Give the relationship between frequency and wavelength of an electromagnetic radiation.
- 6) State Beer's law.

Q.2 Solve any Eight of following. 16

- 1) What is electrochemical series?
- 2) Calculate the de Broglie wavelength of electron moving with the speed of 1×10^5 m/s.
- 3) What is chemiluminescence?
- 4) What do you mean by sparingly soluble salt? Give two examples of it.
- 5) Mention any two radiative and non-radiative transitions.
- 6) Calculate the energy in joules per mole of radiation having wavelength of 6500 Å.
- 7) Write Gibbs' phase rule and give the physical significance of terms involved in it.
- 8) Define perfect black body.
- 9) Give the lifetimes for fluorescence and phosphorescence emission.
- 10) Give any two examples of amalgam electrode.

- Q.3 A) Attempt any Two of the following. 10**
- 1) Derive an expression for the emf of concentration cell where electrodes are at different concentrations.
 - 2) Give the statement of photoelectric effect. Explain quantum mechanical approach of photoelectric effect.
 - 3) Write a note on photodimerization of anthracene.
- B) Short note/ Solve 06**
- Illustrate photochemical hydrogen-halogen reactions.
- Q.4 A) Attempt any Two of following. 08**
- 1) Write the expression for Schrodinger wave equation. Give the physical significance of wave function.
 - 2) At 20°C, the following has emf of 0.447 volt. Calculate the solubility of AgCl.
 $-\text{Ag} \mid \text{AgCl (saturated)} \parallel \text{AgNO}_3 \mid \text{Ag}^+$
 At. Wt. : Ag=108, Cl = 35.5
 Assume complete ionization of AgNO₃ solution.
 - 3) Explain the phase diagram of sulphur system.
- B) Describe/Explain/Solve. 08**
- What are standard electrode potentials? Solve the following problem.
 Standard reduction potential E_0 for the electrode reaction at 298 K are given below.
- | Electrode | E_0 volt |
|-----------------------------|------------|
| $\text{Zn}^{2+}, \text{Zn}$ | -0.76 |
| $\text{Cu}^{2+}, \text{Cu}$ | +0.34 |
| Ag^+, Ag | +0.80 |
- Calculate the standard cell potentials for the following voltaic cells:
- i) $\text{Zn}, \text{Zn}^{2+}(1\text{M}) \parallel \text{Cu}^{2+}(1\text{M}), \text{Cu}$
 - ii) $\text{Cu}^{2+}(1\text{M}), \text{Cu} \parallel \text{Ag}^+(1\text{M}), \text{Ag}$
- Q.5 Attempt any Two of the following. 16**
- a) Explain how the emf measurements may be employed to determine.
 - i) ΔG ,
 - ii) ΔH ,
 - iii) ΔS
 - b) With the help of neat labelled phase diagram, discuss water system.
 - c) With the help of black body radiation distribution curves, explain Planck's distribution law.

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Botany (Special Paper - IX)
Plant Systematics (22221501)

Day & Date: Sunday, 18-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions: 1) All questions are compulsory.
 2) Draw neat labelled diagram wherever necessary.
 3) Figure to right indicate full marks.

Q.1 A) Multiple choice questions.**10**

- 1) _____ types of roots found in dicot plants.

a) Tap roots	b) Adventitious roots
c) Colloroid roots	d) Epiphytic roots
- 2) _____ among the following is one of the members of family Rubiaceae.

a) <i>Ficus bigemina</i>	b) <i>Ixora coccinea</i>
c) <i>Cocus nucifera</i>	d) <i>Dalbergia sisso</i>
- 3) () in floral formula represents _____.

a) Free nature of calyx
b) fused nature of calyx
c) Free nature of calyx & corolla
d) Fused nature of calyx & corolla
- 4) Presence of three anthers is characteristic of _____ family.

a) Annonaceae	b) Malvaceae
c) Orchidaceae	d) Rubiaceae
- 5) If placenta attached to the centre of ovary wall the type of placentation is called as _____ placentation.

a) Axile	b) Free central
c) Basal	d) Parietal
- 6) A racemose type of inflorescence with sessile flowers is called as _____.

a) Racemose	b) Cymose
c) Spike	d) Umbell
- 7) In hypogynous flowers the position of ovary is _____.

a) Superior	b) Inferior
c) Half superior	d) Half inferior

- 8)** Wheat is _____ type of fruit.
- a) Aggregate b) Berry
c) Caryopsis d) Fleshy
- 9)** If flower cut in to any plane & it gives two equal parts that flower is called as _____.
a) Zygomorphic b) Actinomorphic
c) Isomorphic d) Heteromorphic
- 10)** Poaceae family shows presence of _____ inflorescence.
a) Spadix b) Spiklet
c) Spike d) Racemose

B) Definition.

06

- 1) Define essential whorls of flower.
- 2) Define pollination.
- 3) Define flower.
- 4) Define stipule.
- 5) Define multiple fruits.
- 6) Define APG system of classification.

Q.2 Solve any Eight of following.

16

- 1) Define plant systematics.
- 2) Define phyllotaxy.
- 3) Draw a well labeled diagram of typical flower.
- 4) What is specialized inflorescence?
- 5) Write any 4 vegetative characters of family Rutaceae.
- 6) Enlist the types of placentations.
- 7) Define aggregate fruits.
- 8) Enlist the types of aestivations.
- 9) Define fertilization.
- 10) write any 4 general characters of family Lamiaceae.

Q.3 A) Attempt any Two of the following.

10

- 1) Write a note on leaf structure & phyllotaxy.
- 2) Write a note on evolutionary trends in vascular bundles.
- 3) Give merits & demerits of Engler & Prantl system of classification.

B) Write short note on vegetative characters of angiosperms.

06

Q.4 A) Attempt any Two of following.

08

- 1) Give general characters of family Malvaceae.
- 2) Write a note on types of fruits.
- 3) Write a note on evolutionary trends in flower.

B) Describe in brief types of roots & modification of roots.

08

Q.5 Attempt any Two of the following.

16

- a)** Give general characteristic features of family Bignonaceae.
- b)** Describe APG III system of classification & add a note on its merits & demerits.
- c)** With well labeled diagram describe types of inflorescence.

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Zoology (Special Paper-IX)
Molecular Biology (22221513)

Day & Date: Sunday, 18-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagram wherever necessary.
 3) Figure to right indicate full marks.

Q.1 A) Choose the correct alternative.**10**

- 1) Units of nucleic acid _____.
 a) Nucleosides b) Nucleotides
 c) Sugar d) Phosphoric acid
- 2) The purines and pyrimidines pairs of complementary strands of DNA are held together by _____.
 a) Hydrogen bond b) Phosphorus bond,
 c) Nitrogen bond d) Nickel bond
- 3) The nature of DNA replication _____.
 a) Conservative b) Semiconservative
 c) Non-conservative d) All conservative
- 4) Which of the following enzyme is used in replication?
 a) DNA polymerase b) RNA polymerase,
 c) Gyrase. d) Mutase.,
- 5) Okazaki fragments are synthesized on _____ strand of DNA.
 a) Lagging and leading. b) only lagging.
 c) Only leading. d) All of these.
- 6) The process by which DNA molecule passes genetic information to mRNA is called _____.
 a) Replication. b) Transcription.
 c) Translation. d) Duplication.
- 7) In three dimensional view of molecule of t-RNA is _____.
 a) I shaped. b) J- shaped.
 c) K- shaped. d) L- shaped.
- 8) A codon of m-RNA contains _____.
 a) 5 bases. b) 4 bases.
 c) 3 bases. d) 2 bases.

- 9) The first codon discovered by Nirenberg and Matthaei was _____.
a) AUG. b) GGG.
c) UUU. d) GAG

- 10)** In eukaryotes as well prokaryotes those DNA sequence that appear in mature RNA is known as _____.
 b) Exon and Intron. b) Only intron.
 c) only cistron. d) only exon.

B) Give one sentence answer.

06

- 1) Central Dogma.
- 2) Replication.
- 3) Transcription.
- 4) Translation.
- 5) Reverse transcription.
- 6) Purine nucleotide

Q.2 Solve any eight of following.

16

- 1) DNA.
- 2) m-RNA.
- 3) r-RNA.
- 4) t-RNA.
- 5) Transcriptional factor.
- 6) Nucleoside
- 7) Splicing.
- 8) DNA damage.
- 9) intron.
- 10) RNA polymerase.

Q.3 A) Attempt any two of the following.

10

- 1) Explain role of RNA polymerase in transcription.
- 2) Describe the mechanism of r- DNA technology and its applications in medicine and agriculture.
- 3) Write silent feature of DNA.

B) Describe structure of RNA.

06

Q.4 A) Attempt any two of following.

08

- 1) Explain DNA replication- in prokaryotes.
- 2) Describe role of RNA polymerase.
- 3) Explain mechanism of transcription in eukaryotes.

B) Describe any two DNA repair mechanism.

08

Q.5 Attempt any two of the following.

16

- Describe Lac- operon.
- Describe miRNA and siRNA.
- Difference between prokaryotic and eukaryotic translation.

Seat No.	

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B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Mathematics (Special Paper-IX)
Algebra - II (22221517)

Day & Date: Sunday, 18-May-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
3) Figure to right indicate full marks.

Q.1 A) Multiple choice questions. 10

- 1) Let $T: R^3 \rightarrow R^3$ defined by $T(x, y, z) = (x, x+z, x+y+2z, 2x+y+3z)$ then nullity of T is _____.
a) 0 b) 1
c) 2 d) 3
- 2) The number of ideals of Z_{40} are _____.
a) 4 b) 5
c) 7 d) 8
- 3) Trace of square matrix is the _____.
a) sum of diagonal entries
b) difference of diagonal entries
c) product of diagonal entries
d) determinant of diagonal entries
- 4) Let V be the vector space and $s_1 \leq s_2 \leq v$, consider the following statements.
I) s_1 is linearly dependent
II) s_2 is linearly dependent
a) (I) $\Rightarrow$ (II) b) (II) $\rightarrow$ (I)
c) (I) $\Leftrightarrow$ (II) d) (I) $\nRightarrow$ (II)
- 5) The characteristics of ring $n\mathbb{Z}$ is _____.
a) 0 b) 1
c) n d) ∞
- 6) In an inner product space, the norm is defined by $\|u\| =$ _____.
a) $\langle u, u \rangle$ b) $\sqrt{\langle v, v \rangle}$
c) $\langle u, v \rangle^2$ d) $\frac{\langle u, u \rangle}{\|u\|}$

- 7) Let $T: V \rightarrow W$ be the linear transformation then null space $N(T)$ of T is _____.
 a) $\{x \in v/T(x) = 0\}$ b) $\{x \in v/T(x) = x\}$
 c) $\{x \in w/T(x) = 0\}$ d) The whole space W
- 8) Number of zero divisors of Z_8 are _____.
 a) 3 b) 4
 c) 5 d) 8
- 9) Over the field of real numbers $\mathbb{Q}$ has dimension _____.
 a) 1 b) 2
 c) 3 d) ∞
- 10) Let $T: R^2 \rightarrow R^3$ be the linear transformation defined by $T(a_1, a_2) = (a_1 + 3a_2, 0, 2a_1 - 4a_2)$ then $[T]_{\beta}^{\delta} =$ _____.
 a) $\begin{bmatrix} 1 & 3 \\ 0 & 0 \\ -2 & -4 \end{bmatrix}$ b) $\begin{bmatrix} 1 & 3 \\ 2 & -4 \\ 0 & 0 \end{bmatrix}$
 c) $\begin{bmatrix} 3 & 1 \\ -4 & 0 \\ 0 & 2 \end{bmatrix}$ d) $\begin{bmatrix} 3 & 1 \\ 0 & 0 \\ -4 & 2 \end{bmatrix}$

B) Fill in the blank/Definition/One sentence answer.**06**

- 1) Show that the vectors $v_1 = (1,0,0)$ $v_2 = (0,1,0)$ $u_3 = (0,0,1)$ are linearly independent.
- 2) Define maximal ideal in a ring.
- 3) Prove that $\|cx\| = |c|\|x\| \forall x \in v \text{ \& } C \in F$.
- 4) Let $T: R^3 \rightarrow R^2$ defined by $T(x, y, z) = (x - y, 2z)$ then $N(T) =$ _____.
- 5) Define basis of a vector space.
- 6) Find norm of the vector $v = (2,3,7) \in R^3$.

Q.2 Solve the following (Any Eight)**16**

- a) Let V be an inner product space and $x, y, z \in V$ then show that $\langle x, y + z \rangle = \langle x, y \rangle + \langle x, z \rangle$.
- b) Let $Q: R \rightarrow S$ be a ring homeomorphism then prove that Kero is an ideal of R .
- c) Let $T: R^2 \rightarrow R^2$ be a linear transformation such that $T(1,1) = (1,3)$ $T(-1,1) = (3,1)$ find $T(a, b)$.
- d) If F is field then prove that F has no ideals other than $\{0\}$ & F
- e) Define division ring & integral domain.
- f) Prove that $\|x + y\|^2 + \|x - y\|^2 = 2(\|x\|^2 + \|y\|^2)$
- g) Show that intersection of two subspaces is subspace.
- h) Let $T: R^2 \rightarrow R^2$ defined by $T(a_1, a_2) = (2a_1 + a_2, a_1)$ find $N(T)$.

- i) If β and γ are standard ordered basis for $P_3(R)$ & $P_2(R)$ & $T: P_3(R) \rightarrow P_2(R)$ is linear defined by $T[f(x)] = f^1(x)$ find $[T]_{\beta}^{\gamma}$.
- j) Define zero divisor and find zero divisors of Z_{12} .

Q.3 A) Attempt the following (Any Two) 10

- 1) State and prove fundamental homeomorphism theorem for rings.
- 2) Let R be commutative ring with unity then prove that an ideal P of R is prime iff R/P is an integral domain.
- 3) Prove that $V = W_1 \oplus W_2 \Leftrightarrow V = W_1 + W_2, W_1 \cap W_2 = \{0\}$.

B) Prove that every finite integral domain is field. 06

Q.4 A) Attempt the following (Any Two) 08

- 1) Show that the vectors $\{(1,2,3,4), (0,1, -1,2), (1,5,1,8), (3,7,8,14)\}$ in R^4 are L.D.
- 2) Find range, rank, kernel and nullity of the linear transformation $T: R^2 \rightarrow R^3$ defined by $T(x_1, x_2) = (x_1 + x_2, x_1 - x_2, x_2)$
- 3) Prove that characteristic of an integral domain is either 0 or prime number.

B) State and prove dimension theorem. 08

Q.5 Attempt the following (Any Two) 16

- a) Let R be commutative ring with unity prove that an ideal M of R is maximal ideal of R if and only if R/M is field.
- b) State and prove replacement theorem.
- c) If β and γ are standard ordered bases of R^2 & R^3 respectively.

Let $T: R^2 \rightarrow R^3$ & $U: R^2 \rightarrow R^3$ defined by

$$T(a_1, a_2) = (a_1 + 3a_2, 0, 2a_1 - 4a_2)$$

and $U(a_1, a_2) = (a_1 - a_2, 2a_1, 3a_1 + 2a_2)$ compute

$$[T]_{\beta}^{\gamma} \quad [U]_{\beta}^{\gamma} \quad [T + U]_{\beta}^{\gamma}$$

Seat No.	

Set P

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Statistics (Special Paper - IX) (22221520)
Statistical Inference - I

Day & Date: Sunday, 18-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Use of log table and calculators is allowed.

Q.1 Multiple Choice Questions.

10

- 1) Neyman's factorization criterion is applied for testing _____
 a) Sufficiency of an-estimator
 b) Consistency of an estimator
 c) Unbiasedness of an estimator
 d) Efficiency of an estimator
- 2) By method of moments one can estimate:
 a) All constant of a populations
 b) Only mean and variance of a distribution
 c) All moments of a population distribution
 d) none of the above
- 3) An estimator is considered to be best if its distribution is _____
 a) Continuous
 b) Discrete
 c) Concentrated about the true parameter value
 d) Normal
- 4) Consistency of an estimator is a _____
 a) Large sample property
 b) Small sample property
 c) Property not related to sample size
 d) property applicable to any sample size
- 5) An estimator which converges to a parameter θ in probability as the sample size tends to Infinity is said to be _____
 a) sufficient estimator b) efficient estimator
 c) consistent estimator d) unbiased estimator
- 6) If T_1 and T_2 be two unbiased estimators of θ . The estimator T_2 is said to be more efficient than estimator T_1 if _____
 a) $\text{var}(T_1) = \text{var}(T_2)$ b) $\text{var}(T_1) < \text{var}(T_2)$
 c) $\text{var}(T_1) > \text{var}(T_2)$ d) None of the above

- 7) Efficiency of an estimator is related to _____
 - a) Mean
 - b) Median
 - c) Mode
 - d) Variance
- 8) Which one of the following is unique estimator?
 - a) Unbiased
 - b) Biased
 - c) U.M.V.U.E.
 - d) Sufficient
- 9) The types of estimates are _____
 - a) Point estimate
 - b) Interval estimate
 - c) Estimation of confidence region
 - d) all the above
- 10) The M.L.E. of Exponential distribution based a random sample of size n given by _____
 - a) sample mean
 - b) sample median
 - c) X_n
 - d) X_1

B Fill in the blank

06

- 1) Bias of an estimator can be _____
- 2) The denominator in the Crammer-Rao inequality is known as _____
- 3) Likelihood function is a function of _____
- 4) Population characteristics is called _____
- 5) Let 5, 8, 3, 6, 8 are observations from Poisson (λ) then unbiased estimate of λ is _____
- 6) If statistic T is unbiased estimator of parameter θ then unbiased estimator of $2\theta - 1$ is _____

Q.2 Solve any Eight of the following.

16

- 1) Define consistent estimator.
- 2) Define a sample and a population.
- 3) State any two properties of Maximum Likelihood Estimator (MLE).
- 4) Define information function $I(\theta)$ of parameter θ .
- 5) Define likelihood function of a random variable $X_1, X_2, \dots, X_n$ from exponential distribution with parameter θ .
- 6) Define a parameter and Parameter space.
- 7) Distinguish between an estimator and estimate.
- 8) State Neyman - factorization theorem.
- 9) Prove that sample SD is always biased estimator of population SD.
- 10) What are the requirements of good estimator?

Q.3 A) Attempt any Two of the following.

- 1) Let $X_1, X_2, \dots, X_n$ be iid r.v. with Poisson distribution with parameter λ then find sufficient statistic for λ .
- 2) Obtain Fisher Information function $I(\theta)$ based on a random sample $X_1, X_2, \dots, X_n$ from exponential distribution with parameter θ .
- 3) State and prove sufficient condition for consistency for θ .

- B)** Let $X_1, X_2, \dots, X_n$ be a r.s. from $N(\mu, \sigma^2)$ distribution. Find the estimators of μ and σ^2 by the Method of moments. **06**

Q.4 A) Attempt any Two of the following. **08**

- 1) Obtain the MLE of the parameter θ based on a r.s. of size n from Bernoulli Distribution.
- 2) State and prove sufficient condition for consistency for θ
- 3) Find moment estimator of θ if $f(x) = \begin{cases} (1 + \theta)X^\theta & ; 0 < X < 1 \\ 0 & ; \text{otherwise} \end{cases}$

- B)** Let X_1, X_2 and X_3 is a r.s. from $P(\theta)$ distribution **08**

$$\text{Let } T_1 = \frac{X_1 + X_2 + X_3}{3}, \quad T_2 = \frac{X_1 + X_2 + X_3}{4}$$

Show that T_1 and T_2 are unbiased estimator of θ and also find the efficiency of T_2 in relative to T_1

Q.5 Attempt any Two of the following. **16**

- 1) State and prove Crammer - Rao Inequality.
- 2) Define Uniformly Minimum Variance Unbiased Estimator (UMVUE) and show that it is unique when it exists.
- 3) Find MLE and Moment estimator of θ based on a sample of size n from

$$f(x, \theta) = \begin{cases} 1 & \theta - \frac{1}{2} < x < \theta + \frac{1}{2} \\ 0 & \text{otherwise} \end{cases}$$

Seat No.	

Set P

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Geology (Special Paper-IX)
Economic Geology (22221525)

Day & Date: Sunday, 18-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagram wherever necessary.
 3) Figure to right indicate full marks.
 4) Use of log table and calculators is allowed.

Q.1 A) Multiple choice questions. 10

- 1) _____ concentration is a process of natural gravity separation of heavy minerals from light minerals.
 - a) Residual
 - b) Mechanical
 - c) Metasomatic
 - d) Hydrothermal
- 2) The correct sequence of encountering oil in a drill well is _____.
 - a) Gas - Oil - Water
 - b) Water - Gas - Oil
 - c) Gas - Water-Oil
 - d) Oil - Water - Gas
- 3) The digboi oil field is associated with the tipam sandstones, which are of _____.
 - a) Eocene age
 - b) Miocene age
 - c) Oligocene age
 - d) Pliocene age
- 4) In khetri and singhbhum, copper mainly occurs as _____.
 - a) Cuprite
 - b) Chalcocite
 - c) Chalcocite
 - d) Covellite
- 5) Epigenetic ore deposits are formed _____.
 - a) Before the host rock formation
 - b) Same time as the host rock
 - c) Later than the host rock formation
 - d) No relation with host rock
- 6) A mineral from which a metal can be extracted is _____.
 - a) Ore
 - b) Gangue
 - c) Rock
 - d) Mineral
- 7) Mineral deposits formed directly from the magma is _____.
 - a) Magmatic Concentration
 - b) Sublimation
 - c) Replacement
 - d) Hydrothermal

- 8)** The mineral deposit formed by dissemination is _____.
a) Chromite b) Magnetite
c) Diamond d) Zinc
- 9)** Hot solution derived from an intrusive magma is responsible for _____.
a) Magma Concentration b) Sublimation
c) Replacement d) Hydrothermal
- 10)** Interlocking network of small veinlets is called as _____.
a) Fissure vein b) Stock works
c) Saddle reef d) Ladder vein

B) Fill in the blanks:

06

- 1) Deposit in the anticlinal crest is called _____.
- 2) The placer formed by rivers is known as _____ deposits.
- 3) Lower unaffected part of sulphide ore is _____.
- 4) Chalcopyrite is a ore of _____.
- 5) Gash vein are generally found in which minerals?
- 6) Give any two examples of metalliferous mineral deposits?

Q.2 Solve any Eight of following.

16

- 1) What is skarn?
- 2) Give two names of iron ores with chemical composition.
- 3) Define economic geology.
- 4) What is mesothermal deposit?
- 5) Name the type of magmatic deposits.
- 6) Define syngenetic deposits.
- 7) What is gangue minerals?
- 8) Name of ore minerals of lead and zinc metal.
- 9) Define tenor of ore.
- 10) Give example of magmatic segregation ore deposit.

Q.3 A) Attempt any Two of the following.

10

- 1) Write a note on pegmatitic deposits.
- 2) Explain in detail early magmatic deposit.
- 3) Describe crustification.

B) Write short note on saddle reef and ladder vein.

06

Q.4 A) Attempt any Two of the following.

08

- 1) Describe eluvial placers deposits with example?
- 2) Explain fissure vein deposit.
- 3) Explain process of supergene enrichment.

B) Describe the origin, occurrence and distribution of copper ore.

08

Q.5 Attempt any Two of the following.

16

- a)** What are magmatic mineral deposits'? Describe the late magmatic deposits.
- b)** Discuss in detail hydrothermal replacement deposits.
- c)** Describe manganese deposits with physical properties, occurrence and distribution in India.

Page 1 of 3

- 8)** The nucleus of cancerous cells becomes _____.
a) Unchanged b) Degenerated
c) Abnormally large d) Hypertrophie
- 9)** In the growth curve of plaque-forming units, the time from infection until lysis is known as _____.
a) eclipse period b) rise period
c) burst period d) latent period
- 10)** Viral genome inserted to the bacterial DNA is termed as _____.
a) Prophage b) Lytic cycle
c) Virulent phage d) None of the above

B) Definitions / one-word answer.

06

- 1) Define viroids.
- 2) What is the complex symmetry of a capsid?
- 3) Give an example of the enveloped virus.
- 4) Define temperate phage.
- 5) What is leukemias?
- 6) What is somatic mutation?

Q.2 Solve the following (Any Eight)

16

- a) Draw the structure of HIV.
- b) Give examples of oncogenic DNA viruses.
- c) What is the defective immunity hypothesis?
- d) Give the types of cancer depending on the pattern of growth.
- e) Enlist the methods of enumeration of viruses.
- f) Explain laboratory diagnosis of the Ebola virus.
- g) Give the structure of the Tobacco Mosaic Virus.
- h) Write an account of the purification of the virus.
- i) Write down the general properties of the virus.
- j) Explain the concept of replication of prions.

Q.3 A) Attempt the following (Any Two)

10

- 1) Write an account of isolation of bacteriophage?
- 2) Explain lysogeny of lambda phages.
- 3) Describe in detail swine flu.

B) Write a short note on viral gene hypothesis of cancer.

06

Q.4 A) Attempt the following (Any Two)

08

- 1) Explain the cultivation of animal virus.
- 2) Write a note on one step growth curve.
- 3) Explain the prevention and control of plant viral diseases.

B) Explain the LHT scheme of virus classification.

08

Q.5 Attempt the following (Any Two)

16

- a) Explain the production and application of virus as biopesticides.
- b) Give the details of the characteristics of cancerous cell.
- c) Describe the lytic cycle of T4 bacteriophage.

Seat No.	

Set	P

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Electronics (Special Paper-IX)
Linear Integrated Circuits and Applications(22221537)

Day & Date: Sunday, 18-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) **All** questions are **compulsory**.
 2) Draw neat labelled diagram **whenever** necessary.
 3) Figures to the **right** indicate full marks.
 4) Use of **log table** and **calculator** is allowed.

Q.1 A) Chose correct alternative and rewrite the sentence. 10

- 1) In Monolithic ICs the whole circuit is fabricated on top of _____.
 a) single wafer of ceramic b) multiple wafer of silicon
 c) single wafer of silicon d) multiple wafer of glass
- 2) The component _____ in the IC is made by using transistor structure.
 a) capacitor b) FET
 c) resistor d) diode
- 3) In precision rectifier Op-Amp is used to _____.
 a) reduce cut-in voltage b) increase breakdown voltage
 c) increase cut-in voltage d) reduce breakdown voltage
- 4) In an active clipper circuit the clipping level is decided by the _____.
 a) input voltage b) reference voltage
 c) output voltage d) supply voltage
- 5) In the 2nd order Butterworth filter Op-Amp is configured in _____ mode.
 a) non-inverting b) inverting
 c) voltage follower d) open loop
- 6) The all pass filter is used when _____.
 a) high roll of rates are important
 b) phase shift is important
 c) a rippled stop band is important
 d) a rippled pass band is important
- 7) IC LM 317 is a _____ voltage regulator IC.
 a) fixed positive b) adjustable negative
 c) adjustable positive d) fixed negative
- 8) _____ has a short circuit, and current-limiting protection.
 a) IC LF 398 b) IC μ A 741
 c) IC NE 555 d) IC LM 317

- 9)** In normal condition PLL is operates in a _____ mode.
- a) a lock range b) free running
c) Capture d) Filter
- 10)** In case of PLL the capture range is always _____ the lock range.
- b) greater than b) equal with
c) less than d) equal with VCO frequency

B) Define the following terms.

06

- 1) Active clamper.
- 2) Roll of rate.
- 3) Integrated circuit.
- 4) Antilog amplifier.
- 5) Voltage Controlled Oscillator.
- 6) Monolithic IC.

Q.2 Solve any Eight of following.

16

- 1) State the disadvantages of Integrated circuit.
- 2) Define free running frequency of PLL.
- 3) Define cut off and center frequency of the filter.
- 4) Write the important features of the three terminal IC regulators.
- 5) Define lock range and capture range of PLL.
- 6) Calculate the value of IC resistance having sheet resistance of $4 \Omega/\text{sq.}$ and has aspect ratio $L:W=20:4$.
- 7) Draw the circuit diagram of active clamper circuit.
- 8) Draw the circuit diagram of voltage regulator using IC 79XX.
- 9) Calculate high cut off frequency of second order low pass filter if $R_1 = R_2 = 1 \text{ K}\Omega$ and $C_1 = C_2 = 0.001 \mu\text{F}$.
- 10) Draw the diagram of active sample and hold circuit.

Q.3 A) Attempt any Two of the following.

10

- 1) Explain fabrication process of monolithic capacitor.
- 2) Explain working of precision full wave rectifier.
- 3) Explain basic operation of voltage-controlled oscillator.

B) What is voltage regulator? Draw the functional block diagram of IC voltage regulator and explain function of each block.

06

Q.4 A) Attempt any Two of following.

08

- 1) Explain working of adjustable positive regulator.
- 2) Explain working of active peak detector.
- 3) Explain working of PLL as a frequency multiplier.

B) With block diagram explain working of phase lock loop.

08

Q.5 Attempt any Two of the following.

16

- a)** Explain with neat diagram fabrication of npn transistor in IC.
- b)** Give the classification of filter and explain wide band pass filter.
- c)** Explain working V to F converter by using IC LM 331.

Seat No.	

Set	P

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Computer Science (Special Paper-IX)
Data Communication and Networking (22221533)

Day & Date: Sunday, 18-May-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figure to right indicate full marks.

Q.1 A) Multiple choice questions.

10

- 1) Which type of topology is best suited for large businesses which must carefully control and coordinate the operation of distributed branch outlets?
 - a) Ring
 - b) Local area
 - c) Hierarchical
 - d) Star
- 2) "Parity bits" are used for which of the following purposes?
 - a) Encryption of data
 - b) To transmit faster
 - c) To detect errors
 - d) To identify the user
- 3) The term FTP stands for?
 - a) File transfer program
 - b) File transmission protocol
 - c) File transfer protocol
 - d) File transfer protection
- 4) Which of the following is correct IPv4 address?
 - a) 01.200.128.123
 - b) 300.142.210.64
 - c) 10110011.32.16.8
 - d) 128.64.0.0
- 5) Which layer of the TCP / IP stack corresponds to the OSI model transport layer?
 - a) Host to host
 - b) Application
 - c) Internet
 - d) Network Access
- 6) Which of the following switch methods creates a point-to-point physical connection between two or more computers?
 - a) Message switching
 - b) Packet switching
 - c) Circuit switching
 - d) None of the these
- 7) Addresses are reserved for multicasting _____.
 - a) Class B
 - b) Class C
 - c) Class D
 - d) Class E

- 8) The _____ layer of OSI model can use the trailer of the frame for error detection.
- | | |
|--------------|-----------------|
| a) Physical | b) Data link |
| c) Transport | d) Presentation |
- 9) Which of the transport layer protocols is connectionless?
- | | |
|--------|--------|
| a) UDP | b) TCP |
| c) FTP | d) Nvt |
- 10) Which of the communication modes support two way traffic but in only once direction of a time?
- | | |
|-----------------------------|----------------|
| b) Simplex | b) Half-duplex |
| c) Three - quarter's duplex | d) Full duplex |

B) Give the answer of below questions.**06**

- 1) WAN stands for _____.
- 2) In _____ network topology, a single backbone cable is shared by all the devices.
- 3) TCP/IP stands for _____.
- 4) _____ is a high level communication protocol of Internet that manages the data.
- 5) _____ protocol tells each system how to form mail messages and transfer them between computers.
- 6) A physical address assigned by NIC manufacturer is called _____ address.

Q.2 Solve any Eight of following.**16**

- 1) What is the Role of routing in computer network?
- 2) Long form of CSMA/CD, CSMA/CA.
- 3) What is data Flow?
- 4) What is the use of Repeaters?
- 5) Mention the different physical media?
- 6) Define modulation and what are different types of modulation?
- 7) Define error and its types.
- 8) Long form of SMTP and SNMP.
- 9) Define Protocols & Standards.
- 10) What is mean of Congestion in computer network?

Q.3 A) Attempt any Two of the following.**10**

- 1) Explain Fiber Optic Cable.
- 2) Explain serial Transmission in detail.
- 3) Explain Congestion Control in Datagram Subnets.

B) Explain Cyclic Redundancy Check.**06**

- Q.4 A) Attempt any Two of following. 08**
- 1) Explain ALOHA in detail.
 - 2) Explain Packet Switching.
 - 3) Differentiate between HUB and stitch.
- B) Explain TCP/IP protocol suite. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Explain ISO -OSI reference model in detail.
 - b) Explain Data Compression in detail.
 - c) Explain Distance Vector Routing with example.

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Physics (Special Paper-X)
Solid State Physics (22221510)

Day & Date: Sunday, 25-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) Which of the following solid is amorphous in nature?
 a) germanium b) Glass
 c) Diamond d) Sodium Chloride

- 2) The packing fraction of face centred cubic crystal (fcc) formed by atoms having radius equal to $5 \text{ \AA}$ is _____.
 a) 0.74 b) 0.32
 c) 0.64 d) 0.34

- 3) The wavelength of X-rays is about _____ nanometer.
 a) 1000 b) 10000
 c) 0.1 d) 1540

- If θ is angle of diffraction in X-ray diffraction from a crystal then
 4) the diffracted X-ray beams make an angle of _____ with the direction of incident X-rays.
 a) $\theta/2$ b) θ
 c) 2θ d) 3θ

- 5) Number of free electrons in a filled band is _____.
 a) Zero b) Large
 c) very large d) One

- 6) Which of the following is incorrect statement in case of valence band?
 a) It represents less electron energy than conduction band.
 b) It is the highest occupied band.
 c) It is always partially filled.
 d) Can never be empty

- 7) Magnetization of the substance per unit magnetizing field strength is called _____.
 a) intensity of magnetization b) magnetic induction
 c) relative permeability d) magnetic susceptibility

B) Discuss Bravais lattices in two dimensions. **06**

Q.4 A) Attempt any Two of the following. 08

- i) Explain Miller indices.
- ii) Discuss Energy loss in the hysteresis.
- iii) What are applications of superconductor

B) Write a note on production of X-rays. **08**

Q.5 Attempt any Two of the following. 16

- a)** Obtain expression for thermal and electrical conductivity of metal. Determine the probability that an energy level $3kT$ above the Fermi energy E_F is occupied by an electron.
[Given: The value of exponent base ' e ' is 2.718 and temperature, $T = 300K$]
- b)** State and explain Hall effect. Obtain expression for Hall coefficient.
- c)** Explain Type – I and Type II superconductors.

Seat No.	

Set	P

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Chemistry (Special Paper - X)
Inorganic Chemistry (22221506)

Day & Date: Sunday, 25-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative.

10

- 1) 4p orbital is _____ orbital.

a) a_{1g}	b) t_{1u}
c) t_{2g}	d) e_g
- 2) In any chemical reaction, the rate of the reaction can be increased by _____.
 - a) adding product molecules to the reaction mixture
 - b) changing the size of the container
 - c) increasing the concentrations of the reactants
 - d) decreasing the temperature
- 3) Uranium-238 is a _____.

a) fertile nuclear fuel	b) transuranic element
c) man-made element	d) non-radioactive element
- 4) Sodium pump transports _____ ion into the cell.

a) Mg^{2+}	b) K^+
c) Ca^{2+}	d) Na^+
- 5) The catalyst when retards the speed of the reaction it carries the name catalyst _____.

a) lower activation energy	b) faster
c) poison	d) adsorption
- 6) In plants, carboxylase involved _____ metal.

a) K	b) Zn
c) Ca	d) Fe
- 7) Ferritin is _____.

a) transport iron	b) store iron
c) protein chain	d) transport O_2

- 8) In octahedral complexes each t_{2g} electrons is destabilized by _____.
a) -6 Dq b) -4 Dq
c) +6 Dq d) +4 Dq
- 9) [Co (NH₃)₆]²⁺ is _____ spin complex.
a) high b) moderate
c) low d) intermediate
- 10) In structure determination of PCl₅, the isotope used is _____.
a) ³⁶N b) ³⁶P
c) ³⁶C d) ³⁶Cl

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. **06**

- 1) Contact catalysis was explained by _____ theory.
- 2) The excess of nitrogen fertilizers led to _____ problems.
- 3) Name the moderator used in the nuclear reactor.
- 4) What is indirect fertilizers?
- 5) What is the metalloporphyrines?
- 6) What is mean by homogeneous catalysis?

Q.2 Solve any Eight of the following. **16**

- Define the crystal field splitting.
- What is C-14 dating?
- Draw the structure of oxymyoglobin.
- Define auto-catalyst and give one example of auto-catalyst.
- Calculate the magnetic momentum of $K_4[Fe(CN)_6]$ complex.
- What is cooperativity effect?
- What are essential elements and trace elements?
- What are ideal fertilizers?
- Why atomic bomb is called as fission bomb?
- Define projectile and Ejectile particles.

Q.3 A) Attempt any Two of the following. 10

- i) Explain the molecular orbital energy level diagram for hypothetical octahedral complex.
- ii) Write a note boiling water reactor.
- iii) Write a note on intermediate compound theory.

B) Short note/Solve	06

Explain the structure and working of myoglobin.

Q.4 A) Attempt any Two of the following. 08

- i) Difference between Hemoglobin and Myoglobin.
- ii) Explain the crystal field splitting of $[\text{Ni}(\text{Cl})_6]^{4-}$
- iii) Write a note on nuclear fusion reactions.

B) Describe/Explain/Solve**08**

What are mixed fertilizers? Give the advantages and disadvantages of mixed fertilizers.

Q.5 Attempt any Two of the following.**16**

- a) What is ion pump? Discuss ion exchange action of pump.
- b) With the help of MO diagram, explain the formation of $[\text{Co}(\text{NH}_3)_6]^{3+}$ complex. Comment on colour and magnetic properties.
- c) Explain in detail types of nuclear reactions.

Seat No.	

Set	P

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Botany (Special Paper-X)
Genetics (22221502)

Day & Date: Sunday, 25-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Select the correct alternative. 10

- 1) Kernel color in wheat is the example of _____ inheritance.
 - a) Mendelian
 - b) cytoplasmic
 - c) Polygenic
 - d) gene interaction
- 2) The term linkage was coined by _____.
 - a) Correns
 - b) Mendel
 - c) Morghan
 - d) de Vries
- 3) Complete linkage is observed in _____.
 - a) birds
 - b) lizards
 - c) Frog
 - d) *Drosophila*
- 4) When tall plant (TT) crossed with dwarf plant (tt), the phenotypic ratio in F₂ generation is _____.
 - a) 9:7
 - b) 9:3:3:1
 - c) 9:4:3
 - d) 3:1
- 5) An organism with two identical alleles of gene is called _____.
 - a) dominant
 - b) homozygous
 - c) heterozygous
 - d) recessive
- 6) polygenes means _____.
 - a) Genes involved in quantitative inheritance
 - b) Genes involved in the qualitative inheritance
 - c) Genes involved in multiple allelism
 - d) Multiple genes for a single trait
- 7) Cytoplasmic DNA found _____.
 - a) in nucleus
 - b) only in mitochondria
 - c) only in chloroplast
 - d) in mitochondria and chloroplast
- 8) Cytoplasmic male sterility in plants due to _____.
 - a) Polygenic inheritance
 - b) chloroplast inheritance
 - c) mitochondrial inheritance
 - d) Mendelian inheritance

- 9) Out of following _____ is not a sex chromosome.
- a) AA b) XY
- c) ZW d) ZO
- 10) In *Drosophila*, a fly with 3A + 3X chromosome is _____.
- a) diploid female b) triploid female
- c) super female d) intersex

B) Answer the following.

06

- 1) The Character expressed in F1 generation is known as ... character
- 2) Crossing over occurs in the ... stage of meiosis.
- 3) Holandric gene is example of linked inheritance.
- 4) As per Hardey-Weignburg law $p + q = \underline{\hspace{2cm}}$
- 5) petite in yeast is example of inheritance
- 6) The ratio of complementary gene is

Q.2 Solve any Eight of the following.

16

- What is Test cross?
- What is phenotype?
- Define complete Linkage.
- How many pairs of sex chromosomes in human being?
- What is mean by colour blindness?
- What is mean by Hardey Weinberg law?
- Define sex chromosomes.
- What is repulsion?
- Give any two examples of cytoplasmic inheritance
- Define Linkage.

Q.3 A) Attempt any Two of the following.

10

- i) Write a note on Hardey Weinberg law.
- ii) Write a note on Haemophilia
- iii) Write a note on supplementary gene.

B) What is crossing over? Explain mechanism of crossing over.

06

Q.4 A) Attempt any Two of the following.

08

- Write a note on holandric gene.
- Explain in brief Mendel's law of segregation with suitable example
- Write the significance of crossing over

B) Describe in brief cytoplasmic inheritance in *Mirabilis jalapa*

08

0.5 Attempt any Two of the following.

16

- Why Mendel selected pea plant for his experiment? Enlist the dominant and recessive characters observed in pea plant.
- Describe in brief balance concept of sex determination in *Drosophila* (Bridges experiment)

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Zoology (Special Paper-X)
Principles of Genetics (22221514)

Day & Date: Sunday, 25-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labeled diagrams wherever necessary.

Q.1 A) Select the correct alternative. 10

- 1) _____ is the process of identifying the location, structure and function of genes on chromosomes

a) Chromosome mapping	b) Chromosome separation
c) Crossing over	d) Linkage
- 2) The phenomenon of inheritance of two or more genes are located on same chromosomes together called as _____.

a) Linkage	b) Crossing over
c) Multiple alleles	d) Gene Pool
- 3) Crossing over is a process that takes place during _____.

a) Metaphase I	b) Anaphase I
c) Telophase I	d) Prophase-1
- 4) _____ syndrome is usually caused by an error in cell division called nondisjunction

a) Turners	b) Down
c) Klinefelters	d) Angelman
- 5) _____ is ratio of supplementary gene interaction

a) 9:3:3:1	b) 1:2
c) 9:7	d) 9:3:4
- 6) The lethal genes are largely recessive hence they produce effect in the _____ state

a) Homozygous	b) Heterozygous
c) Dominant	d) Recessive
- 7) Mutation theory was proposed by _____.

a) Mendel	b) Gregon
c) Watson	d) Hugo de Vries

- 8) Height, weight, hair color, eye color are examples of _____.
 a) Polygenic traits b) Hereditary traits
 c) Mutations d) Recombination
- 9) _____ is the process of exchanging genetic material between organisms within a genome
 a) Migration b) Mutation
 c) Transcription d) Recombination
- 10) Transposons are also known as _____.
 a) Jumping genes b) Lethal gene
 c) Multiple genes d) Mutagenic genes

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. 06

- 1) _____ gene can cause the death of an organism
 2) A mutation is a change in a _____.
 3) CLB Method/technique developed by _____.
 4) Jumping genes are called as _____.
 5) Turners ,Down and Klinefelefs syndromes are _____ disorders
 6) _____ is a type of virus that infects bacteria

Q.2 Solve any Eight of the following. 16

- a) State law of Dominance
 b) Define supplementary genes
 c) What is linkage gene
 d) Define Crossing over
 e) Write cause of Down syndrome
 f) Application of CLB method
 g) Define Mutation
 h) Describe Sex determination
 i) Define Lethal gene
 j) Give symptoms of Klinefelter's syndromes

Q.3 A) Attempt any Two of the following. 10

- i) Explain Supplementary gene interaction with suitable examples.
 ii) Explain the extrachromosomal inheritance with suitable examples.
 iii) Describe transposons in Bacteria

B) Short note/Solve 06

Describe the classification of gene mutation

Q.4 A) Attempt any Two of the following. 08

- i) Give an account on somatic cell hybridization
 ii) Describe symptoms and treatments of Down syndrome
 iii) Describe the chromosomal mechanism of sex determination in drosophila

B) Describe/Explain/Solve

08

Give an account on chromosomal mapping

Q.5 Attempt any Two of the following.

16

- a)** Describe in detail gene interaction
- b)** Describe the sex linked inheritance with suitable example
- c)** Give an account on polygenic inheritance with suitable examples

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Mathematics (Special Paper - X)
Complex Analysis (22221518)

Day & Date: Sunday, 25-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks:80

Instructions: 1) All questions are compulsory.
 2) Figure to right indicate full marks.

Q.1 A) Choose the correct alternative for each of the following. 10

1) A function of x and y possessing Antinous partial derivatives of the first and second orders is called a harmonic function if it satisfies ____.

- a) Lagrange's equation b) Laplace equation
 c) Euler equation d) Homogeneous equation

2) The polar form of complex number $-5 + 5i$ is ____.

- a) $5\sqrt{2} e^{i\frac{3\pi}{4}}$ b) $-5\sqrt{2} e^{i\frac{3\pi}{4}}$
 c) $5\sqrt{2} e^{i\frac{\pi}{4}}$ d) $-5\sqrt{2} e^{i\frac{\pi}{4}}$

3) $\int_L |dz|$ where L is any rectifiable are joining the point $z = a$ and

$z = b$ is equal to ____.

- a) $b - a$ b) $|b - a|$
 c) arc length of 1 d) arc length of z

4) An analytic function with constant modulus is ____.

- a) analytic b) variable
 c) constant d) may be variable or content

5) The $\text{Exp}(2 \pm 3\pi i) =$ ____.

- a) $\pm e^{\pm 2}$ b) e^{-2}
 c) $-e^{-2}$ d) $-e^2$

6) If C is circle $|z - a| = r$ then $\int_C \frac{dz}{z - a}$ is ____.

- a) $-2\pi i$ b) 2π
 c) $2\pi i$ d) -2π

- 7) Residue of $\frac{1}{\sin z - \cos z}$ at $z = \frac{\pi}{4}$ is _____.
 a) $\sqrt{2}$ b) $-\sqrt{2}$
 c) $-\frac{1}{\sqrt{2}}$ d) $\frac{1}{\sqrt{2}}$
- 8) If $\int_L (3x + y)dx + (2y - x)dy$, form $z = i$ to $z = 5i$
 then value of integral is _____.
 a) 40 b) 24
 c) 32 d) $\frac{88}{3}$
- 9) The residue of the function $\frac{1}{(z^2+1)^3}$ at $z = i$ is _____.
 a) $\frac{3}{16i}$ b) $-\frac{3}{16i}$
 c) $\frac{3i}{16}$ d) $\frac{3}{16}$
- 10) If $a > b > 0$; then $\int_0^{2\pi} \frac{d\theta}{a + b \cos \theta} =$
 a) $\frac{2\pi i}{\sqrt{a^2 - b^2}}$ b) $\frac{2\pi}{\sqrt{a^2 - b^2}}$
 c) $\frac{2\pi i}{\sqrt{b^2 - a^2}}$ d) $\frac{3\pi}{\sqrt{a^2 - b^2}}$

B) Fill in the blanks of the following.

06

- 1) If $f(z) = u + iv$ be an analytic function of $z = x + iy$ then the families curves $u = \text{constant}$, $v = \text{constant}$ are _____ to each other.
- 2) If harmonic function u and v satisfy Cauchy - Riemann equation, then $f(z) = u + iv$ is an _____ function.
- 3) If the curve L is defined the line from $z = 2i$ to $z = 4 + 2i$ then
$$\int_L \bar{z} dz = \underline{\hspace{2cm}}.$$
- 4) $\int_L z dz$ where L is any rectifiable arc joining the points $z = a$ and $z = b$, is equal to _____.
- 5) Residue of $\frac{z^3}{(z-1)(z-2)(z-3)}$ at $z = 2$ is _____.
- 6) If $f(z) = \frac{\sin 2z}{(z+1)^3}$; then $\text{Res } f(z)$ at $z = -1$ is _____.

Q.2 Attempt any Eight of following.**16**

- 1) Define Partitions.
- 2) Expand $f(z) = \frac{1}{(z+1)(z+3)}$ in a region $|z| < 1$
- 3) What kind of the poles of the function $f(z) = \frac{\cot \pi z}{(z-a)^2}$
- 4) If u is a harmonic function then show that the differential equation $\frac{\partial^2 u}{\partial z \partial \bar{z}} = 0$
- 5) Construct the analytic function $f(z) = u + iv$ where $u = y^3 - 3x^2y$
- 6) Expand $\frac{1}{(z-2)(z+1)}$ for $1 < |z| < 2$
- 7) Evaluate the residue of $\frac{z^2}{(z-1)(z-2)(z-3)}$ at $z = 1, 2$
- 8) Find the residue of $\frac{1}{(z^2+1)^3}$ at $z = i$
- 9) If $f(z)$ and $g(z)$ are analytic function in a domain D , then prove that $\frac{d}{dz}[f(z) + g(z)] = \frac{d}{dz}f(z) + \frac{d}{dz}g(z)$
- 10) Evaluated by the method of calculus of residue $\int_c \frac{dz}{(z-1)(z+1)}$
where c is circle $|z| = 3$

Q.3 A) Attempt any Two of the following.**10**

- 1) If $u - v = (x - y)(x^2 + 4xy + y^2)$ and $f(z) = u + iv$ is an analytic function of $z = x + iy$, find $f(z)$ in terms of z .
- 2) Evaluate $\int_{(0,1)}^{(2,5)} (3x + y)dx + (2y - x)dy$ along the curve
 - i) $y = x^2 + 1$
 - ii) The straight line $(0,1)$ to $(0,5)$ and then from $(0,5)$ to $(2,5)$
- 3) Prove that $\int_0^{2\pi} e^{-\cos \theta} \cos(n\theta + \sin \theta) d\theta = (-1)^n \frac{2\pi}{ni}$

B) Find the Cauchy - Riemann equation in polar form.**06****Q.4 A) Attempt any two of following.****08**

- 1) If $f(z) = \frac{x^3y(y-ix)}{x^6+y^2}$ ($z \neq 0$) $f(0) = 0$ Prove that $\frac{f(z)-f(0)}{z} \rightarrow 0$ as $z \rightarrow 0$ along any radius vector but not as $z \rightarrow 0$ in any manner.
- 2) Expand $\frac{1}{z(z^2-3z+2)}$ for the regions.
 - i) $0 < |z| < 1$
 - ii) $1 < |z| < 2$

3) Show that $\int_0^{\pi} \frac{1 + 2 \cos \theta}{5 + 4 \cos \theta} d\theta = 0$

B) State and prove Cauchy's Residue theorem.

08

Q.5 Attempt any two of the following.

16

- a)** If a function $(f(z) = u(x, y) + iv(x, y))$ is differentiable at any point $z = x + iy$, then the partial derivatives u_x, v_x, u_y, v_y should exist and satisfy the equations $u_x = v_y, u_y = -v_x$
- b)** Prove that $\int_0^{2\pi} \frac{\sin^2 \theta}{a + b \cos \theta} d\theta = \frac{2\pi}{b^2} (a - \sqrt{a^2 - b^2})$, where $a > b > 0$
- c)** Obtain the Taylor and Laurent's series which represents the function $\frac{z^2 - 1}{(z+2)(z+3)}$ in the regions
- i) $|z| < 2$
 - ii) $2 < |z| < 3$
 - iii) $|z| > 3$

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (CBCS) : Examination March/April - 2025
Statistics (Special Paper-X)
Probability Distributions (22221521)

Day & Date: Sunday, 25-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Use if log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) In bivariate normal distribution $V[X|Y = y]$ is _____.
 a) a function of X alone b) a function of Y alone
 c) a function of X and Y d) Constant
- 2) For Laplace distribution with pdf $f(x) = \frac{1}{2} e^{-|x|} \mu'_4$ about origin is _____.
 a) 0 b) 4!
 c) 4 d) None of these
- 3) If $X \sim \text{Weibull}(\alpha, \beta)$ and $Y = x^\beta$ then distribution of Y is _____.
 a) Gamma b) Beta
 c) Exponential d) Normal
- 4) The p.m.f. of Power series distribution is _____.
 a) $\frac{a_x \theta}{f(\theta)}$ b) $\frac{a_x \theta^x}{f(\theta)}$
 c) $\frac{a(x) \theta^x}{f(\theta)}$ d) $\frac{a_x \theta(x)}{f(\theta)}$
- 5) If X is a Pareto (α, β) r.v., then $E(X) =$ _____.
 a) $\frac{\alpha\beta}{\beta - 1}$ b) $\frac{\alpha\beta}{\alpha + 1}$
 c) $\frac{\alpha\beta}{\alpha - 1}$ d) $\frac{\alpha\beta}{\beta + 1}$
- 6) Mean of truncated Poisson distribution truncated at $X = 0$ is _____.
 a) $\frac{\lambda}{1 - e^{-\lambda}}$ b) λ
 c) $1 - e^{-\lambda}$ d) 0

- 7) If X is a Weibull $(0.5, 2)$ r.v., then $E(X^2) = \underline{\hspace{2cm}}$.
a) 1 b) 4
c) 0.25 d) None of these
- 8) For logistic distribution which of the following statements is correct?
a) mean < median < mode b) mean > median > mode
c) mean = median = mode d) mode > mean > median
- 9) Let (X, Y) is $BN(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ and $\rho = 0$ then X and Y are _____.
a) Independent b) Uncorrelated
c) neither a nor b d) both a and b
- 10) If X and Y are two iid $LN(\mu, \sigma^2)$ r.vs. then distribution of $\frac{X}{Y}$ is _____.
a) Cauchy b) Normal
c) lognormal d) bivariate normal

B) Fill in the blanks

06

- 1) Let X be a random variable on the sample space such that $0 \leq P(X \in T) \leq 1$ then the conditional distribution $P[X \leq x/X \in T]$ define for any real x is called the _____ of x .
- 2) The mean of Logistic distribution is _____.
- 3) If $X \sim W(\alpha, \beta)$ Then the third quartile is _____.
- 4) If $X \sim LN(\mu, \sigma^2)$ then the Median of log-Normal distribution is _____.
- 5) The mean and variance of Cauchy distribution is _____.
- 6) The mean of Weibull distribution is _____.

Q.2 Solve any Eight of the following.

16

- Define left truncated probability distribution.
- Sketch the probability curve of Logistic distribution
- State the additive property of Cauchy distribution.
- State the p.d.f. of Pareto distribution with parameters (α, β) .
- Define truncated normal distribution
- Define p.d.f. of Weibull distribution with parameters (α, β) .
- State the p.d.f. of Laplace distribution of with parameters (μ, λ) .
- State p.d.f. of truncated exponential distribution to the left below 'a'
- What is the p.d.f. of Pareto distribution. When $\alpha = \beta = 1$?
- State the p.m.f. of truncated binomial distribution $X \sim B(n, p)$.

Q.3 A) Attempt any Two of the following.

10

- i) Find mode of Log-Normal distribution.
- ii) Suppose X_T is truncated Poisson random variable with $\lambda = 2$, truncated at $X = 0$.
Find
 - a) $P(X_T = 2)$
 - b) $E(X_T)$
 - c) $V(X_T)$
- iii) Derive the distribution function of Cauchy distribution.

B) Derive distribution function of truncated exponential distribution. **06**

Q.4 A) Attempt any Two of the following. **08**

- i) Derive p.d.f. of truncated normal distribution to the left below 'a' And p.d.f. of truncated Normal distribution to the right above 'b'.
- ii) Find distribution function for Log-Normal distribution.
- iii) Find the p.d.f of Bivariate Normal Distribution. If $N(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ as parameters.

B) Derive mean and variance of Pareto distribution. **08**

Q.5 Attempt any Two of the following. **16**

- a)** Let X be a Logistic random variable with parameters (μ, σ) , obtain C.D.F. and mean of X .
- b)** If (X, Y) is $BN(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$ then find the distribution of $aX + bY + c$ where a, b and c are real numbers.
- c)** If X is a Laplace (μ, λ) r.v. then find first and third quartile.

Seat No.	

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B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Geology (Special Paper-X)
Hydrogeology (22221526)

Day & Date: Sunday, 25-May-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat diagrams wherever necessary.

Q.1 A) Select the correct alternative. 10

- 1) What is the type of the springs emerging in basin like areas?
 - a) Contact
 - b) Gravity
 - c) hot
 - d) Depression
- 2) Primary porosity of _____ is more.
 - a) sandstone
 - b) limestone
 - c) basalt
 - d) granite
- 3) Seasonal fluctuation is caused in _____ of a well.
 - a) surface runoff
 - b) Transpiration
 - c) sediment
 - d) water table
- 4) Which of the following deposits will probably provide the poor ground-water supply?
 - a) high altitude shale terrain
 - b) till
 - c) Alluvium
 - d) lake clay
- 5) What type of aquifer, whose groundwater is in direct vertical contact with the atmosphere through open pores?
 - a) confined
 - b) Unconfined
 - c) perched
 - d) Artesian
- 6) What better defines 'the capacity of a rock to transmit water through its pores'?
 - a) porosity
 - b) void ratio
 - c) permeability
 - d) Flow
- 7) Which of the following usually has the highest porosity?
 - a) gravel
 - b) Sand
 - c) clay
 - d) Boulder
- 8) What composes the study of the water cycle?
 - a) Remote sensing
 - b) Petrology
 - c) Hydrogeology
 - d) surface runoff

Q.5 Attempt any Two of the following.

- a)** Explain how the rock textures function, wrt to groundwater?
- b)** Define watershed. Explain its elements. Draw figures of watershed.
- c)** What is artesian well? Explain the confined aquifer Draw its diagram.

Seat No.	

Set	P

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Microbiology (Special Paper-X)
Agricultural Microbiology (22221530)

Day & Date: Sunday, 25-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) _____ is excellent biofertilizer.

a) Salvinia	b) Pteridium
c) Azolla	d) Marsilea
- 2) Carbon dioxide makes up approximately _____ % of the atmosphere

a) 0.47	b) 0.03
c) 21	d) 98
- 3) Vanillic acid is the product formed after the biodegradation of _____.

a) Cellulose	b) Lignin
c) Hemicellulose	d) Hydrocarbons
- 4) _____ is the most persistent pesticide found in nature.

a) Malathion	b) Parathion
c) DDT	d) 2,4-D
- 5) Smallest particle of soil is called as _____.

a) Sand	b) silt
c) clay	d) gravel
- 6) _____ is the best example of Microbial insecticide.

a) <i>Bacillus polymixa</i>	b) <i>Bacillus subtilis</i>
c) <i>Bacillus anthracia</i>	d) <i>Bacillus thureingensis</i>
- 7) _____ is the major component of the Bordeaux mixture.

a) Sodium chloride	b) copper sulphate
c) calcium chloride	d) magnesium sulphate
- 8) The moisture level required for vermicomposting should be between _____.

a) Below 30%	b) 40 and 50%
c) 70 and 80%	d) Above 90%

- 9) In farm yard manure the proportion of cattle dung and urine is _____.
a) 1:1 b) 2:1
c) 3:1 d) 1:2
- 10) Cellulose is degraded to cellobiose by the enzyme _____.
a) Cellulase b) Beta- glucosidase
c) hexokinase d) cellulose dehydrogenase

B) Fill in the blank/definition

06

- 1) _____ is the causative agent of oily spot of pomegranate.
- 2) Earthworms are used for production of _____ compost.
- 3) Define Green manure
- 4) Define Ammonification
- 5) Define Rhizosphere
- 6) Name the most dominant group of microorganisms in soil.

Q.2 Solve any Eight of the following.

16

- a) What are biofertilizers?
- b) Give examples of genetically modified plants.
- c) Define nitrification
- d) Enzymes involved in cellulose degradation.
- e) List non-symbiotic nitrogen fixing bacteria.
- f) What are the sources of sulphur in atmosphere.
- g) Define term 'Pesticide'
- h) Name the causative agent of whip smut of sugarcane
- i) Define canker
- j) Define soil ecosystem

Q.3 A) Attempt any Two of the following.

10

- Describe in detail the process of Vermicomposting.
- Explain carbon cycle in nature.
- Explain biodegradation of lignin.

B) Write short note on large scale production of Rhizobium

06

Q.4 A) Attempt any Two of the following.

08

- Explain various control measures of plant diseases.
- What are pesticides? Explain degradation of pesticides.
- Explain structure and properties of soil.

B) Describe biogradation of hemicellulose.

08

0.5 Attempt any Two of the following.

16

- Describe the large scale production and application of Bioinsecticide-*Bacillus thuringiensis*
- Discuss in detail causative agent, symptoms and control of oily spots of pomegranate.
- Explain in detail- Nitrogen cycle.

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Electronics (Special Paper-X)
Fundamentals of Microcontroller (22221538)

Day & Date: Sunday, 25-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative. 10

- 1) The 8051 microcontroller is _____ device.
 - a) 16 bit
 - b) 8 byte
 - c) 16 byte
 - d) 8 bit
- 2) Which of the following pin of 8051 microcontroller is used for serial reception?
 - a) INT0
 - b) INT1
 - c) Rx D
 - d) Tx D
- 3) The _____ registers pair is normally used for indirect addressing.
 - a) R0 & R1
 - b) R0 & R2
 - c) R1 & R2
 - d) both b & c
- 4) The SJMP instruction is of _____ addressing method.
 - a) Long
 - b) Relative
 - c) Absolute
 - d) All of these
- 5) To store quotient after the execution of DIV A, B the _____ register is used.
 - a) R0
 - b) B
 - c) R1
 - d) A
- 6) Which SFR register is used for selection of the Register Bank?
 - a) Accumulator
 - b) SCON
 - c) PSW
 - d) TCON
- 7) Which IC is used to convert TTL signal into RS232 signal to communicate serially?
 - a) MAX232
 - b) MAX223
 - c) MAX323
 - d) None of the above
- 8) The Timer 0 or Timer 1 in Mode 1 of 8051 microcontroller works as _____ number.
 - a) 8 bit
 - b) 16-bit auto reload
 - c) 8-bit auto reload
 - d) 16-bit

- 9) To mask lower nibble of a byte, it should be AND with _____ number.
- a) F0H b) FEH
c) EFH d) 0FH
- 10) The 8051 microcontroller has _____ I/O port pins for interfacing purpose.
- a) 8 b) 16
c) 32 d) 40

B) State True or False.

06

- 1) In 8051 microcontroller there are two 8 bit.Timers/Counters called T0 and T1.
- 2) The synonym of ALE is Address Light Enable.
- 3) The accumulator A has A5H data then after executing the instruction ORL A, #0FFH the result will be same as data in accumulator.
- 4) The SFRs, Stack Pointer, is bit addressable.
- 5) Register SMOD used to controls processor power down, sleep modes and serial data baud rate.
- 6) The microcontroller 8051 has 4Kbyte of internal RAM.

Q.2 Solve any Eight of the following.

16

- a) State any four features of 8051 microcontroller.
- b) State the need of clock signal in 8051?
- c) Give modes of serial data communication.
- d) Draw the clock and reset circuit of 8051 Microcontroller.
- e) Give the role of $\overline{EA}$ pin in 8051.
- f) Illustrate the instruction MUL AB with suitable example.
- g) Mention the names of any four SFRs.
- h) How to configure Timer-1 as Timer in Mode-2 and Timer-0 as Counter in Mode-1?
- i) List the instructions used for byte level operations.
- j) What is the concept of subroutine?

Q.3 A) Attempt any Two of the following.

10

- i) Write a note on functional block diagram of 8051 microcontroller.
- ii) To generate square wave at port pin P2.1, write Assembly Language Program.
- iii) Explain PSW and Stack Pointer of 8051 microcontroller.

B) Write a note on interrupts in 8051.

06

Q.4 A) Attempt any Two of the following.

08

- State the comparison between microprocessor and microcontroller.
- Write an Assembly Language Program to blink LED at port pin P0.5. Use Timer-1 in Mode-1.
- Write a note on pin configuration of microcontroller 8051.

B) Explain in detail Ports of 8051.

08

Q.5 Attempt any Two of the following.**16**

- a)** Write an Assembly Language Program to
 - i) Toggle the bits of port 1 and 2.
 - ii) Logical ANDing-of two numbers stored at A500 & A501
- b)** Classify and explain the instruction set of microcontroller 8051.
- c)** Explain serial communication facility of 8051 microcontroller? With suitable Assembly Language Program, explain serial transmission.

Seat No.	

Set P

B.Sc. (Semester - V) (New) (CBCS) : Examination March/April - 2025
Computer Science (Special Paper-X)
Advanced Java (22221534)

Day & Date: Sunday, 25-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Select the correct alternative. 10

- 1) Which method of DriverManager class is used to establish connection with the database?
 - a) getConnection()
 - b) setConnection()
 - c) registerDriver()
 - d) forName()
- 2) _____ method of CallableStatement interface which is used to registers the output parameter.
 - a) prepaCall
 - b) registerOutParameter
 - c) outParameter
 - d) exceuteQuery()
- 3) What is the Correct URL to establish connection with the oracle database?
 - a) oracle:jdbc:thin:@localhost:1521:xe
 - b) thin:jdbc:oracle:@localhost:1521:xe"
 - c) jdbc:oracle:thin:@localhost:1521:xe"
 - d) jdbc:oracle:thin://localhost:xe:1521"
- 4) The web container calls the _____ method only once after creating the servlet instance
 - a) service()
 - b) init()
 - c) destroy()
 - d) all of theses
- 5) Which method is used to handle POST requests in a servlet?
 - a) doPost()
 - b) doGet()
 - c) service()
 - d) handlePost()
- 6) Which of the following tags is used to include a file in JSP?
 - a) <%@ include file="filename" %>
 - b) <% include file="filename" %>
 - c) <%@ file="filename" %>
 - d) <%@ include="filename" %>

- 7) Which directive tag is used to translate a JSP page into the corresponding servlet?
 - a) page
 - b) include
 - c) taglib
 - d) all of these
- 8) In hibernate _____ is the sub element of class. It specifies the primary key attribute in the class.
 - a) primary key
 - b) unique key
 - c) id
 - d) class
- 9) Which annotation marks this class as an entity in hibernate.
 - a) @Table
 - b) @Entity
 - c) @class
 - d) @Name
- 10) What is Spring Core?
 - a) A Java framework for creating user interfaces
 - b) An IDE for developing Spring based applications
 - c) A sub-module of Spring framework
 - d) A scripting language of the Spring Framework

B) Fill in the blanks**06**

- 1) ORM stands for _____.
- 2) The web container calls the _____ method each time when request for the servlet is received.
- 3) _____ Interface provides the methods to access servlet context information.
- 4) The _____ JSTL SQL tag is used for creating a simple data source suitable only for prototyping.
- 5) MVC Stands for _____.
- 6) out is an implicit object of type _____ class.

Q.2 Solve any Eight of the following.**16**

- a) What is the difference between Statement and PreparedStatement interface.
- b) What is Framework?
- c) What is CGI?
- d) Define Servlet API.
- e) What are Use of RequestDispatcher?
- f) List out use advantages of JSP over Servlet.
- g) List out use of HttpServletRequest interface.
- h) What is cookie?
- i) What is Dependency injection?
- j) What is MVC in Spring?

- Q.3 A) Attempt any Two of the following. 10**
- i) Explain JDBC Architecture.
 - ii) Write a servlet to that use of HttpServlet Class.
 - iii) What are the Components of JDBC.
- B) What are types of JDBC Drivers? 06**
- Q.4 A) Attempt any Two of the following. 08**
- i) Explain servlet life cycle.
 - ii) What is Java Bean? Explain use of Java Bean in JSP with example.
 - iii) Write a hibernate program to insert student information into oracle database.
- B) Explain session management in servlet with its all types. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Write a JSP page to check given number is prime or not.
 - b) Explain hibernate annotation with suitable example.
 - c) Explain JSTL SQL tags with example.

Seat No.	

Set P

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Physics (Special Paper - XI)
Classical Mechanics (22221511)

Day & Date: Monday, 05-May-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculators is allowed.

Q.1 A) Multiple choice questions. 10

- 1) In the anti-symmetric mode of oscillations, the particles are always _____.
a) In phase b) out of phase
c) with constant phase d) in opposite phase
- 2) In southern hemisphere, due to Coriolis's force, cyclone deflects towards _____.
a) North b) South
c) East d) West
- 3) Any rigid body having large number of particles has _____ degrees of freedom.
a) 2 b) 3
c) 5 d) 6
- 4) If a particle is in motion at right angle in a rotating frame of reference, the Coriolis force acting on it is _____.
a) Zero b) Minimum
c) Maximum d) Infinity
- 5) The constraints involved in the motion of a particle placed on the surface of a sphere is _____.
a) Holonomic b) Rheonomous
c) non-holonomic d) scleronomous
- 6) The shortest distance between two points in space is _____.
a) Exponential b) Straight line
c) Parabolic d) ellipsoidal
- 7) When one particle is in motion in a space then it will have _____ degrees of freedom.
a) 1 b) 2
c) 3 d) 4

- 8) A rigid body in motion can be completely specified if its _____
 a) Position and orientations are given
 b) Only positions is given
 c) Only orientations are given
 d) All of the above
- 9) The trajectory of projectile in absence of air resistance is _____
 a) Parabolic
 b) Circular
 c) Hyperbolic
 d) Elliptical
- 10) When torque acting on a particle is zero then its _____ is conserved.
 a) Linear momentum
 b) Angular momentum
 c) Energy
 d) Mass

Q.1 B) Fill in the blanks**06**

- 1) Minimum surface of revolution is _____
- 2) In rigid body, distance between any two particles is always _____
- 3) Hamilton's principle is _____ principle.
- 4) When three particles are in motion in a plane then it will have _____ degrees of freedom.
- 5) If force acting on a system of particles is zero, its _____ is conserved.
- 6) If a particle is at rest in a rotating frame of reference, the Coriolis force acting on it is _____

Q.2 Solve any Eight of the following.**16**

- 1) State and prove conservation theorem for linear momentum of a particle.
- 2) Define constraints and give its types.
- 3) What is principle of virtual work?
- 4) What is pseudo force? Give one example of it.
- 5) Define normal mode of oscillations and normal coordinates.
- 6) Explain the effect of Coriolis's force on flight of missile.
- 7) What are generalized coordinates?
- 8) State Euler's theorem for a rigid body.
- 9) Define centre of mass of a system of particles.
- 10) Define range of a projectile.

Q.3 A) Attempt any Two of the following.**10**

- 1) Show that the angular acceleration of a particle is same in fixed and rotating coordinate system.
- 2) State and prove conservation theorem of energy of a particle.
- 3) Explain the minimum surface of revolution.

- B)** Explain the effect of Coriolis force on freely falling body under the action of gravitational force.

06

- Q.4 A) Attempt any Two of the following. 08**
- 1) State and prove Brachistochrone problem.
 - 2) Explain the energy transfer mechanism in coupled oscillatory system.
 - 3) Derive the Euler-Lagrange's equation of motion using variational principle.
- B) State and explain Hamilton's principle and obtain Lagrange's equations from it. 08**
- Q.5 Attempt any Two of the following. 16**
- 1) Derive an expression for time of flight and range of projectile in resistive medium.
 - 2) State and explain D'Alembert's principle and obtain Lagrange's equations from it.
 - 3) Obtain an expression for acceleration of Atwood's machine.
Calculate the acceleration of Atwood's Machine when masses of 200 gm and 100 gm are used.

Seat No.	

Set P

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Chemistry (Special Paper - XI)
Organic Chemistry (22221507)

Day & Date: Monday, 05-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to right indicate full marks.
 3) Draw neat diagram and give equations wherever necessary.
 4) Chart of spectroscopic data supplied by university is allowed.

Q.1 A) Choose the most correct alternative 10

- 1) The MPV reduction occurs through the shift of _____ ion.
 - a) nitronium
 - b) proton
 - c) hydride ion
 - d) OH^-
- 2) Numbers of signal in NMR spectrum of 2-chloro propane are _____.
 - a) 2
 - b) 3
 - c) 4
 - d) 5
- 3) The m/e of ethanol is observed at _____.
 - a) 46
 - b) 32
 - c) 16
 - d) 12
- 4) In cyclohexane, _____ conformation is least stable.
 - a) chair
 - b) half chair
 - c) twist boat
 - d) boat
- 5) _____ reaction involve change in carbon skeleton due to rearrangement of intermediate carbocation.
 - a) Claisen condensation
 - b) M.P.V. Reduction
 - c) Hofmann Rearrangement
 - d) Wagner-Meerwein Rearrangement
- 6) The diethyl malonate on alkylation gives corresponding alkyl derivatives. In this reaction the intermediate formed is _____.
 - a) enolate ion
 - b) nitrene
 - c) carbocation
 - d) isocyanate
- 7) The C-O stretching frequency at about 1710 cm^{-1} is _____ due group.
 - a) alcohol
 - b) phenol
 - c) ketone
 - d) cyano

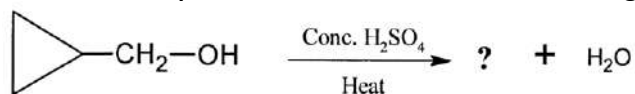
- 8) Baeyers strain theory fails to explain the stability of _____.
 a) cyclopropane b) cyclobutane
 c) cyclopentane d) cyclohexane
- 9) Radiofrequency radiations are used in _____ spectroscopy.
 a) Infrared b) NMR
 c) Ultraviolet d) Mass
- 10) The distance between two flagpole hydrogen atoms of cyclohexane is _____.
 a) $0.54 \text{ \AA}$ b) $1.83 \text{ \AA}$
 c) $2.40 \text{ \AA}$ d) $1.20 \text{ \AA}$

B) Fill in the blanks.**06**

- 1) Number of fundamental modes of vibrations in water molecule is / are _____.
- 2) Ethyl aceto acetate on condensation with urea gives _____.
- 3) In _____ spectroscopy, gaseous organic molecule is bombarded with electron at elevated temperature and reduced pressure.
- 4) Number of sets of equivalent protons in acetaldehyde is/are _____.
- 5) In Oppenauer oxidation, secondary alcohol is converted into _____.
- 6) In _____ conformation of cyclohexane, all the C-H bond are staggered.

Q.2 Solve any Eight of the following.**16**

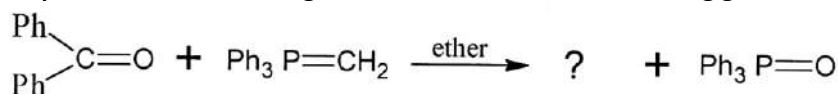
- a) Give applications of mass spectroscopy.
- b) Define the terms
 - 1) Stereoselective reaction
 - 2) Stereospecific reaction
- c) Give the synthesis of glycine from diethyl malonate.
- d) Why TMS used as internal standard in NMR spectroscopy.
- e) Predict the product and name to following reaction



- f) How many NMR signal are possible for following molecules?
 - 1) acetone
 - 2) 2-butanol
- g) Give reaction of urea with diethyl malonate.
- h) Explain the principle of IR spectroscopy
- i) How succinic acid is prepared from diethyl malonate?
- j) Give principle of mass spectroscopy.

Q.3 A) Attempt any Two of the following. 10

- 1) Draw schematic diagram of mass spectrometer and explain its working.
- 2) Complete the following reaction, name it and suggest mechanism.



- 3) Write a note on confirmations and stability of methyl cyclohexane.

B) An organic compound A [C₃H₆O] IR absorption at 1720 cm⁻¹ and gives silver mirror test. When A is treated with bromoester B [C₄H₇O₂Br] and metallic zinc in presence of ether gives an intermediate which on hydrolysis gives C [C₇H₁₄O₃]. This C on further hydrolysis form D [C₅H₁₀O₃] which on dehydration gives E [C₅H₈O₂]. What are A, B, C, D and E? Write and name the reaction. 06**Q.4 A) Attempt any Two of the following. 08**

- 1) Discuss coupling constant in detail.
- 2) How will you synthesize
 - i) propanoic acid
 - ii) cinnamic acid by using ethyl aceto acetate?
- 3) Determine the structure from following data
Molecular formula- C₄H₈O₂, IR- 1745 cm⁻¹,
NMR: δ 1.2 (triplet, 3H), δ 4.1 (quartet, 2H), δ 2.1 (singlet, 3H).

B) Discuss Bayer's strain theory in detail. 08**Q.5 Attempt any Two of the following. 16**

- a) Discuss Hoffmann rearrangement reaction with mechanism and synthetic applications.
- b) Explain PMR spectra of
 - i) Ethyl bromide
 - ii) Ethanol
- c) i) How ethyl aceto acetate is prepared by Claisen condensation? Explain with mechanism.
ii) Discuss keto enol tautomerism of ethyl aceto acetate with mechanism.

TABLE - 1
Characteristic Infrared Absorptions of Functional Groups

GROUP	FREQUENCY RANGE cm^{-1}	INTENSITY
A. Alkyl		
C - H (stretching)	2853 - 2962	(m - s)
Isopropyl - $\text{CH}(\text{CH}_3)_2$	1380 - 1385	(s)
and	1365 - 1370	(s)
tert - Butyl - $\text{C}(\text{CH}_3)_3$	1385 - 1395	(m)
and	1365	(s)
B. Alkenyl		
C-H (stretching)	3010 - 3095	(m)
C = C (stretching)	1620 - 1680	(v)
R - $\text{CH} = \text{CH}_2$	985 - 1000	(s)
and	905 - 920	(s)
$\text{R}_2\text{C} = \text{CH}_2$ (out of plane)	880 - 900	(s)
cis - $\text{RCH} = \text{CHR}$ C-H bendings)	675 - 730	(s)
trans - $\text{RCH} = \text{CHR}$	960 - 975	(s)
C. Alkynyl		
$\equiv \text{C} - \text{H}$ (stretching)	- 3300	(s)
$\text{C} \equiv \text{C}$ (stretching)	2100 - 2260	(v)
D. Aromatic		
Ar - H (stretching)	- 3030	(v)
Aromatic substitution type (C-H out-of-plane bendings)		
Monosubstituted	690 - 710	(very s)
and	730 - 770	(very s)
o - Disubstituted	735 - 770	(s)
m - Disubstituted	680 - 725	(s)
and	750 - 810	(very s)
p - Disubstituted	800 - 840	(very s)
E. Alcohols, Phenols, Carboxylic Acids		
OH (alcohols, phenols, dilute solutions)	3590 - 3650	(sharp v)
OH (alcohols, phenols, hydrogen bonded)	3200 - 3550	(broad s)
OH (carboxylic acids, hydrogen bonded)	2500 - 3000	(broad v)
F. Aldehydes, Ketones, Esters and Carboxylic Acids		
C = O stretch 1720	1630 - 1780	(s)
aldehydes - 1720 {Stre 2700 - 2900	1690 - 1740	(s)
ketones	1680 - 1750	(s)
esters	1735 - 1750	(s)
carboxylic acids	1710 - 1780	(s)
amides	1630 - 1690	(s)
G. Amines		
N - H	3300 - 3500	(m)
H. Nitriles		
$\text{C} \equiv \text{N}$	2220 - 2260	(m)

TABLE - 2
Approximate Proton Chemical Shifts in NMR

TYPE OF PROTON	CHEMICAL SHIFT, DELTA, PPM (δ)
1° Alkyl, RCH_3	0.8 - 1.0
2° Alkyl, RCH_2R	1.2 - 1.4
3° Alkyl R_3CH	1.4 - 1.7
Allylic, $\text{R}_2\text{C}=\text{C}-\text{CH}_3$	1.6 - 1.9
$\begin{array}{c} \text{R} \\ \\ \text{C}=\text{O} \end{array}$	$\begin{array}{c} \text{O} \\ \\ \text{Ester R}-\text{C}-\text{O}-\text{CH}_2-\text{R} \text{ 4 to 4.5} \\ \text{N}-\text{CH}_3 \quad 2.3 \end{array}$
Benzylic, ArCH_3	2.2 - 2.5
Alkyl chloride, RCH_2Cl	3.6 - 3.8
Alkyl bromide, RCH_2Br	3.4 - 3.6
Alkyl iodide, RCH_2I	3.1 - 3.3
Ether, ROCH_2R	3.3 - 3.9
Alcohol, HOCH_2R	3.3 - 4.0
Ketone, RCCH_3	2.1 - 2.6
$\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{H} \end{array}$	9.5 - 9.6
$\begin{array}{c} \text{O} \\ \\ \text{R}_2\text{C}=\text{CH}_2 \end{array}$	4.6 - 5.0
$\begin{array}{c} \text{O} \\ \\ \text{R}_2\text{C}=\text{CH}-\text{R} \end{array}$	5.2 - 5.7
Aromatic, ArH	6.0 - 9.5
Acetylenic, $\text{RC}\equiv\text{CH}$	2.5 - 3.1
Alcohol hydroxyl, ROH	0.5 - 6.0 ^a
Carboxylic, RCOH	10 - 13 ^a
$\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{OH} \end{array}$	
Phenolic, ArOH	4.5 - 7.7 ^a
Amino $\text{R}-\text{NH}_2$	1.0 - 5.0

^aThe chemical shifts of these groups vary in different solvents and with temperature and concentration.

TABLE - 3
U.V. Absorption rules for Diene Chromophores

1) Parent	215 nm	
2) Each extra conjugation	30 nm	
3) Homoannular	39 nm	
4) Exocyclic double bond	05 nm	- OH, - OR, Cl, Br 5 (nm)
5) Each alkyl (R) substituent directly attached to double bonded carbon	05 nm	- SR, (30 nm), - NR ₂ (60 nm)

U.V. Absorption rules for Enone System

1) Parent	215 nm			
2) Each extra conjugation	30 nm			
3) Homoannular	39 nm			
4) Substituents				
a) Alkyl group at α	10 nm			
b) Alkyl group at β	12 nm			
c) Alkyl group at γ, δ	18 nm			

	α	β	γ
Cl	15	12	
OH, OR	35	30	
SR		85	
NR ₂		95	
O		75	
Acyl	6	6	6

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Botany (Special Paper - XI)
Molecular Biology (22221503)

Day & Date: Monday, 05-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Multiple choice questions.**10**

- 1) The Watson and Crick model shows that _____.
 a) A is hydrogen bonded to T
 b) T is hydrogen bonded to G
 c) G is hydrogen bonded to A
 d) C is hydrogen bonded to A
- 2) Identify the purine base of nucleic acids in the following.
 a) Cytosine b) Thymine
 c) Uracil d) Adenine
- 3) In Griffith's experiment _____.
 a) S strain bacteria killed the mice
 b) R strain bacteria killed the mice
 c) heat-killed S strain bacteria killed the mice
 d) a mixture of heat-killed S strain bacteria and R strain bacteria failed to kill the mice
- 4) DNA unwinding is done by _____.
 a) Ligase b) Helicase
 c) Topoisomerase d) Exonuclease
- 5) Transcriptional activators consist of _____ domains.
 a) 1 b) 2
 c) 3 d) 4
- 6) Genetic information stored in mRNA is translated to polypeptide by _____.
 a) Ribosome b) Nucleus
 c) Endoplasmic reticulum d) Golgi apparatus
- 7) The role of RNA polymerase III is transcription of _____.
 a) rRNAs b) mRNAs
 c) tRNAs d) hnRNA

- 8) DNA replication is _____.
 a) Conservative b) Non-conservative
 c) Semi-conservative d) None of the mentioned
- 9) Genetic information must _____.
 a) be able to store information
 b) stable so it can be replicated and passed from one generation to the next
 c) be able to undergo changes that increase genetic variability
 d) all of the above
- 10) _____ is not a post-translational modification.
 a) Lipidation b) Protein phosphorylation
 c) Proteolytic processing d) DNA methylation

B) Fill in the blank.**06**

- 1) Building blocks of nucleic acids are _____.
- 2) In Griffith's experiment _____ strains of pneumococci was isolated from dead mice.
- 3) _____ enzyme is used for the process of replication in E. Coli.
- 4) _____ form of DNA is described by Watson-Crick model.
- 5) _____ is the site of protein synthesis in a cell.
- 6) Lactose utilization by E. coli requires _____.

Q.2 Solve any Eight of the following.**16**

- a) What are the functions of DNA?
- b) Sketch and label the structure of ribosome.
- c) What are the difference between the DNA & RNA.
- d) Define the Denaturation.
- e) What are the different forms of the RNA?
- f) What is Organization of DNA in Eukaryote?
- g) Name the two transcription factors.
- h) Define the replication of DNA.
- i) Sketch and label structure of t- RNA?
- j) Name of sugar present in the DNA.

Q.3 A) Attempt any Two of the following.**10**

- 1) Explain replication of DNA in prokaryotes.
- 2) Write a note protein synthesis in eukaryotes.
- 3) Explain Griffith's experiment.

B) Process of transcription in Eukaryotes.**06****Q.4 A) Attempt any Two of the following.****08**

- 1) Explain the post - translational modifications of proteins.
- 2) Describe enzymes involve in DNA replication.
- 3) Explain the regulation of lactose metabolism in E. coli.

B) Describe the principles of transcriptional regulation.**08**

Q.5 Attempt any Two of the following.

16

- a)** Give an account on DNA structure and its types.
- b)** What are the salient features of Ribonucleic Acid? Give the account on the Central Dogma of Molecular Biology.
- c)** What is the DNA? Write a note on synthesis of DNA.

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Zoology (Special Paper - XI)
Endocrinology (22221515)

Day & Date: Monday, 05-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Multiple choice questions**10**

- 1) This hormone is responsible for fight or flight response.
 - a) Thyroxine
 - b) Insulin
 - c) Epinephrine and Norepinephrine
 - d) Oestrogen
- 2) Pituitary hormone triggering the male testes to generate sperm and in female to generate ovum on a monthly basis is _____.
 - a) Prolactin
 - b) Growth hormone
 - c) Follicle stimulating Hormone
 - d) Luteinizing hormone
- 3) Which of following hormone regulates sleep-wake cycle?
 - a) Melatonin
 - b) Thyroxine
 - c) Vasopressin
 - d) MSH
- 4) The secretion of several anterior pituitary hormones are governed by other hormones from _____.
 - a) Thyroid Gland
 - b) Hypothalamus
 - c) Adrenal Gland
 - d) Pancreas
- 5) The structure that connects hypothalamus and pituitary.
 - a) Cerebral cortex
 - b) Infundibulum
 - c) Hypophysis
 - d) Corpus callosum
- 6) Action of parathormone in the human body is _____.
 - a) Decrease blood sodium level
 - b) Increase blood-Sodium level
 - c) Decrease blood calcium level
 - d) Increase blood-calcium level

- 7) This is not an endocrine gland.
 - a) Salivary
 - b) Adrenal
 - c) Pituitary
 - d) Thyroid
- 8) Which of the following is an accumulation and releasing centre of neurohormone?
 - a) Hypothalamus
 - b) Anterior pituitary
 - c) Posterior pituitary
 - d) Intermediate lobe of pituitary
- 9) Which of the following gland regarded as master gland?
 - a) Adrenal
 - b) Hypothalamus
 - c) Thyroid
 - d) Pituitary
- 10) Which of the following is not released by anterior pituitary?
 - a) Prolactin
 - b) FSH
 - c) TSH
 - d) ADH

B) Give answer in one word.

06

- 1) Testis produce which hormone?
- 2) Ovary produce which hormone?
- 3) Pancreas produce which endocrine hormone?
- 4) Thyroid gland produce which hormone?
- 5) Parathyroid gland produce which hormone?
- 6) Adrenal gland produce which hormone?

Q.2 Solve any Eight of the following.

16

- a) Hormones of posterior pituitary
- b) Structure of testis
- c) GnRH
- d) Neurohormone
- e) Feedback mechanism
- f) Functions of MSH
- g) Structure of hypothalamus
- h) Pineal gland
- i) Neurosecretion
- j) Structure of placenta

Q.3 A) Attempt any Two of the following.

10

- 1) Explain hormonal regulation of ovary.
- 2) Describe classification of hormones.
- 3) Explain functions of placenta.

B) Describe location, structure and functions of posterior pituitary.

06

- Q.4 A) Attempt any Two of the following. 08**
- 1) Explain hormones of testis.
 - 2) Describe role of pineal gland in biological rhythm.
 - 3) Explain neuroendocrine gland.

- B) Describe the role of adenohypophysis in endocrine system. 08**

- Q.5 Attempt any Two of the following. 16**
- a) Explain feedback mechanism of hypothalamus.
 - b) Describe characteristics and transport of hormones.
 - c) Explain structure, hormones, functions of ovary.

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Mathematics (Special Paper - XI)
Real Analysis (22221519)

Day & Date: Monday, 05-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figure to right indicate full marks.

Q.1 A) Choose the correct alternative for each of the following. 10

- 1) The sequence $\{(-1)^{0-1}\}$ is _____.
 a) only bounded above b) only bounded below
 c) bounded d) unbounded
- 2) The sequence $\left\{\log\left(\frac{1}{n}\right)\right\}_{n=1}^{\infty}$ _____.
 a) Converges b) Diverges to ∞
 c) Diverges to $-\infty$ d) Oscillates
- 3) If B is an infinite subset of countable set A then B is _____.
 a) uncountable b) countable
 c) equivalent d) countable and uncountable
- 4) The series $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \dots$ is _____.
 a) Divergent b) Convergent
 c) Oscillatory d) Both (a) and (b)
- 5) Every Cauchy sequence of real no is _____.
 a) Divergent b) Unbounded
 c) Convergent d) Oscillatory
- 6) If $f: A \rightarrow B$ and $x \subset A, y \subset A$ then $f(x \cup y) =$ _____.
 a) $f(x) \cap f(y)$ b) $f(x) \cup f(y)$
 c) $f^{-1}(x) \cap f^{-1}(y)$ d) $f^{-1}(x) \cup f^{-1}(y)$
- 7) The series $\sum_{n=1}^{\infty} \frac{1}{n}$ is _____.
 a) Convergent b) Divergent
 c) Conditionally convergent d) Absolute convergent

- 8) If $f(x) = x^2$ ($-\infty < x < \infty$) then $f^{-1}(7)$ is _____.
 a) $\{\sqrt{7}\}$ b) $\{-\sqrt{7}\}$
 c) $\{\sqrt{7}, -\sqrt{7}\}$ d) ϕ
- 9) If $\lim_{n \rightarrow \infty} \left(\frac{3n^2 - 6n}{5n^2 + 4} \right) = \text{_____}$.
 a) $\frac{5}{3}$ b) $\frac{3}{5}$
 c) $\frac{6}{4}$ d) $\frac{5}{6}$
- 10) The series $\sum_{n=2}^{\infty} \frac{1}{n(\log n)^P}$ is convergent if _____.
 a) $P = 1$ b) $P < 1$
 c) $P \leq 1$ d) $P > 1$

B) Fill in the blanks.

06

- 1) The series $1 + r + r^2 + r^3 + \dots$ is oscillatory if _____.
If $\mathcal{X}$ is the characteristics function on the set A and B then
- 2) $\mathcal{X}_{A \cup B} =$ _____.
- 3) If $s_n = (-1)^n$ then $\liminf_{n \rightarrow \infty} s_n =$ _____.
- 4) If $\sum_{n=1}^{\infty} a_n$ is convergent then $\lim_{n \rightarrow \infty} a_n =$ _____.
- 5) If $\lim_{n \rightarrow \infty} \left(1 + \frac{2}{n}\right)^n =$ _____.
- 6) If $0 < x < 1$ then $\sum_{n=0}^{\infty} x^n$ converges to _____.

Q.2 Attempt any Eight of following.

16

- a) Prove that $(A - C) \cap (B - C) \subset (A \cap B) - C$
- b) If $s = (s_n) = (2n - 1)$ and $\sigma = ni = i^2$ write down the different term of s and subsequence $s. \sigma$
- c) If $\sum_{n=1}^{\infty} a_n$ converges to A and $\sum_{n=1}^{\infty} b_n$ converges to B then $\sum_{n=1}^{\infty} (a_n + b_n)$ converges to $A + B$
- d) Find another following series are convergent $\sum_{n=1}^{\infty} \frac{n+2}{10^{10}(n+3)}$

- e) Find the limit superior and limit inferior of the sequence
 $\{s_n\}_{n=1}^{\infty} = \sin n \frac{\pi}{2} + (-1)^n$
- f) If $f(x) = \log x$ for $x \in (0, \infty)$ if $A = [1, 3]$ find $f^{-1}(A)$.
- g) Define Monotone sequence.
- h) Define absolute convergence and conditional convergence of series.
- i) Find whether the following sequence are convergent
 $1, -1/2, 1/3, -1/4, \dots$
- j) Prove that set of all integer is countable.

Q.3 A) Attempt any two of the following. **10**

- Let $S_n = 1 + \frac{1}{1!} + \frac{1}{2!} + \dots + \frac{1}{n!}$
- 1) Prove that $\lim_{n \rightarrow \infty} S_n$ exists and lies 2 and 3.
- If $\lim_{n \rightarrow \infty} S_n = L$ and $\lim_{n \rightarrow \infty} t_n = M$ then prove that
- 2) $\lim_{n \rightarrow \infty} (S_n - t_n) = L - M$
- 3) Prove that the series $\sum_{n=1}^{\infty} \frac{1}{n}$ is divergent.

B) If $\lim_{n \rightarrow \infty} \sup |a_n|^{1/n} = A$ then the series of real no $\sum_{n=1}^{\infty} a_n$ **06**

- 1) Converges absolutely if $A < 1$
- 2) Diverges if $A > 1$
- 3) If $A = 1$ test fails

Q.4 A) Attempt any two of the following. **08**

- If $f: A \rightarrow B$ and $X \subset B, Y \subset B$ then
- 1) $f^{-1}(X \cup Y) = f^{-1}(X) \cup f^{-1}(Y)$
- 2) For any $a, b \in \mathbb{R}$ such that
 $||a| - |b|| \leq |a - b|$
 Then prove that $\{s_n\}_{n=1}^{\infty}$ converges to $|L|$ if $\{s_n\}_{n=1}^{\infty}$ converges to L .
- 3) Prove that $1 + \frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + \dots$ converges.

B) If A and B are subset of S then **08**

1) $(A \cup B)' = A' \cap B'$

2) $(A \cap B)' = A' \cup B'$

Q.5 Attempt any two of the following.

a) If $\{s_n\}_{n=1}^{\infty}$ is convergent then $\lim_{n \rightarrow \infty} \inf s_n = \lim_{n \rightarrow \infty} s_n$

b) 1) If $0 < x < 1$ then $\sum_{n=0}^{\infty} x^n$ converges to $\frac{1}{1-x}$

2) If $x \geq 1$ then $\sum_{n=0}^{\infty} x^n$ diverges.

c) An infinite subset of a constable is countable.

Seat No.	

Set P

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Statistics (Special Paper - XI)
Sampling Techniques (22221522)

Day & Date: Monday, 05-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) Under proportional allocation, the size of the sample from each stratum depends on _____.
 a) Total sample size b) Size of the stratum
 c) Population size d) All the above
- 2) The discrepancy between estimate and population parameter is known as _____.
 a) human error b) sampling error
 c) non-sampling error d) none of these
- 3) In presence of linear trend _____ method is more efficient.
 a) Stratified b) Systematic
 c) SRSWOR d) SRSWR
- 4) The total number of possible samples of size n , drawn from population size N by SRSWR is _____.
 a) n b) N
 c) $\binom{N}{n}$ d) N^n
- 5) The population size of i^{th} stratum in stratified sampling.
 a) N b) n
 c) N_i d) n_i
- 6) Systematic sampling means _____.
 a) Selection of n contiguous units
 b) Selection of n units situated at equal distances
 c) Selection of n largest units.
 d) Selection of n middle units in a sequence
- 7) Probability of selection of same at each subsequent draw in _____.
 a) SRSWOR b) SRSWR
 c) both (a) and (b) d) neither (a) nor (b)

- 8) How many types of allocation are in common use?
 - a) One
 - b) Two
 - c) Three
 - d) Four
- 9) In Linear systematic sampling total number of possible samples _____.
 - a) N
 - b) k
 - c) n
 - d) $N!$
- 10) When respondents not available for information then this is _____ type of error.
 - a) formula error
 - b) sampling error
 - c) non- sampling error
 - d) none of the above

B) Define the following.

06

- 1) Population and sample
- 2) Purposive sampling
- 3) Representative sample
- 4) Sampling frame
- 5) Census
- 6) Auxiliary variable

Q.2 Solve any Eight of the following.

16

- State any two non-sampling errors.
- Give a real life situation where Systematic sampling is used.
- State ratio estimator.
- Give a real life situation where stratified random sampling is used.
- Define purposive sampling.
- What is meant by proportional allocation?
- Give a real life situation where stratified sampling is used over SRS.
- State the advantages of sampling method over census method.
- Write difference between stratified sampling and cluster sampling.

Q.3 A) Attempt any Two of the following.

10

- 1) Explain sampling for proportion, obtain its unbiased estimator for population proportion.
- 2) Find estimate of population mean and variance in case of cluster sampling.
- 3) Find under what condition ratio estimate is more efficient than SRS.

B) Write a short note on a stratified random sampling.

06

Q.4 A) Attempt any Two of the following.

- 1) Compare regression estimator over ratio estimator.
- 2) Describe the idea of two-stage and multistage sampling in details.
- 3) Show that ratio estimator is biased.

B) Describe allocation problem and find variances under proportional allocation and Neyman allocation.**08****Q.5 Attempt any Two of the following.****16**

- a) With usual notations prove that Neyman's allocation has better precision than proportional allocation; and also prove that proportional allocation has better precision than SRS.
- b) In presence of linear trend of the form $Y_i = a + bi; i = 1, 2, \dots, N$, compare SRSWOR, Stratified random sampling and systematic sampling.
- c) Discuss choice of sample size based on the cost of survey and variability by using cost function
 - 1) Minimize variability for given variability
 - 2) Minimize cost for given variability

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Geology (Special Paper - XI)
Applied Geology - Engineering Geology (22221527)

Day & Date: Monday, 05-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagrams wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of log table and calculators is allowed)

Q.1 A) Multiple choice questions.**10**

- 1) A tunnel passing through core of syncline and align parallel to fold axis is _____ site
 - a) Favourable
 - b) Unfavourable
 - c) Both a and b
 - d) Cannot say
- 2) Stress is expressed as (P-load and A-area)
 - a) P/A
 - b) A/P
 - c) $A \times P$
 - d) $A/P \times 100$
- 3) Strain is a _____
 - a) The change in metals
 - b) The change of form produced in a piece by the action of load
 - c) The result of the application on a body
 - d) The change in shape and direction in metal
- 4) The strain at a point is a _____
 - a) Scalar
 - b) Vector
 - c) Tensor
 - d) None of these
- 5) The Bhakra dam is located on _____
 - a) Sandstone only
 - b) Sandstone interbedded with clay stone and siltstone
 - c) Gneissic complex
 - d) Clayey formation
- 6) Which of the following has low crushing strength and low porosity?
 - a) Quartzite
 - b) Vesicular basalt
 - c) Gabbro
 - d) Compact basalt
- 7) _____ is a process of collection and recharge of rainwater within bore well from rooftop in Urban areas.
 - a) Trench recharge
 - b) Rainwater harvesting
 - c) Flooding
 - d) Pit recharge

- 8) Strength of building stone mainly depends upon _____
 a) Mineral composition b) Texture
 c) Structure d) All of these
- 9) Which of the following should be considered while aligning a tunnel?
 a) Atmospheric conditions b) Hydrological conditions
 c) Climatic conditions d) Surface limits
- 10) Which of the following mass movements is the fastest?
 a) Mudflows b) Debris flow
 c) Soil creep d) Earthflow

B) Answer the following questions in a one sentence / Fill in the blanks. 06

- 1) Preparation of geological map is done in the _____ stage of the civil engineering project
- 2) The branch or study which deals with behaviour of rocks under applied forces is called _____
- 3) What is the maximum compressive force expressed per unit area, which a stone can withstand without rupturing?
- 4) Which rock possesses very high compressive strength?
- 5) The compressive strength of granite is _____
- 6) Modulus of elasticity is derived from _____

Q.2 Solve any Eight of the following 16

- 1) Which one of the following parameters can be derived by both direct and indirect methods?
- 2) Define dam.
- 3) What are the objectives for the construction of dam?
- 4) Define reservoir.
- 5) What are the factors influencing soil development?
- 6) What is subsidence?
- 7) What is creep?
- 8) What is RQD?
- 9) What is test pit?
- 10) Define porosity.

Q.3 A) Attempt any Two of the following. 10

- 1) Explain siltation process.
- 2) Describe gravity dam with suitable labelled diagram.
- 3) Write short note on shear stress.

B) Write a note on Geological conditions for selection of dam. 06

Q.4 A) Attempt any Two of the following 08

- 1) Describe durability of building stones.
- 2) Explain the shear strength.
- 3) Discuss in brief the various causes of landslide.

B) Explain classification of landslides with suitable diagram. **08**

Q.5 Attempt any Two of the following. **16**

- a)** Explain the geological factors affecting construction of Roads.
- b)** What is RQD? Explain advantage and disadvantage.
- c)** Explain the geological considerations involved in the Tunneling.

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Microbiology (Special Paper - XI)
Immunology (22221531)

Day & Date: Monday, 05-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) The _____ antibody is produced in primary immune response.

a) Ig G	b) Ig E
c) Ig M	d) Ig A
- 2) _____ blood group is called universal blood donor.

a) A	b) B
c) AB	d) O
- 3) _____ lymphocytes are involved in cell mediated immunity.

a) B	b) T
c) Macrophage	d) Neutrophils
- 4) The immune complex is required for activation of _____ complement pathway.

a) Classical	b) Alternative
c) Lectin	d) All of the above
- 5) Humoral immunity is mediated by _____.

a) B cells	b) Macrophages
c) Dendritic cells	d) Cytotoxic T cells
- 6) Myasthenia gravis is an example of _____ disease.

a) Transitory autoimmune	
b) Organ specific autoimmune	
c) Non organ specific autoimmune	
d) Complement deficiency	
- 7) The _____ type of reaginic antibody is involved in type I hypersensitivity.

a) Ig M	b) Ig G
c) Ig E	d) Ig D

Q.5 Attempt any Two of the following.

16

- a)** Describe in detail delayed type of hypersensitivity.
- b)** Give a detailed account of organ specific autoimmune disorders.
- c)** Describe properties of complement and write a note on Classical complement pathway.

Seat No.	

Set	P

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Electronics (Special Paper - XI)
Sensors and Transducers (22221539)

Day & Date: Monday, 05-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) _____ Transducers doesn't need external energy for their operation.

a) Active	b) Passive
c) Inverse	d) Both a & b
- 2) _____ is the design value, most probable value that calculations indicate one should expect to measure.

a) Expected value	b) Sensitivity
c) Error	d) Drift
- 3) _____ is not a dynamic characteristics.

a) Precision	b) Fidelity
c) Dynamic error	d) Measuring lag
- 4) _____ is produced when photoconductive cell is connected to load.

a) Light	b) Electric current
c) Heat	d) Voltage
- 5) NTC type Thermistor has _____ Temperature coefficient of resistance.

a) negative	b) positive
c) both	d) zero
- 6) _____ is represents piezoelectric materials.

a) ADP	b) Quartz
c) Bernilite	d) All of the mentioned
- 7) In piezoelectric transducer voltage developed is _____ to strain applied.

a) Directly proportional	b) Inversely proportional
c) Equal	d) Independent

- 8) LM 35 sensor is _____.
 a) Pressure sensor b) Humidity sensor
 c) Temperature sensor d) Touch
- 9) _____ is temperature measuring instruments need not touch the object whose temperature is being measured.
 a) Radiation/Infrared pyrometer
 b) Thermocouple
 c) RTD
 d) All of these
- 10) Thermocouple generate output voltage according to _____.
 a) Circuit parameters b) Humidity
 c) Temperature d) Voltage

B) One sentence answer**06**

- 1) What is of Passive Transducers?
- 2) What is Actuator?
- 3) Enlist Photoelectric Transducers.
- 4) PIR stands for?
- 5) Define Accuracy.
- 6) Define measurand.

Q.2 Solve any Eight of the following.**16**

- a) What is the basic needs of measurement?
- b) Give the principle of operation of capacitive Transducer.
- c) What is RTD?
- d) Basic difference between sensor and transducer.
- e) Draw the diagram of Resistive Position transducer.
- f) Give the principle of operation of resistive Transducer.
- g) State any four points to be considered while selecting a transducer for any application.
- h) Give selection criteria for transducer.
- i) What is need of system calibration.
- j) What is optocouplers?

Q.3 A) Attempt any Two of the following.**10**

- 1) Explain with neat diagram RVDT.
- 2) Explain Classification of transducers.
- 3) Explain hall effect transducer with diagram.

B) Write a note on Thermistor.**06****Q.4 A) Attempt any Two of the following.****08**

- 1) Explain Pyrometers.
- 2) Explain LM 35.
- 3) Explain LPG sensor.

B) What is Explain the construction and working of Electromagnetic Relay? **08**

Q.5 Attempt any Two of the following. **16**

- a)** What is Photoelectric Transducers? Explain Photovoltaic cell.
- b)** Explain Thermocouple in brief.
- c)** Discuss static and dynamic characteristics & responses of instrument.

Seat No.	

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B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Computer Science (Special Paper - XI)
Dot Net Core (22221535)

Day & Date: Monday, 05-May-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.
4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) In reference type, the memory allocation made with _____.
 - a) stack
 - b) Heap
 - c) queue
 - d) Hashtable
- 2) Choose the keyword which declares the indexer?
 - a) base
 - b) this
 - c) super
 - d) extract
- 3) Which of these clauses will be executed even if no exception are found?
 - a) throws
 - b) finally
 - c) throw
 - d) catch
- 4) Which of the following is incorrect about a delegate?
 - a) A delegate can invoke more than one method
 - b) Delegate are value type
 - c) Delegate is like a function pointer
 - d) Delegate are stored reference of a method
- 5) What is Default value of a Boolean variable in C# if not initialized explicitly?
 - a) False
 - b) True
 - c) 0
 - d) Null
- 6) _____ is not Exception class.
 - a) DivideByZeroException
 - b) ArithmeticException
 - c) NullReferenceException
 - d) OverflowStackException
- 7) A type of class which does not have its own objects but acts as a base for its subclass is known as?
 - a) Static class
 - b) Abstract class
 - c) Sealed class
 - d) None of the mentioned

- 8) Which of the following is the correct about interfaces in C#?
 - a) interfaces are declared using the interface keyword
 - b) interfaces methods are public by default
 - c) Both a) and b)
 - d) None of the above
- 9) Events enable a class or object to notify other classes or objects when something of action occurs.
 - a) True
 - b) False
- 10) Which reference modifier is used to define reference variable?
 - a) &
 - b) ref
 - c) #
 - d) \$

B) Fill in the blank.**06**

- 1) MSIL stands for _____.
- 2) Converting an object to Binary format is called _____ Serialization.
- 3) LINQ stands for _____.
- 4) By default every process has at least one thread that is responsible for executing the application code, and that thread is called _____ Thread.
- 5) _____ method tries to pop and return last item from ConcurrentStack<T> collection class.
- 6) _____ priority is default priority of the Thread.

Q.2 Solve any Eight of the following.**16**

- a) Define Boxing and Unboxing.
- b) State the use of Deconstruct.
- c) What is Exception?
- d) Give the need for operator overloading?
- e) State difference between method overloading and method overriding.
- f) What is Thread?
- g) Define Anonymous method.
- h) What is the purpose of Garbage Collector?
- i) State of the use of Enumeration.
- j) Differentiate between Foreground Thread and Background Thread.

Q.3 A) Attempt any Two of the following.**10**

- 1) Write a program to demonstrate custom exception.
- 2) Write a program to implement generic list with basic operations.
- 3) Explain XML Serialization.

B) Explain in detail Multithreading.**06****Q.4 A) Attempt any Two of the following.****08**

- 1) What is method overriding? Explain with example.
- 2) Write a short note on foreach loop.
- 3) Explain Tuple with example.

B) What is inheritance.? Explain types of inheritance with example. **08**

Q.5 Attempt any Two of the following. **16**

- a)** What is Delegate? Write a program that uses multicast delegate.
- b)** Write a program to overload any two binary operators.
- c)** Explain constructor with its type in detail.

Seat No.	

Set **P**

B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination: March/April - 2025
Physics (Special Paper-XII)
Nuclear Physics (22221512)

Day & Date: Tuesday, 06-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagrams wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative : **10**

- 1) Nucleus of an atom consists of _____
 - a) protons and electrons
 - b) protons and neutrons
 - c) neutrons and electrons
 - d) protons, electrons and neutrons
- 2) In exothermic nuclear reactions the Q value should be _____
 - a) positive
 - b) negative
 - c) zero
 - d) infinity
- 3) In stripping reaction product and target nuclei are _____
 - a) Isomers
 - b) isobars
 - c) isotopes
 - d) monomers
- 4) An accelerator is used for increasing of a charged particles.
 - a) Potential energy
 - b) kinetic energy
 - c) binding energy
 - d) excitation energy
- 5) In cyclotron time for semicircular path of ion is _____ for every revolution.
 - a) Increases
 - b) decreases
 - c) constant
 - d) zero
- 6) The substance which emits flash of light when high energetic charge particles strikes on it is called _____
 - a) Phosphor
 - b) collector
 - c) eimtter
 - d) absorber
- 7) Voltage discriminator in counter is used to _____
 - a) Increase low level noise pulses
 - b) remove low level noise pulses
 - c) amplify the signal
 - d) counting the particles

- 8) α - rays are nothing but _____
 a) Hydrogen nucleus
 b) Helium nucleus
 c) Sodium nucleus
 d) Lanthanum nucleus
- 9) Hydrons means _____
 a) intermediate
 b) bulky
 c) heavy
 d) light in weight
- 10) Field particle in electromagnetic force is _____
 a) muon
 b) pion
 c) photon
 d) positron

Q.1 B) Fill in the blanks

06

- 1) The value of packing fraction is $P =$ _____
- 2) In nuclear reaction the bombarding particle is called _____
- 3) The betatron accelerates _____ ions
- 4) The time at which GM tube unable to count pulse is called _____
- 5) Neutrino hypothesis was postulated by _____
- 6) Photon obeys _____ statistics.

Q.2 Solve any Eight of the following.

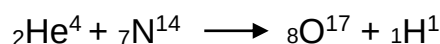
16

- 1) Define Binding Energy.
- 2) Explain endothermic reaction.
- 3) What is pickup reaction?
- 4) What is accelerator?
- 5) State principle of scintillation counter.
- 6) Define dead time and recovery time.
- 7) Define α -disintegration energy.
- 8) Give properties of Photons
- 9) What is Gravitational Interaction?
- 10) Define Mass defect.

Q.3 A) Attempt any Two of the following.

10

- 1) Calculate Q- value of the following reaction and indicate type of reaction.



Given: Mass of ${}_2\text{He}^4 = 4.0038727$ a.m.u

Mass of ${}_7\text{N}^{14} = 14.003074$ a.m.u.

Mass of ${}_8\text{O}^{17} = 16.999133$ a.m.u.

Mass of ${}_1\text{H}^1 = 1.007825$ a.m.u.

1 a.m.u. = 931 MeV

- 2) Explain β -ray spectrometer and Neutrino hypothesis.
- 3) Explain the classification of elementary particles in brief.

B) Explain liquid drop model of nucleus.

06

- Q.4 A) Attempt any Two of the following. 08**
- 1)** Explain electrical quadrupole moment.
 - 2)** Obtain betatron condition and explain the construction and working of betatron.
 - 3)** Explain electromagnetic and weak nuclear interactions.
- B) Explain construction and working of cyclotron. What are the limitations of cyclotron? 08**
- Q.5 Attempt any Two of the following. 16**
- 1)** Obtain semi - empirical mass formula.
 - 2)** Explain construction and working of GM counter. Hence explain Geiger plateau region.
 - 3)** Explain continuous nature of β -ray spectrum and fine structure of α line spectra.

Seat No.	

Set **P**

B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination: March/April - 2025
Chemistry (Special Paper-XII)
Analytical and Industrial Physical Chemistry (22221508-A)

Day & Date: Tuesday, 06-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagrams wherever necessary.
 3) Figures to right indicate full marks.
 4) Use of log table and calculators is allowed.

Q.1 A) Choose the must correct alternative of the following and rewrite the sentences 10

- 1) The logarithm of opacity is known as _____.
 a) transmittance b) optical density
 c) extinction coefficient d) absorbance
- 2) The equation, $I_t = I_0 e^{-kt}$ represents _____.
 a) Lambert's law b) Grotthus law
 c) Lambert-Beer's law d) none of these
- 3) In potentiometric titrations between AgNO_3 and KCl , the salt bridge used is _____.
 a) KCl b) KNO_3
 c) NH_4Cl d) KBr
- 4) In laminar flow burner, the sample used is _____ %.
 a) 100 b) 50
 c) 5 d) 25
- 5) In potentiometric measurements, saturated calomel electrode is used as a _____ electrode.
 a) reference b) indicator
 c) auxiliary d) All of these
- 6) The temperature of the flame is controlled by _____ factors.
 a) fuel-oxidant ratio b) type of solvent
 c) type of fuel and oxidant d) all of these
- 7) Titrations in which end points are determined by conductance measurements are called _____.
 a) potentiometric titrations
 b) conductometric titrations
 c) amperometric titrations
 d) all of these

- 8)** Current density is usually expressed in terms of _____
- a) Am.dm^{-2} b) Am.dm^2
- c) Am.dm^{-1} d) Am.dm^1
- 9)** The process of cleaning the article in acid is known as _____
- a) dipping b) pickling
- c) tumbling d) brightening
- 10)** To determine the cell constant _____ electrolyte is preferred.
- a) KCl b) KNO_3
- c) NH_4NO_3 d) all of these

Q.1 B) Fill in the blanks

06

- 1) In conductivity cell _____ plates are used as electrodes.
- 2) The molecular formula of quinhydrone is _____
- 3) Boltzmann distribution equation for the fraction of free atoms that are thermally excited is given as $\frac{N^*}{N_0} = \text{_____}$
- 4) In electroplating process the article to be plated is generally made as _____
- 5) The equivalent conductance is given by the relation, $\lambda = \text{_____}$
- 6) The material most commonly used in making prism in flame photometer is _____

Q.2 Solve any Eight of the following.

16

- 1) State Lambert-Beer's law.
- 2) Represent the nature of graph for the determination of end point by classical method.
- 3) What is principle of potentiometric titrations?
- 4) State the Faraday's laws of electrolysis.
- 5) Cathode efficiency and anode efficiency is expressed by
- 6) Explain the term electroforming.
- 7) Explain the terms with reference to flame photometry: i) Filters ii) Slits
- 8) What are the advantages of premix burner?
- 9) Mention different types of conductometric titrations with suitable example of each.
- 10) How conductivity water is prepared?

Q.3 A) Attempt any Two of the following.

10

- 1) Discuss single cell photoelectric colorimeter.
- 2) Discuss acid -base titration potentiometrically.
- 3) What are the factors used to control the temperature of flame in flame photometer.

B) Explain briefly the process of electroplating of nickel.

06

- Q.4 A) Attempt any Two of the following. 08**
- 1)** State and explain the Lambert's law.
 - 2)** Write note on photovoltaic cell.
 - 3)** Explain the basic circuit diagram of D.C. Wheatstone bridge.
- B) Discuss classical and analytical methods for determination of end point of potentiometric titration. Give advantages of potentiometric titrations. 08**
- Q.5 Attempt any Two of the following. 16**
- 1)** Describe principles of electroplating.
 - 2)** what is flame photometry? Discuss qualitative and quantitative applications of flame photometry.
 - 3)** Discuss in detail the conductometric titration of strong acid against strong base. Give advantages of conductometric titrations.

Seat No.	

Set P

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
CHEMISTRY (Special Paper - XII)
Methodology and Materials of Industrial Importance (22221508-B)

Day & Date: Tuesday, 06-May-2025

Max. Marks: 80

Time: 12:00 PM To 03:00 PM

- Instructions:** 1) All questions are compulsory.
 2) Draw neat and labeled diagram and give equations wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of logarithmic table and calculator is allowed.

Q.1 A) Rewrite the following sentences by selecting correct answers from given alternatives. 10

- 1) _____ of following method of graphical representation of data would be useful for showing association between two variable.
 - a) Ogive
 - b) Histogram
 - c) Scatter Plot
 - d) Pie Chart
- 2) In data processing, what does abbreviation SAP stands for _____.
 - a) System, application, product
 - b) Sales, allocation, purchases
 - c) System, authorization, program
 - d) System, algorithm, process
- 3) Nucleation in nanoparticle synthesis gives _____ product.
 - a) Kinetically stable
 - b) Electrically stable
 - c) Thermodynamically stable
 - d) Electro-sterically stable
- 4) Mechanical properties of fiber-reinforced composites depend on _____.
 - a) Properties of constituents
 - b) Interface strength
 - c) Fiber length, orientation, and volume fraction
 - d) All of above
- 5) Which one of the following is a non-parametric statistic?
 - a) F - statistic
 - b) t - statistic
 - c) Pearson's correlation
 - d) Spearman's correlation
- 6) Which of the following is an example of a chemical hazard?
 - a) Slippery floors
 - b) Loud noise
 - c) High temperature
 - d) Toxic fumes
- 7) Size of nanoparticles is ranged between _____ nm.
 - a) 0.01-1
 - b) 1-100
 - c) 0.1-10
 - d) 100-1000

- 8) Generally _____ are not combine with fiber to give composites.
- nonmetals
 - nonmetals
 - ceramics
 - metals
- 9) What is the purpose of using personal protective equipment (PPE) in chemical handling?
- To improve communication
 - To enhance productivity
 - To prevent chemical reactions
 - To minimize exposure and protect against hazards
- 10) What does the "flammable" symbol on a chemical container indicate?
- The chemical is highly corrosive
 - The chemical is explosive
 - The chemical can catch fire easily
 - The chemical is radioactive

B) Answer in short:**06**

- Define regression.
- What mean by ethical handling of chemicals.
- What is the biggest problem with Top Down approach in nanomaterial synthesis?
- Write the names of materials used for filling in sandwich structures of composite materials.
- What is residuals analysis?
- In composites, higher the amount of Reinforcement content, greater will be its strength. True or False?

Q.2 Answer the following: (Any Eight)**16**

- What are health effect of hazardous chemicals on human.
- Explain polynomial fitting with example.
- What are gold metallic nanoparticles? Give any one method of its preparation.
- Write the limitations of conventional engineering materials.
- Explain the multiple linear regression analysis.
- Give the examples of hazards, flammable or explosive chemicals.
- Explain one dimensional control method of nano synthesis in short.
- Mention important characteristics of composite
- What is linearizing transformations?
- What is Incineration?

Q.3 A) Attempt the following: (Any Two)**10**

- How data analysis is used for scientific method and design of experiments.
- Give the applications of composites materials.
- How to identify, verify and segregate laboratory waste.

- B) What are Bio-inorganic nanomaterials? Explain natural and anti-sical nanomaterials.**

06

- Q.4 A) Attempt the following. (Any Two) 08**
- 1) What are key of investigative approach used in measurements.
 - 2) Explain the environmental effects on composites.
 - 3) Discuss the bio-nanocomposites.
- B) Explain in detail the classification of composite materials with example. 08**
- Q.5 Attempt the following. (Any Two) 16**
- a) Discuss carbon nanotubes and inorganic nanowires.
 - b) What are procedure for working with substances that pose hazards, flammable or explosive hazards.
 - c) What is chemometrics. Explain the various statistics methods used in data analysis.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
March/April - 2025
Botany (Special Paper- XII)
Plant Breeding (22221504- A)**

Day & Date: Tuesday, 06-May-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Multiple choice questions. 10

- 1) Breeding for disease resistance requires _____.
a) good source of resistance b) planned hybridization
c) disease test d) All of these
- 2) The hybridization between two strains of same species is called as _____ hybridization.
a) Intervarietal b) Intergeneric
c) Interspeci d) complex
- 3) Heterosis is _____.
a) Appearance of spontaneous mutations
b) Induction of mutation
c) Mixture of two or more traits
d) Superiority of hybrids over their parents
- 4) Removal of stamens from the flowers before dehiscence of anthers is called _____.
a) emasculation b) badding
c) tagging d) Selfing
- 5) A cross between F₁ generation and recessive parent is known as _____.
a) one way cross b) two way cross
c) backcross d) selection
- 6) Mutation frequency during plant breeding depends on _____.
a) Dose (Concentration x time)
b) pH value
c) temperature
d) humidity
- 7) _____ is intellectual Property.
a) Car b) Building
c) Literary Works d) Land

- 8) _____ is patentable.
- | | |
|---------------------------|--------------|
| a) Agricultural implement | b) Soap |
| c) Lubricant | d) Detergent |
- 9) Polyploidy can induce in cell culture by _____.
- | | |
|---------------|-------------|
| a) colchicine | b) PDB |
| c) Acetone | d) Formalin |
- 10) Vavilo proposed _____ main centers of origin of crop diversity.
- | | |
|------|------|
| a) 8 | b) 7 |
| c) 9 | d) 6 |

B) Fill in the blanks.**06**

- 1) In centers of origin of crop plants Indian center is divided in to _____ and _____ sub centers.
- 2) In long term conservation of seed duration is _____.
- 3) In Plant introduction and acclimatization there are _____ types of introduction.
- 4) Non heritable variations are found in _____ selection.
- 5) UV rays are example of _____ radiation.
- 6) Bulk method is found in _____ pollinated crops.

Q.2 Solve any Eight of the following.**16**

- a) Write scope of plant breeding.
- b) China center of origin.
- c) Types of Introduction.
- d) What is pureline selection.
- e) Write Merits of Clonal selection.
- f) What is three way cross?
- g) Enlist chemical mutagenic agents.
- h) Write types of polyploidy.
- i) Types of IPR
- j) Achievement of Mass selection.

Q.3 A) Attempt any Two of the following.**10**

- 1) Explain role of polyploidy in plant breeding.
- 2) Write aims and objectives of Plant breeding.
- 3) Give an account on any two National crop breeding institutes.

B) Write short note on Pedegree method of breeding.**06****Q.4 Attempt any Two of the following.****16**

- a) What is Pureline selection? Describe in brief.
- b) Describe backcross method in brief.
- c) Advantages and disadvantages of IPR.

Q.5 Attempt any Two of the following.

16

- a)** Describe steps in hybridization.
- b)** Describe in detail clonal selection.
- c)** Explain Mutation breeding in brief.

Seat No.	

Set **P**

B.Sc (Plain) (Semester - V) (New) (CBCS) Examination: March/April - 2025
Botany (Special Paper-XII)
ECONOMIC BOTANY (22221504-B)

Day & Date: Tuesday, 06-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Rewrite the following sentence by choosing the correct alternative. 10

- 1) One of the following is source of rubber: _____.
 a) Hevea brasiliensis b) Annona squamosa
 c) Glycine max d) Tectona grandis
- 2) Gossypium hirsutum originate from _____.
 a) Africa b) America
 c) India d) China
- 3) The name of chemical constituent zingiberene refers to _____.
 a) Withania b) Zingiber
 c) Rauvolfia d) Tinospora
- 4) Curcuma longa is commonly called _____.
 a) Saffron b) Henna
 c) Turmeric d) None of these
- 5) _____ of the flowers used as kesar.
 a) Sepals b) Petals
 c) Stigmas d) Ovaries
- 6) Soyabean oil belongs to the following groups of oil: _____.
 a) Drying b) Semi-drying
 c) Non-drying d) Vegetable fats
- 7) _____ is used as botanical pesticide.
 a) Neem b) Custard apple
 c) Tobacco d) All of these
- 8) *Withania somnifera* is a _____ drug.
 a) stem b) rhizome
 c) leaf d) root

- 9) 'Gulvel satva' is prepared from: _____.
 a) *Tinospora cordifolia* b) *Papaver somniferum*
 c) *Terminalia belerica* d) *Ephedra species*

- 10) Example of drugs obtained from flower bud is _____.
 a) Hirda b) Clove
 c) Behda d) Red gram

B) Answer the following one sentence only. 06

- 1) Write down the botanical name of Soyabean.
- 2) Write down the botanical name of Rubber.
- 3) Write down the botanical name Hena.
- 4) Enlist any two dyes plant.
- 5) Enlist any two drugs plant.
- 6) Enlist any two vegetable oil sources pant.

Q.2 Solve any Eight of the following. 16

- a) What is mean by fodder legume? Give its two examples.
- b) What are plant fibers?
- c) State the botanical name and source of drug ginger.
- d) What are plant dyes?
- e) Write any two uses of soybean.
- f) Write the Scientific name of coconut and cotton.
- g) Write any two uses cotton.
- h) Write any two medicinal uses of Ginger.
- i) Write any two medicinal uses of Gulvel.
- j) Write any two uses of Turmeric.

Q.3 A) Attempt any Two of the following. 10

- 1) Explain the morphology, source and economic importance of Henna.
- 2) What are Insectides? Add a note on their uses.
- 3) Write physical and chemical properties of Rubber.

B) Answer the following. 06

- 1) State economic importance of ginger.
- 2) Describe the medicinal properties of *Adathoda zelyanica*.
- 3) Explain the dying properties of Heena.

Q.4 A) Attempt any Two of the following. 08

- 1) Give Botanical name of coir and explain economic importance of Coir.
- 2) Write importance of fodder legumes.
- 3) Describe cultural practice of groundnut.

B) Answer any one of the following. 08

- 1) Describe Botanical name, source, morphology and economic importance of chick pea?
- 2) Give Botanical name, morphology and medicinal uses of Emblica.

Q.5 Attempt any Two of the following.

16

- a)** Give the botanical name, source and economic importance of rubber.
- b)** Give the botanical name, morphological characters, source and economic importance of Tobacco.
- c)** Give the brief account on cultural practices of soyabean.

B.Sc (Plain) (Semester - V) (New) (CBCS) Examination: March/April - 2025
Zoology (Special Paper-XII)
Wildlife Conservation & Management (22221516)

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative. 10

- 1) Wildlife mainly decreasing due to _____.
 - a) Predation
 - b) cutting down forest
 - c) destruction of habitat
 - d) Hunting
- 2) Long form of GPS
 - a) Global positioning solar
 - b) Global positioning sector
 - c) Global positioning section
 - d) Global positioning system
- 3) Which is the following term is used to denote animal species of a particular region?
 - a) Fern
 - b) fauna
 - c) flora
 - d) femina
- 4) Which factor is not included in ecotourism?
 - a) Responsible travel to natural area
 - b) conserve the environment
 - c) sustains of wellbeing of local people
 - d) hunting of animal
- 5) World Environmental Day celebrated on _____.
 - a) 4th June
 - b) 5th June
 - c) 6th June
 - d) 7th June
- 6) Which of the following uses maximum energy?
 - a) Primary consumer
 - b) secondary consumer
 - c) primary producers
 - d) decomposer
- 7) Which of the following is the diversity index?
 - a) Upright index
 - b) inverted index
 - c) bell shaped index
 - d) Simpsons index
- 8) Which one of the following has the highest number of species in nature?
 - a) Insect
 - b) bird
 - c) Mammal
 - d) reptile

- 9) What is full form of WWF?
 a) World wildlife fund b) world wildlife foundation
 c) world wildlife federation d) World wildlife field
- 10) Which one of the following areas in India is a hotspot of biodiversity?
 a) Western Ghats b) Gangetic Plain
 c) Southern Ghats d) Eastern Ghats

B) Answer the following in one sentence **06**

- 1) Climax
- 2) Pug mark
- 3) Wildlife
- 4) National Park in India
- 5) Carrying capacity
- 6) Ecotourism

Q.2 Solve any Eight of the following. **16**

- a) GIS
- b) Care of injured and diseased animal
- c) Great Indian bustard
- d) Sanctuaries in India
- e) CITES
- f) Diversity indices
- g) Steps in succession
- h) Negative values of wildlife
- i) Importance of wildlife conservation
- j) Topography

Q.3 A) Attempt any Two of the following. **10**

- i) Population estimation with the help of fecal analysis of ungulates and carnivores.
- ii) Describe the preservation of general genetic Diversity.
- iii) Give important feature of protected areas in India.

B) Short notes on **06**

Explain wildlife tourism in forest.

Q.4 A) Attempt any Two of the following. **08**

- i) Describe positive values of wildlife.
- ii) Explain biotelemetry of wild animal.
- iii) Describe Wildlife Protection Act 1972.

B) Describe great Indian bustard sanctuaries and their management in India. **08**

Q.5 Attempt any Two of the following.

16

- a) Describe Shannon and Simpsons diversity indices.
- b) Explain in detail on grazing, logging and mechanical treatment as habitat management practices.
- c) Explain tiger reserves in India.

B.Sc (Plain) (Semester - V) (New) (CBCS) Examination: March/April - 2025
Mathematics (Special Paper - XII)
Partial Differential Equations (22221520-A)

Day & Date: Tuesday, 06-May-2025
Time: 12:00 PM To 03:00

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figure to right indicate full marks.

Q.1 A) Choose the correct alternative for each of the following. 10

- 1) By elimination of arbitrary constant a and b from $z = (x + a)(y + b)$ we get p.d.e _____.
a) $z = pq$
b) $z = p/q$
c) $z = q/p$
d) $z = 1/pq$
- 2) When the number of arbitrary constant is less than the number of independent variables then eliminating arbitrary constant we get _____.
a) more than one p.d.e. of order one
b) unique p.d.e. of order one
c) p.d.e. of order greater than one
d) unique p.d.e. of order greater than one
- 3) The general solution of p.d.e. $p + q = 1$ is _____.
a) $\phi(x - y, x - z) = 0$
b) $\phi(x - y, y - z) = 0$
c) Both a) and b)
d) Neither a) nor b)
- 4) The first order partial differential equation $p = P(x, y)$ $q = Q(x, y)$ are compatible if and only if _____.
a) $\frac{\partial P}{\partial y} = \frac{\partial Q}{\partial x}$
b) $\frac{\partial P}{\partial y} = \frac{\partial Q}{\partial x}$
c) $\frac{\partial P}{\partial x} = \frac{\partial Q}{\partial y}$
d) $\frac{\partial P}{\partial x} = \frac{\partial Q}{\partial x}$
- 5) The integral which does not contains an arbitrary constant is called _____.
a) complete integral
b) singular integral
c) general integral
d) particular integral

- 6) The standard form IV of nonlinear p.d.e. of order one is _____.
 a) $f_1(x, p) = f_2(y, q)$ b) $f_1(y, p) = f_2(x, q)$
 c) $f_1(x, y) = f_2(p, q)$ d) All of above
- 7) The particular integral of $\frac{1}{D-mD^1}f(x, y)$ is _____.
 a) $\int f(x, c + mx)dx$ b) $\int f(y, c - mx)dx$
 c) $\int f(x, c - mx)dx$ d) $\int f(y, c + my)dy$
- 8) In $f(DD')$ if roots are repeated twice times, then $CF =$ _____.
 a) $z = \psi_1(y + mx) + \psi_2(y + mx)$
 b) $z = \psi_1(y + mx) + x\psi_2(y + mx)$
 c) $z = \psi_1(y + mx) + \psi_2(y + mx) + \dots + x^n\psi(y + mx)$
 d) None of these
- 9) The general solution of $(D-D^{12})z = 0$ is _____.
 a) $z = \sum Ae^{k^2x+ky}$ b) $z = \sum Ae^{kx-y}$
 c) $z = Ae^{kx-ky}$ d) None of these
- 10) The meaning of $\frac{1}{D}(x^3y^4)$ _____.
 a) $x^3\frac{y^5}{5}$ b) $\frac{x^4}{4}y^4$
 c) $\frac{x^4}{4}\frac{x^5}{5}$ d) $\frac{x^3y^4}{4}$

B) Fill in the blanks.**06**

- 1) The equation $\frac{\partial^2 z}{\partial x^2} - 2\left(\frac{\partial^2 z}{\partial x \partial y}\right) + \left(\frac{\partial z}{\partial y}\right)^2 = 0$ is of order _____.
 2) The equation $P(x, y, z)p + Q(x, y, z)q = R(x, y, z)$ is called _____.
 3) The standard form II of non-linear p.d.e of order one is _____.
 4) The complete integral of $pq = k$ is _____.
 5) The $C.F$ of $(D + 2D' - 3)(D^2 + D')z = 0$ is _____.
 6) The $P.I$ of $(D - D')(D + D' + 1)z = e^{2x+3y}$ is _____.

Q.2 Attempt any Eight of following.**16**

- a) Eliminate arbitrary constant from $z = ax + (c - a)y + b$
 b) Eliminate arbitrary constant from $z = f(x^2 - y^2)$
 c) Solve $p \tan x + q \tan y = \tan z$
 d) Define singular integral.
 e) Find complete integral of $q = px + p^2$
 f) Solve $p - 3x^2 = q^2 - y$
 g) Solve $r = a^2t$

- h) Find c.f $(D^2 - 3aDD' + 2a^2D'^2)z = 0$
 i) Solve $(D + D')z = \sin x$
 j) Solve $(D^2 - D') = 0$

Q.3 A) Attempt any two of the following. 10

- 1) Show that the equation $xp = yq$ and $z(xp + yq) = 2xy$ are compatible and solve them
- 2) Solve $(D^2 + 3DD' + 2D'^2)z = 2x + 3y$
- 3) Solve $(DD' + D - D' - 1)z = xy$

B) Derive the partial differential equation by eliminating arbitrary function ϕ from the equation $\phi(u, v) = 0$ where u & v are function of x, y, z 06

Q.4 A) Attempt any two of the following. 08

- 1) Find C.I, G.I, and S.I. of $z = px + qy + pq$
- 2) Solve $r - 2s + t = \sin(2x + 3y)$
- 3) Find equation of surface Satisfying $4yzp + q + 2y = 0$ and passes through $y^2 + z^2 = 1, x + z = 2$

B) Solve $(D^2 - 3DD' + 2D'^2)z = e^{2x+y} + \cos(2x + y)$ 08

Q.5 Attempt any two of the following. 16

a) Explain the Charpit method of solving the partial differential equation $f(n, y, z, p, q) = 0$ where x and y independent variables.

If $f(DD')$ be homogenous function of D and D' of degree n if
b) $f(a, b) \neq 0$ then prove that $\frac{1}{f(DD')} \phi^n(ax + by) = \frac{1}{f(a,b)} \phi(ax + by)$

c) Explain method of solution of Langrange's partial differential equation $Pp + Qq = R$ with usual notation.

Seat No.	

Set	P

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Statistics (Special Paper-XII)
Operations Research (22221523-A)

Day & Date: Tuesday, 06-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagrams wherever necessary.
 3) Figures to right indicate full marks.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) Operation research analysis does not _____.
 - a) Predict future operation
 - b) Build more than one model
 - c) Collect the relevant data
 - d) Recommended decision and accept

- 2) If one of the constraints of an equation in an LP problem has an unbounded solution, then _____.
 - a) solution to such LP problem must be degenerate
 - b) feasible region should have a line segment
 - c) alternative solutions exist
 - d) none of the above

- 3) A constraint in an LP model restricts _____.
 - a) Value of the objective function
 - b) Value of the decision variable
 - c) Use of the available recourses
 - d) all of the above

- 4) If the value of the objective function z can be increased or decreased indefinitely, such solution is called _____.

a) Bounded solution	b) Unbounded solution
c) Solution	d) None of the above

- 5) The dummy source or destination in a transportation problem is added to _____.
 - a) Satisfying rim condition
 - b) Prevent solution from becoming degenerate
 - c) Ensure that total cost does not exceed a limit
 - d) All of the above

- 6) The slack for an activity is equal to _____.

a) $LF - LS$	b) $EF - ES$
c) $LS - ES$	d) none of the above

- 7) While solving an assignment problem, an activity is assigned to a resource through a square with zero opportunity cost because the objective is to _____.
 a) minimize total cost of assignment
 b) reduce the cost of assignment to zero
 c) reduce the cost of that particular assignment to zero
 d) all of the above
- 8) The another term commonly used for activity slack time is _____.
 a) total float
 b) free float
 c) independent float
 d) all of the above
- 9) Monte Carlo is _____.
 a) a technique for modeling
 b) a book
 c) a technique for Simulation
 d) None of these
- 10) Network models have advantage in terms of project
 a) Planning
 b) Scheduling
 c) Controlling
 d) all of the above

B) Fill in the Blanks:**06**

- 1) The _____ is that region which satisfies all constraints.
- 2) To solve a L.P.P. by simplex method all b_j 's should be _____.
- 3) The graphical method can only be used when there are _____ decision variables.
- 4) The method of finding an initial solution based upon opportunity costs is called _____.
- 5) If a game involves more than two players, then it is called a _____ game.
- 6) Monte Carlo is technique for _____.

Q.2 Solve the following. (Any Eight)**16**

- a) Write the definition of solution, basic solution.
- b) Define LPP in the mathematical form.
- c) How to balance unbalanced T.P?
- d) State the mathematical formulation for T.P.
- e) What is sequencing problem?
- f) When is Big M method useful?
- g) Write similarities and differences between PERT and CPM.
- h) What is an opportunity loss in decision making problem?
- i) What is the artificial variable?
- j) Define Surplus Variable.

Q.3 A) Attempt the following. (Any Two) 10

- a) Five men are available to do five jobs. The time (in hours) that each man takes to do each job is given in the table below

Men/Jobs	1	2	3	4	5
1	10	5	13	15	16
2	3	18	18	13	6
3	10	2	2	2	2
4	7	11	9	7	12
5	7	9	10	4	12

Find the assignment of men to job that will minimize the total time taken.

- b) Write the steps involved in the Procedure of Monte Carlo Simulation.
c) Explain EVPI in decision making

B) Write the procedure of Vogel's approximation method 06**Q.4 A) Attempt the following. (Any Two) 08**

- a) What is a Decision Making under Risk?
b) Write the dual of following LPP:

$$\text{Maximize } Z = 5X_1 + 12X_2 + 4X_3$$

Subject to the constraints,

$$X_1 + 2X_2 + X_3 \leq 10$$

$$2X_1 - X_2 + 3X_3 = 8$$

$$X_1, X_2, X_3 \geq 0$$

- c) Explain the procedure of generating random number from Bernoulli distribution.

B) Solve Following LPP 08

$$\text{Maximize } Z = X_1 - X_2 + 3X_3$$

Subject to the constraints,

$$X_1 + X_2 \leq 20$$

$$X_1 + 6X_3 = 5$$

$$X_2 + X_3 \geq 10$$

$$X_1, X_2, X_3 \geq 0$$

Q.5 Attempt the following. (Any Two) 16

- a) Find the Initial Basic Feasible Solution to the following Transportation problem by using VAM method.

		Destination				Supply
		D ₁	D ₂	D ₃	D ₄	
Source	S ₁	19	30	50	10	7
	S ₂	70	30	40	60	9
	S ₃	40	8	70	20	18
	Demand	5	8	7	14	

- b) A company has factories at F1, F2 & F3 which supply warehouses at W1, W2 and W3. Weekly factory capacities are 200, 160 and 90 units respectively. Weekly warehouse requirements are 180, 120 and 150 units respectively. Unit shipping costs (in rupees) are as follows.

Factory	W1	W2	W3	Supply
F1	16	20	12	200
F2	14	8	18	160
F3	26	24	16	90
Demand	180	120	150	

- c) Suggest the best strategy using the EMV criteria for the following decision making problem:

States Of Nature	Acts			P(E _i)
	A ₁	A ₂	A ₃	
E ₁	25	-10	-125	0.4
E ₂	400	440	400	0.2
E ₃	650	740	750	0.4

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Statistics (Special Paper - XII)
Regression Analysis (22221523-B)

Day & Date: Tuesday, 06-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labeled diagrams whenever necessary.
 4) Use of log table and calculator is allowed.

Q.1 A) Choose the correct alternatives from the following. 10

- 1) The sum of residuals weighted by the corresponding fitted values is always equal to _____.
 a) 0.5 b) 0
 c) 1 d) -1
- 2) If all observations on response variable Y are located on a straight line, then _____.
 a) $SST = SSR$ b) $SSR = SS \text{ res}$
 c) $SST = SS \text{ res}$ d) $SST = SSR = SS \text{ res}$
- 3) In simple linear regression model, errors follow _____.
 a) Normal distribution b) Binomial distribution
 c) Poisson distribution d) Uniform distribution
- 4) In univariate logistic regression model, estimate of odds ratio is given by _____.
 a) $\ln \beta_1$ b) $\frac{1}{\beta_1}$
 c) $\sqrt{\beta_1}$ d) e^{β_1}
- 5) Forward selection method begins with the assumption that _____.
 a) no regressors are in the model
 b) some regressors are in the model
 c) all regressors are in the model
 d) None of These
- 6) In simple linear regression model $Y = \beta_0 + \beta_1 X + \varepsilon$, Y and X are respectively _____.
 a) response variable and regressor variable
 b) regressor variable and response variable
 c) intercept and slope
 d) none of the above

- 7) Regression means _____.
 - a) relation between variables
 - b) relation between dependent and independent variables
 - c) relation between dependent variables
 - d) all the above
- 8) The least square estimate of β_1 in simple linear regression is _____.
 - a) S_{xy}
 - b) S_{xx}
 - c) $\frac{S_{xy}}{S_{xx}}$
 - d) None of the above
- 9) Hat matrix is given by _____.
 - a) $X(X'X)^{-1}$
 - b) $X'(X'X)^{-1}$
 - c) $X'(X'X)^{-1}X$
 - d) $X(X'X)^{-1}X'$
- 10) In the regression equation, $Y = 10 - 5X + \varepsilon$, the slope is _____.
 - a) 10
 - b) -5
 - c) 5
 - d) 50

B) Fill in the blanks.**06**

- 1) The transformation $\ln\left(\frac{\pi(x)}{1-\pi(x)}\right)$ is called _____.
- 2) In simple linear regression β_1 is _____.
- 3) In multiple linear regression model, variance of least square estimator of β is _____.
- 4) In simple linear regression model, the number of independent variables _____.
- 5) In simple linear regression model, to test the hypothesis about intercept parameter _____ test is used.
- 6) In simple linear regression model, the distribution of response variable is assumed to be _____.

Q.2 Attempt any Eight of the following.**16**

- a) Define simple logistic regression model.
- b) Define the matrix H. state Properties of H.
- c) Define residuals.
- d) Explain the term variable selection in linear regression.
- e) State properties of $\hat{\beta}$ in simple linear regression.
- f) With usual notations, show that $Cov(I - H) = 0$
- g) Write multiple linear regression model in matrix form.
- h) Write simple linear regression model.
- i) With usual notations, show that $(1 - H)X = 0$.
- j) Discuss the logit transformation in the context of logistic regression model.

- Q.3 A) Attempt any Two of the following.** **10**
- 1) Define residual vector in regression analysis. Obtain its mean and variance.
 - 2) Define the ANOVA approach to test the significance of regression in a simple regression model.
 - 3) Write note on transformations for linearizing a non-linear model.
- B)** Explain the residual plot. Outline the procedure of construction of normal probability plot. **06**
- Q.4 A) Attempt any Two of following.** **08**
- 1) Define odds ratio, Ψ Write its interpretation if
 - i) $\Psi = 1$
 - ii) $\Psi > 1$
 - iii) $\Psi < 1$
 - 2) Write note on forward selection method.
 - 3) Write note on backward elimination method.
- B)** In usual notations, prove that. **08**
- 1) $Var(\hat{Y}) = \sigma^2 H$
 - 2) $Var(\hat{\beta}) = (X'X)^{-1} \sigma^2$
- Q.5 Attempt any Two of the following.** **16**
- a) Find unbiased estimators of β_0 and β_1 in simple linear regression.
 - b) Derive the maximum likelihood estimators of parameters of logistic regression model with covariate.
 - c) Explain the concept of simple linear regression with illustration. Derive least squares estimators of the regression coefficients in the model.

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Geology (Special Paper - XII)
Applied Geology - Prospecting and Mining Geology (22221528)

Day & Date: Tuesday, 06-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagrams wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of log table and calculator is allowed.

Q.1 A) Select the correct alternative. 10

- 1) Which of the following criteria are associated with the chemical composition and behaviour of elements in the earth's crust.
 - a) Geological
 - b) Geophysical
 - c) Geochemical
 - d) None of the above
- 2) A criteria covers the geological settings associated primarily with the age of various sedimentary series (or intrusions) enclosing a mineral.
 - a) Stratigraphic criteria
 - b) Geomorphological criteria
 - c) Structural criteria
 - d) None of the above
- 3) The pathfinder element of gold is _____.
 - a) As
 - b) Se
 - c) Mo
 - d) SO₄
- 4) The spacing of the trenches, pits and boreholes depend on:
 - a) The length of the ore body
 - b) The modes of occurrence of the deposits
 - c) The depth of the deposits
 - d) The outcrops of the deposits
- 5) The magnetic method of prospecting depends on detecting the:
 - a) Magnetic susceptibility of ore body
 - b) Chemical composition of ores
 - c) Structure of ore deposits
 - d) Anomalies in the earth's
- 6) In the _____ configuration, the current and potential electrode pairs have a common midpoint and the distance between adjacent electrodes are equal.
 - a) Double dipole
 - b) Schlumberger
 - c) Wenner
 - d) pole - pole

- 7) Which mining method is most likely to destroy the habitat of wildlife?
 - a) Subsurface mining
 - b) Strip mining
 - c) Solution mining
 - d) Placer mining
- 8) A series of measurements of resistivity are made by increasing the electrode spacing about a fixed point.
 - a) Resistivity traversing
 - b) Lateral exploration
 - c) Vertical exploration
 - d) Electrical trenching
- 9) Which of the following are major environmental issues involved in mining?
 - a) Air pollution
 - b) Water pollution
 - c) Soil degradation
 - d) All of the above
- 10) Drilling process is employed in mining and geological work for:
 - a) Prospecting
 - b) Exploration
 - c) Blasting and during exploitation for development
 - d) All the above

B) Fill in the blanks:**06**

- 1) Self-potential method is the most suitable method for prospecting of _____ ore.
- 2) Prospecting based on geological maps with scale of 1:50,000 is called _____ survey.
- 3) _____ electrode configuration acquires maximum vertical resolution.
- 4) _____ is an entrance to an underground mine which is horizontal or nearly horizontal, for providing access to a mineral deposit.
- 5) The amount of a particular element present in the parent rock not affected by dispersion or migration is known as _____
- 6) _____ is a method used by analytical chemists to reduce the sample size of a powder without creating a systematic bias.

Q.2 Solve any Eight of the following.**16**

- a) Define Dispersion halo.
- b) Name the instruments used in magnetic geophysical method.
- c) Give two examples of Climatic criteria.
- d) Which of the following are major environmental issues involved in mining activity?
- e) Name the types of sampling used exploration.
- f) Give two examples of path finder elements of gold deposits.
- g) What is mean by curie point?
- h) Name the types of electrical configuration used in resistivity survey.
- i) What is meant winning?
- j) Name the instruments used in seismic methods.

- Q.3 A) Attempt any Two of the following. 10**
- i) Explain in detail Wenner Configuration of resistivity method with neat diagram.
 - ii) Describe the environmental impact of acid mine drainage.
 - iii) Explain any three geological criteria's for coal deposits.
- B) Write the short note on dispersion halos with neat diagram. 06**
- Q.4 A) Attempt any Two of the following. 08**
- i) Discuss the principle of Self potential method with suitable diagram.
 - ii) Describe any four sampling methods used in ore exploration.
 - iii) Define mining. Discuss the elementary parts of mine.
- B) Write short note on electrical sounding and profiling with suitable diagram. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Discuss in brief the instrumentation, field procedure, data interpretation and applications of seismic method.
 - b) Describe in brief principle, field procedure, and data interpretation of magnetic geophysical method. Add note on applications of magnetic method.
 - c) Explain the stages in the life of mine with suitable diagram.

Max. Marks: 80

Q.1 A) Rewrite the following sentences by selecting correct answers from given alternative. 10

- Page 1 of 2

- 9) _____ is used for toxicity testing of product.
- a) Mice b) Monkey
- c) Horse d) Cat
- 10) Sacch. Cerevisiae is used for production of _____.
- a) L. lysine b) Vit B12
- c) Grape wine d) Streptomycin

B) Answer in one sentence

06

- 1) What is Pasteurization?
- 2) What is food poisoning?
- 3) Which sugar is present in milk?
- 4) What is use of Insulin?
- 5) What is purpose of Bruce Ames test?
- 6) What is use of monoclonal antibodies?

Q.2 Solve any Eight of the following.

16

- Give the significance of phosphatase test.
- What is meaning of pyrogenicity testing?
- What is use of streptomycin?
- What are the types of beer?
- What is significance of flocculation in recovery of product?
- Give the principles of food preservation.
- What is rancidity?
- What is HTST pasteurization?
- What is Champaign wine?
- What is quality assurance?

Q.3 A) Attempt any Two of the following.

10

- Describe in brief spoilage of meat.
- Describe recovery of product by chromatography.
- Describe in brief production of L - lysine.

B) Write short note on sources of microorganism and spoilage of milk.

06

Q.4 A) Attempt any Two of the following.

08

- i) Describe monoclonal antibody production.
- ii) Describe bioassay of penicillin.
- iii) Explain in brief Beer production.

B) Describe in detail various method of food preservation.

08

Q.5 Attempt any Two of the following.

16

- Describe in detail food borne diseases.
- Describe in detail streptomycin production.
- Describe in detail Vitamin B12 production.

Max. Marks: 80

Q.1 A) Select the correct alternative. 10

- Page 1 of 3

- 8) Which strain of yeast cause fermentation in bread?
 - a) *Saccharomyces cerevisiae*
 - b) Micrococci
 - c) *Lactobacillus bulgaricus*
 - d) *Streptococcus thermophilus*
- 9) The enzyme Amylase acts on which of the following?
 - a) Proteins
 - b) Fats
 - c) Vitamins
 - d) Carbohydrates
- 10) Biomass is used in the production of _____.
 - a) Fibres
 - b) chemicals
 - c) transportation fuels
 - d) biochemicals

B) Solve the following questions in one sentence**06**

- 1) Define starter culture.
- 2) Give the organism involved in production of Dahi.
- 3) What is the principle of food preservation?
- 4) Name any two organisms involved in fruit and vegetables spoilage.
- 5) What is Probiotic?
- 6) Define biomass.

Q.2 Solve any Eight of the following.**16**

- a) What is food infection?
- b) What is consortium of functional dairy products.
- c) Enlist various types of cheese.
- d) Give the principle of drying in down streaming processing.
- e) How is the cell disruption done for extraction of intracellular products?
- f) Enlist the organisms involved in amylase enzyme production.
- g) Enlist functional dairy products.
- h) What are whey drinks?
- i) Enlist the crystallising agents used in down streaming process.
- j) Name the organisms involved in spoilage of meat and poultry products.

Q.3 A) Attempt any Two of the following.**10**

- i) Give details of food poisoning by *Clostridium*.
- ii) Write an account on solvent extraction and recovery.
- iii) Explain industrial production of Vinegar.

B) Write short note on**06**

Food as a substrate for microorganisms.

Q.4 A) Attempt any Two of the following.**08**

- i) Write in detail on nutritional and therapeutic importance of fermented dairy products.
- ii) Explain industrial production of mushrooms (*Agaricus bisporus*).
- iii) Write an account on down streaming process – Chromatography.

B) write an account on bread and idli fermentation **08**

Q.5 Attempt any Two of the following. 16

- a) What is an antibiotic? Explain the production of streptomycin.
- b) Write in detail on the methods of food preservation.
- c) Write an account on criteria for choice of recovery process.

Seat No.	

Set	P

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Microbiology (Special Paper - XII)
Fermentation Technology (22221532-C)

Day & Date: Tuesday, 06-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagrams wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of log table and calculator is allowed.

Q.1 A) Rewrite the following sentences by choosing correct alternatives given below. 10

- 1) The long exposure of batch sterilization may lead to _____.
 a) Purification of media b) Recovery of media
 c) Degradation d) Good quality of product
- 2) _____ is not a nitrogen source.
 a) Waste liquor b) Corn steep
 c) Yeast extract d) Peptones
- 3) _____ procedure has a great application in strain improvement.
 a) rDNA Technology b) Conjugation
 c) Transformation d) Transduction
- 4) In Ames test, the bacterial culture are grown in _____.
 a) Natural media b) Blood agar
 c) Enriched media d) Minimal media
- 5) _____ process is used in the recovery of the product.
 a) Downstream processing b) Upstream processing
 c) Chromatography d) Treatment process
- 6) _____ is not an aspect in the context of scale-down.
 a) Number of generations b) Oxygen Transfer rate
 c) Mixing d) Temperature
- 7) _____ is not a stage of product recovery.
 a) Removal of solids
 b) Isolation of organism
 c) Purification and concentration
 d) Cell disruption
- 8) _____ is not a type of sterilization
 a) Batch b) Continuous
 c) Filter d) Submerged

- 9) Pore size of membrane used for membrane filtration sterility testing is _____
- a) 1 micron b) 45 microns
c) 4 microns d) 100 microns
- 10) The Batch culture is a/an _____ culture system.
- a) Closed b) Isolated
c) Open d) Semi closed

B) Answer the following

06

- 1) Define the term scale up.
- 2) What is meaning of quality assurance of fermentation product?
- 3) Which are methods of strain improvement?
- 4) What is cell distribution in downstream processing?
- 5) What is long form of RSM in media optimization?
- 6) Define the term pyrogen.

Q.2 Solve any Eight of the following.

16

- a) Define the term Distillation.
- b) What is agitation and aeration?
- c) Enlist five Fermentation media components.
- d) Types of bioassay
- e) What is Placket and Burman theory?
- f) What is Downstream processing?
- g) Define the term Scale down
- h) What is the meaning of broth rheology?
- i) Explain principle of drying in downstream process.
- j) What is fermented broth?

Q.3 A) Attempt any Two of the following.

10

- i) Describe ion exchange chromatography.
- ii) Write about Scale up process.
- iii) Write in brief Sterility testing.

B) Write about crystallization and distillation in downstream processing.

06

Q.4 A) Attempt any Two of the following.

08

- i) Write a note on objectives of strain improvement.
- ii) Write about centrifugation in downstream processing.
- iii) Explain Toxicity testing.

B) Describe in detail filtration and centrifugation in downstream processing.

08

Q.5 Attempt any Two of the following.

16

- Write in detail the methods of Detection and quantification of product.
- Describe briefly levels of fermentations.
- Explain in detail Sterilization of Media.

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Electronics (Special Paper - XII)
Electronics Communication (22221540-B)

Day & Date: Tuesday, 06-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagrams wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of log table and calculator is allowed.

Q.1 A) Select the correct alternative from the following. 10

- 1) _____ communication is simplex communication system.
 - a) Satellite
 - b) Telephone
 - c) Mobile
 - d) Television
- 2) In frequency modulation power is _____ in each side band.
 - a) equally distributed
 - b) unequally distributed
 - c) 1/6
 - d) 4/3
- 3) Ionospheric propagation is due to _____ wave.
 - a) Ground
 - b) Sky
 - c) Surface
 - d) Tropospheric
- 4) The vestigial side band width of TV signal for 625-line scanning is _____.
 - a) 4.5 MHz
 - b) 5.5 MHz
 - c) 10 MHz
 - d) 7 MHz
- 5) In telephone communication when cradle is ON hook, _____ circuit is disconnected
 - a) Amplifier
 - b) Hybrid
 - c) Speech
 - d) Ringer
- 6) Current distribution in half wave dipole antenna is _____.
 - a) Uniform
 - b) not uniform
 - c) Both
 - d) None
- 7) To eliminate draw backs of low frequency signal and to radiate them _____ is necessary.
 - a) Modulation
 - b) Multiplexing
 - c) De multiplexing
 - d) Detection
- 8) Over modulation occurs when _____.
 - a) $E_m > E_c$
 - b) $E_m < E_c$
 - c) $E_m = E_c$
 - d) None

- 9) The electronic communication that takes place in two way is _____.
a) Multiplex b) Simplex
c) Duplex d) None of the above
- 10) Noise is mostly introduced in _____.
a) Channel b) Transmitter
c) Receiver d) None

B) Answer in one sentence

06

- 1) What is full form of TDM and FDM?
- 2) What is importance of modulation?
- 3) Give any two points of difference between DSB and SSB.
- 4) What is the role of ringer in telephone hand set?
- 5) List the parameters of antenna.
- 6) Define noise. List its types.

Q.2 Solve any Eight of the following.

16

- a) In amplitude modulated wave $E_m = 2V$, $E_c = 4V$ Calculate its modulation index in percentage.
- b) Define Virtual height.
- c) How many horizontal lines are scanned in one vertical frame?
- d) What is half wave dipole antenna?
- e) What is the role of microphone in telephone hand set?
- f) Define electronic communication system.
- g) List the characteristics of radio receiver.
- h) What is the frequency at which sky wave propagates after reflection from ionosphere?
- i) What is Field ratio in Interlaced scanning?
- j) What is duct propagation?

Q.3 A) Attempt any Two of the following.

10

- i) Explain working principle of antenna.
- ii) Explain ground wave propagation.
- iii) Explain FM super hetero dyne receiver with neat block diagram.

B) Explain Yagi antenna.

06

Q.4 A) Attempt any Two of the following.

08

- Explain analog and digital communication using block diagram.
- Explain composite video signal.
- Explain envelop detector used to detect AM wave.

- B)** The output voltage of transmitter is given by $500(1 + 0.4 \sin 3140t)$ **08**
 $\sin(6.28 \times 10^7)t$ feed to load resistance of 600Ω .

Find

- i) f_c
- ii) f_m
- iii) M_I
- iv) E_c
- v) draw frequency spectra

Q.5 Attempt any Two of the following. 16

- a) Explain Frequency modulation with necessary mathematical analysis of output voltage and wave forms.
- b) What is TV scanning? What are its types? Explain interlaced scanning.
- c) Explain dish antenna in detail.

Seat No.	

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B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Computer Science (Special Paper-XII)
Python Programming (22221536-A)

Day & Date: Tuesday, 06-May-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative. 10

- 1) _____ is a mutable data type in Python.
 - a) Tuple
 - b) String
 - c) List
 - d) Integer
- 2) _____ is not a keyword in Python.
 - a) eval
 - b) pass
 - c) def
 - d) class
- 3) _____ method returns an integer number selected element from the specified range.
 - a) random
 - b) randint()
 - c) sample()
 - d) get_random()
- 4) _____ types of parameters allows for an arbitrary number of arguments.
 - a) Default
 - b) Keyword
 - c) Positional
 - d) Variable-length
- 5) What does the join () method do in threading?
 - a) Starts a thread
 - b) Stops a thread
 - c) Waits for a thread to complete
 - d) Creates a new thread
- 6) An abstract class in Python is defined using the _____ module.
 - a) ABC
 - b) abc
 - c) abstract
 - d) None of these
- 7) _____ module is used for multithreading in Python.
 - a) Threading
 - b) thread
 - c) concurrent
 - d) multiprocessing
- 8) _____ is a valid Python identifier.
 - a) _myVariable
 - b) my Variable
 - c) @myVariable
 - d) 2myVariable

- 9) Which of the following is a Python keyword?
- a) var b) def
c) value d) function
- 10) To calculate the sine of an angle in radians using the math module, you use the _____ function.
- a) Cos b) Sin
c) sign d) None of these

B) Fill in the blanks.

06

- 1) A string in Python is a sequence of characters enclosed in either _____ or _____.
- 2) A method is declared abstract in Python by using the _____ decorator.
- 3) To add an element to the end of a list, you can use the _____ method.
- 4) The _____ keyword in Python is used to refer to the instance of the class in instance methods.
- 5) In Python, the _____ function is used to find the length of a string.
- 6) The _____ module provides support for working with regular expressions in Python.

Q.2 Solve any Eight of the following.

16

- a) What is a conditional statement in Python?
- b) What is the structure of a Python program?
- c) List out some common methods in re module in Python.
- d) Explain the purpose of the cls and self in Python.
- e) What is user defined exception?
- f) List the different types of operators in Python.
- g) What are different types of parameter passing techniques?
- h) What are tuples, and how do they differ from lists?
- i) What is a module in Python?
- j) What is Lock and RLock?

Q.3 A) Attempt any Two of the following.

10

- i) What is interface? How it is achieved in python?
- ii) Explain identifiers and keywords in Python.
- iii) Explain Operator Overloading and Method Resolution Order (MRO).

B) Explain Membership operators, Identity operators and relational operators.

06

O.4 A) Attempt any Two of the following.

08

- What are exceptions in Python, and how are they handled?
- Write a program to copy content of one text file in another.
- Explain lists, tuples and dictionaries with suitable example.

B) Explain features of python.

08

Q.5 Attempt any Two of the following.

16

- a) Write a program for method overriding.
- b) Describe the types of inheritance in Python.
- c) Explain looping control statements in details.

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Computer Science (Special Paper-XII)
Kotlin Programming (22221536-B)

Day & Date: Tuesday, 06-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Draw neat labelled diagrams wherever necessary.
 3) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative.**10**

- 1) _____ is the default visibility modifier for a class in Kotlin.
 - a) Public
 - b) Private
 - c) Protected
 - d) internal
- 2) What is the keyword used to define an interface in Kotlin?
 - a) abstract
 - b) class
 - c) object
 - d) interface
- 3) What is the difference between a "var" and a "val" in Kotlin?
 - a) "var" is a mutable variable, while "val" is an immutable variable
 - b) "var" is a constant, while "val" is a variable
 - c) "val" is a mutable variable, while "var" is an immutable variable
 - d) "val" is a constant, while "var" is a variable
- 4) By default, all classes in the Kotlin are _____.
 - a) final
 - b) sealed
 - c) open
 - d) abstract
- 5) How do you define a secondary constructor in Kotlin?
 - a) init { ... }
 - b) constructor(name: String) { ... }
 - c) fun init() {...}
 - d) None of these
- 6) _____ Keyword is used to allow a class to be inherited in Kotlin.
 - a) final
 - b) override
 - c) open
 - d) abstract
- 7) _____ keyword is used to provide the default case in a when expression in Kotlin.
 - a) final
 - b) else
 - c) otherwise
 - d) defaultCase
- 8) _____ is used to implement an interface in a Kotlin class.
 - a) implements
 - b) extends
 - c) :
 - d) Use

- 9) _____ is feature of Kotlin language.
- | | |
|---------------------|-----------------|
| a) Smart cast | b) Null safety |
| c) Interoperability | d) All of these |
- 10) Sealed class is a class restricts the class hierarchy
- | | |
|----------|-------------|
| a) final | b) Sealed |
| c) open | d) Abstract |

B) Fill in the blanks.**06**

- 1) _____ number of primary constructor can be defined in Kotlin.
- 2) In Kotlin, _____ is used to declare a variable that cannot be reassigned after its initial assignment.
- 3) When you want to declare a data class in Kotlin, you use the _____ keyword before the class name.
- 4) To call a superclass constructor from a subclass in Kotlin, you use the _____ keyword.
- 5) When overriding a method in Kotlin, the method in the subclass must use the _____ keyword to indicate that it is replacing the superclass method.
- 6) You cannot instantiate an _____ class directly.

Q.2 Solve any Eight of the following.**16**

- a) Explain the difference between `var` and `val` in Kotlin.
- b) What are basic data types in Kotlin?
- c) What is Elvis operator (`? :`) in Kotlin?
- d) Define Array.
- e) Define constructor.
- f) What is a set in Kotlin?
- g) What is a class?
- h) Write a note on for loop?
- i) Define type inference.
- j) What is the purpose of the `super` keyword in Kotlin?

Q.3 A) Attempt any Two of the following.**10**

- i) Write a program to demonstrate Function with Default Argument.
- ii) Explain while Loop, do while.
- iii) Explain use of finally block in exception handling.

B) Explain the concept of visibility modifiers in Kotlin with example.**06****Q.4 A) Attempt any Two of the following.****08**

- i) What are data classes in Kotlin?
- ii) Explain abstract class and abstract method in Kotlin.
- iii) Explain Dictionary collection in Kotlin.

B) Write a program to calculate the factorial of a number using a while loop.**08**

Q.5 Attempt any Two of the following.

16

- a) Explain different constructor used in Kotlin with example.
- b) Write a Kotlin program that demonstrates the use of try-catch blocks.
- c) What is inheritance? Explain type of inheritance in Kotlin.

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (CBCS) Examination: March/April - 2025
Computer Science (Special Paper - XII)
Data warehousing and Mining (22221536-C)

Day & Date: Tuesday, 06-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Multiple choice questions. 10

- 1) A Multidimensional Data Model is best suited for _____ kind of analysis.
 - a) Transaction-based
 - b) Exploratory
 - c) Analytical and aggregation
 - d) Data entry
- 2) The role of Metadata in a Data Warehouse is _____.
 - a) Describing the structure and meaning of the data
 - b) Storing transaction data
 - c) Loading data into the warehouse
 - d) Cleaning the data
- 3) A company wants to predict whether a customer will default on a loan (Yes/No) based on their financial history _____ type of algorithm should be used?
 - a) Regression
 - b) Classification
 - c) Clustering
 - d) Association
- 4) The _____ is NOT a predictive Data Mining technique.
 - a) Classification
 - b) Regression
 - c) Time Series Analysis
 - d) Time Series Analysis
- 5) Data Mining is primarily used to extract _____.
 - a) Direct input from operational databases
 - b) Patterns, trends, and relationships in data
 - c) Only numeric calculations
 - d) Raw tabular datasets
- 6) Telecommunication companies apply data mining to _____.
 - a) Improve signal quality
 - b) Monitor network hardware failures
 - c) Provide weather forecasts
 - d) Predict and reduce customer churn

- 7) A hospital wants to predict whether a patient has a high risk of heart disease based on age, cholesterol levels, and BMI. The data _____ mining technique is best suited for this problem.
 - a) Association Rule Mining
 - b) K-Means Clustering
 - c) FP-Growth Algorithm
 - d) Logistic Regression
- 8) The _____ data mining technique is commonly used in fraud detection.
 - a) Regression
 - b) Clustering
 - c) Classification
 - d) Time Series Analysis
- 9) The primary assumption of Naive Bayes classifiers is that the _____.
 - a) Features are independent
 - b) Features are interdependent
 - c) Data can only represent discrete events
 - d) Randomization is unnecessary
- 10) The main purpose of Min-Max Normalization in data preprocessing is to _____.
 - a) Features are independent
 - b) Features are interdependent
 - c) Data can only represent discrete events
 - d) Randomization is unnecessary

B) Fill in the blank.**06**

- 1) The Data Mining task used to discover the future value of a variable is called _____.
- 2) If $\text{Support}(A \rightarrow B) = 0.4$ and $\text{Support}(A) = 0.5$, then the confidence of the rule $A \rightarrow B$ is _____.
- 3) The splitting criterion in decision trees for classification often uses metrics like _____ or Gini Index.
- 4) The tree produced by hierarchical clustering is called a _____.
- 5) In _____, trees are an ensemble method that builds multiple decision trees and merges their outputs.
- 6) A common application of text mining is in _____ analysis, used to determine the opinion expressed in a piece of text.

Q.2 Solve any Eight of the following.**16**

- a) What is Noisy data? How to handle Noisy data.
- b) What is data reduction? Explain how to reduce data.
- c) Explain data mining views.
- d) What is technical metadata? Explain in detail.
- e) What is Ensemble Methods? Explain in detail.
- f) What is underfitting and overfitting? Explain in detail.
- g) What is Outlier Analysis? Explain in detail.
- h) What is Normalization? Explain min max normalization.
- i) List out different data mining issues.
- j) Explain Euclidean distance and Manhattan distance with example.

Q.3 A) Attempt any Two of the following.

- 1) What is Model Evaluation? Explain different techniques for Evaluating Classifier Performance.
- 2) What is Multilevel association? Discuss issues related to Multilevel association and how to solve them?
- 3) What are different types of Hierarchical Clustering Algorithms? Explain each with example

B) Given the following dataset:**06**

89, 25, 70, 95, 109, 56, 91, 24, 78, 70, 96, 94, 28, 107, 67, 90, 26, 112, 102, 100, 89, 103, 27, 75

- i) Partition the data into 4 bins using the Equi-depth binning method.
- ii) Apply the following data smoothing techniques on the binned data by Smoothing by bin means, Smoothing by bin medians, Smoothing by bin boundaries

Q.4 A) Attempt any Two of the following.**08**

- 1) What are the different techniques used to find the best splitting attributes in a decision tree algorithm?
- 2) Explain Multidimensional Data Model in detail.
- 3) Explain Single linkage, Complete linkage and Average linkage with example.

B) What is SVM? Explain linear and nonlinear SVM in detail.**08****Q.5 Attempt any Two of the following.****16**

- a) Explain Text Data Mining and Web Data Mining in detail
- b) What is data preprocessing? Explain different techniques of data preprocessing.
- c) Perform DBSCAN clustering on the following customer ratings for Product A and Product B using the parameters: Epsilon (ϵ) = 3.5 and MinPts = 3.

Customer	Product A	Product B
A	5	7
B	8	4
C	3	3
D	4	4
E	3	7
F	6	7
G	6	1
H	5	5

Seat No.	

Set

P

B.Sc. (Semester - V) (Old) (CBCS) Examination: March/April - 2025
English (Compulsory)
Literary Mindscape-I (19201500)

Day & Date: Wednesday, 30-April-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Answer the following question by choosing the correct answer from the given options. 08

- 1) What did Della sell off to buy a gift for Jim?
a) Notebook
b) Cake
c) Purse
d) Her hair
- 2) What did Phatik lose?
a) School bag
b) School textbooks
c) Confidence
d) Diary
- 3) What instrument was the girl using in 'The Solitary Reaper'?
a) sickle
b) axe
c) rifle
d) telescope
- 4) Who snatched the queen's mirror?
a) the boy
b) the daughter
c) the father
d) the police
- 5) Where did the schoolmaster live?
a) House
b) Hostel
c) Farmhouse
d) Mansion
- 6) The poem 'The Road Not Taken' is written by _____.
a) Robert Frost
b) W. Wordsworth
c) W. Shakespeare
d) R. Tagore
- 7) Everyone loves her. (change the voice)
a) She is loved by everyone.
b) She was loved by everyone.
c) She will be loved.
d) She was being loved.
- 8) The _____ time at the airport is 5.00 p.m.
a) check in
b) break out
c) drop in
d) put out

- Q.2 Answer the following questions briefly. (Any Four) 12**
- a) Who are the Magi? Why Della and Jim are called Magi?
 - b) How did Phatik feel arriving at the uncle's house?
 - c) Explain the title 'The Road Not Taken'.
 - d) Why the queen is unsatisfied and seeks a rival?
 - e) Describe the character of the village schoolmaster.
 - f) What was 'The Solitary Reaper' doing in the field?
- Q.3 Write a detailed note on 21st century skills? 10**
- OR**
- What are the benefits of 21st century technology?
- Q.4 What are the four types of Learning Skills? Discuss in detail. 10**

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagram wherever necessary.
3) Figure to right indicate full marks.
4) Use of log table and calculators is allowed.

10

- 1) The three coordinates of spherical polar coordinate system are _____.
a) (x, y, z) b) (r, θ, Φ)
c) (r, θ, z) d) (x, y, Φ)
- 2) Weins law aggrss well with the experimental results at _____ frequencies.
a) all b) small
c) infinite d) large
- 3) Ratio of most probable speed and average speed of gas molecule is _____.
a) 1 b) $\frac{\sqrt{\pi}}{2}$
c) $\frac{\sqrt{\pi}}{4}$ d) $\frac{2}{\sqrt{\pi}}$
- 4) Three particles are distributed in four energy levels, the possible ways of this distribution when particles are fermions _____.
a) 6 b) 64
c) 4 d) 20
- 5) If five particles are distributed in two-phase cells then number of macrostates is _____.
a) 6 b) 10
c) 32 d) 20
- 6) Condition for most probable distribution is _____.
a) $W=0$ b) $\ln W=0$
c) $\delta \ln W=0$ d) $\delta W=0$

- 7) In orthogonal curvilinear coordinates system, the coordinate surfaces are in general _____.
a) plane b) curved
c) cylindrical d) spherical
- 8) Rest mass of photon is _____.
a) zero b) infinity
c) small but finite d) negative
- 9) Which of the following particles are Bosons?
a) electrons b) neutrons
c) mesons d) photons
- 10) Shortest wavelength of radiation emitted by a star with its surface temperature 5800°K is _____.
a) $4000\text{\AA}^{\circ}$ b) $4699\text{\AA}^{\circ}$
c) $4966\text{\AA}^{\circ}$ d) $4996\text{\AA}^{\circ}$

B) Fill in the blanks:

06

- 1) Bose Einstein distribution law is _____.
- 2) Pauli's exclusion principle applied to _____ statistics.
- 3) Thermodynamics cannot be applied to _____ ensemble.
- 4) Gauss's theorem gives the relation between volume integral with _____.
- 5) In cylindrical coordinate system $h_2 =$ _____.
- 6) Maxwell- Boltzmann statistics applicable to _____.

Q.2 Answer the following (Any Eight)

16

- a) Define Degree and order of differential equation.
- b) State Legendre's and Bessel's differential equations.
- c) State Laplacian Operator.
- d) Describe Cartesian coordinate system.
- e) Define micro canonical and canonical ensembles.
- f) Define accessible microstates and phase space.
- g) State various thermodynamic functions.
- h) Define Fermi energy.
- i) Deduce Wines formula from Planck Radiation formula.
- j) Write any two conclusions of Lummer and Pringsheim experiment.

Q.3 A) Attempt the following (Any Two)

10

- 1) Obtain relation between entropy and probability.
- 2) Derive Maxwell- Boltzmann distribution law.
- 3) Compare M-B, B-E and F-D statistics.

B) Using Maxwell's law of distribution of speeds of molecules in gas obtain expressions for most probable, average, root mean square speeds.

06

- Q.4 A) Attempt the following (Any Two) 08**
- 1) Obtain Greens first and second theorem.
 - 2) Define thermodynamic probability. Obtain an expression for thermodynamic probability.
 - 3) Explain electronic specific heat.
- B) Derive Planck's radiation formula in terms of frequency. 08**
- Q.5 Attempt the following (Any Two) 16**
- a) State and prove Stoke's theorem in vector field.
 - b) Obtain an expression for curl of a vector in orthogonal curvilinear co-ordinates.
 - c) Derive Fermi-Dirac distribution law.

Max. Marks: 80

Q.1 A) Multiple choice questions. 10

- Page 1 of 3

- 8) It is impossible to measure momentum and position of a quantum particle simultaneously. This is statement of _____.
 a) de Broglie hypothesis
 b) Heisenberg's uncertainty principle
 c) Beer-Lambert law
 d) Stefan-Boltzmann law
- 9) A quantum of light is called _____.
 a) Proton
 b) Photon
 c) exciton
 d) all of these
- 10) The energy of an electromagnetic radiation of wavelength 300 nm is _____ that of radiation wavelength 500 nm.
 a) lesser than
 b) greater than
 c) equal to
 d) can't say

B) Fill in the blank/definitions/one sentence answer/one word answer/Give name/predict the product. 06

- 1) Mathematically, Heisenberg's uncertainty principle is represented as _____.
- 2) Define degrees of freedom.
- 3) Give the statement of Compton effect.
- 4) The potential of standard hydrogen gas electrode is _____ V.
- 5) At triple point, _____ degrees of freedom exist.
- 6) State Stark-Einstein photochemical equivalence law.

Q.2 Solve any Eight of following. 16

- 1) Define quantum efficiency.
- 2) State Lambert's law.
- 3) State Stefan-Boltzmann fourth power law.
- 4) What do you mean by sparingly soluble salts? Give any two examples.
- 5) Mention different types of electrodes.
- 6) Estimate the value of frequency, if wavelength of electromagnetic radiation is 500 nm.
- 7) Write the expression for Nernst equation and give the significance of the terms involved in it.
- 8) Write emf equation for metal/metal ion electrode.
- 9) What is eutectic point in phase diagram?
- 10) Give the mathematical expression for de Broglie wavelength.

Q.3 A) Attempt any Two of the following. 10

- 1) With the help black body radiation distribution curves, explain the experimental observations.
- 2) Discuss amalgam electrode by taking suitable example.
- 3) Draw and discuss the phase diagram for water system.

B) Short note/ Solve. 06

The emf of the cell

Pt, H₂ (g), 1 atm | H⁺ (3 × 10⁻⁴ M) || H⁺ (M₁) | H₂ (g), 1 atm, Pt
at 298 K is 0.154 V. Calculate the value of M₁ and pH of this solution.

Q.4 A) Attempt any Two of following. 08

- 1) Discuss in detail the photoelectric effect.
- 2) Calculate the energy associated with
 - i) one quantum
 - ii) one Einstein, given that the wavelength of radiation is 7500 Å⁰.

(N = 6.024 × 10²³, h = 6.62 × 10⁻²⁷ erg-sec, c = 3 × 10⁸ cm/sec,
1 calorie = 4.184 × 10⁷ ergs)
- 3) What is pH? Explain how pH of solutions can be measured by using calomel electrode along with hydrogen electrode.

B) Describe/Explain/Solve. 08

Discuss reversible and irreversible electrodes with suitable example.

Q.5 Attempt any Two of the following. 16

- a) Illustrate Electrolyte concentration cell without transference.
- b) Explain with the help of neat labelled phase diagram, lead-silver, the simple eutectic system.
- c) Draw a neat Jablonski diagram depicting various processes occurring in the excited states. Briefly explain phosphorescence and fluorescence emission.

Seat No.	

Set **P**

B.Sc. (Semester - V) (Old) (CBCS) Examination: March/April - 2025
Botany (Special Paper-IX)
PLANTSYSTEMATICS (19201501)

Day & Date: Sunday, 18-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw **neat** labeled diagrams **wherever** necessary.
 3) Figures to the right indicate full marks.

Q.1 Multiplechoice questions.**10**

- 1) _____ term is used if calyx & corolla not distinguished from each other.

a) Calyx	b) modified corolla
c) Perianth	d) Epicalyx
- 2) _____ among the following is one of the member of family Lamiaceae

a) Ficus bigemina	b) Ocimum sanctum
c) Indigofera lincloria	d) Dalbergia sisso
- 3) G in floral formula represents _____

a) Ovary superior	b) Ovary inferior
c) Actinomorphic flower	d) Fused nature of calyx & corolla
- 4) Presence of verticillaster type of inflorescence is characteristic of _____ family

a) Poaceae	b) Lamiaceae
c) Polygonaceae	d) Rubiaceae
- 5) Apple is a type of _____ fruit.

a) Aggregate	b) Berry
c) Drupe	d) Both b & c
- 6) A type .of inflorescence in which older flowers at base & young at apex is known as _____

a) Racemose	b) Cymose
c) Cythium	d) Umbell
- 7) In perigynous flowers the position of ovary is _____

a) Superior	b) Inferior
c) Half superior	d) Half inferior

- 8)** _____ is the third step of herbarium preparation
- a) Collection b) Sticking
c) Pressing d) Poisoning
- 9)** Lead botanical garden is situated in _____
- a) Kolhapur b) Culcutta
c) Mumbai d) Delhi
- 10)** First name in binomial nomenclature is _____ name
- a) Species b) Genus
c) Subspecies d) Variety

Q.1 B) Fill in the blanks.

06

- 1) Bentham & Hookers system of classification is one of _____ system
- 2) In floral formula _____ sign is used to indicate fused nature of calyx & corolla
- 3) _____ types of roots present in monocots.
- 4) APG stands for _____
- 5) Hibiscus belongs to family _____
- 6) _____ proper size of herbarium sheet.

Q.2 Solve any Eight of the following.

16

- 1) Define herbarium
- 2) Define aggregate fruits
- 3) Define cymose type of inflorescence
- 4) Define binomial nomenclature
- 5) Write any 4 vegetative characters 61 family Poaceae ~
- 6) Draw a well labeled diagram of any two types of placentation
- 7) Enlist different characters mentioned in floral formula
- 8) Define actinomorphic flower
- 9) Define hypogynous flower
- 10) Define botanical gardens

Q.3 A) Attempt any Two of the following.

10

- 1) Write a note on types of fruits
- 2) Write a note on types of stem & its modifications
- 3) Give merits & demerits of Bentham & Hookers system of classification

Q.3 B) Describe Vegetative and reproductive characters of family Bignonaceae.

06

Q.4 Attempt any Two of the following.

08

- 1) Give general characters of family Polygoniaceae
- 2) Write a note on Lead Botanical Garden
- 3) Write a note on principles of ICBN

Q.4 B) Describe in brief types of inflorescence

08

Q.5 Attempt any Two of the following.

16

- 1) Describe APG III system of classification &. add a note on its merits & demerits
- 2) Give general characteristic features of family Malvaceae
- 3) Describe steps for making herbarium & add a note on its significance

Seat t No.	

Set **P**

**B.Sc. (Semester - V) (Old) (CBCS): Examination March/April - 2025: B.Sc.
Zoology (Special Paper - IX)
Molecular Biology (19201520)**

Day & Date: Sunday, 18-May-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 80.00

- Instructions:** 1) All questions are compulsory.
2) Draw **neat** labelled diagrams **wherever** necessary.
3) Figures to the right indicate full marks.

Q.1 Multiple Choice Questions**10**

- 1) Which enzyme is responsible for adding new nucleotides during DNA replication?
 - a) Ligase
 - b) DNA polymerase
 - c) RNA polymerase
 - d) Helicase
- 2) What is the role of the 5' cap in eukaryotic mRNA?
 - a) Enhancing translation
 - b) Protecting mRNA from degradation
 - c) Splicing introns
 - d) Adding a poly-A tail
- 3) Which of the following is a characteristic of eukaryotic transcription?
 - a) No need for transcription factors
 - b) Occurs in the cytoplasm
 - c) Involves multiple types of RNA polymerases
 - d) Operates with operons
- 4) What does the term "degeneracy" refer to in the genetic code?
 - a) Multiple codons coding for the same amino acid
 - b) Each codon coding for a unique amino acid
 - c) Each amino acid coded by a single codon
 - d) Codons that cannot be translated
- 5) Which structure is involved in the initiation phase of translation?
 - a) Ribosome
 - b) tRNA
 - c) mRNA
 - d) DNA
- 6) In eukaryotic cells, where does the process of transcription occur?
 - a) Cytoplasm
 - b) Mitochondria
 - c) Nucleus
 - d) Endoplasmic reticulum
- 7) Which of the following modifications occurs at the 3' end of eukaryotic mRNA?
 - a) Capping
 - b) Splicing
 - c) Polyadenylation
 - d) Exonization

- 8) Which type of RNA is responsible for bringing amino acids to the ribosome?
 - a) mRNA
 - b) rRNA
 - c) tRNA
 - d) snRNA
- 9) What is the function of amino-acyl tRNA synthetase?
 - a) To synthesize mRNA
 - b) To charge tRNA with the appropriate amino acid
 - c) To splice introns
 - d) To unwind DNA
- 10) Which of the following is a mechanism of DNA repair involving the removal of damaged bases?
 - a) Nucleotide excision repair
 - b) Base excision repair
 - c) Mismatch repair
 - d) SOS repair

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc.

06

- 1) Define "Watson and Crick model".
- 2) What is "semi-conservative replication"?
- 3) What is "transcription"?
- 4) What is a "ribosome"?
- 5) Define "capping" in mRNA processing.
- 6) What does "exon" refer to in eukaryotic mRNA?

Q.2 Solve any Eight of the following

16

- 1) Describe the salient features of the Watson and Crick model of DNA.
- 2) Explain the semi-conservative mechanism of DNA replication.
- 3) Compare the mechanisms of DNA replication in prokaryotes and eukaryotes'.
- 4) Discuss the role of transcription factors in eukaryotic transcription.
- 5) Outline the process of translation and the roles of amino-acyl tRNA synthetases.
- 6) Explain the concept of degeneracy in the genetic code.
- 7) Describe the process and significance of splicing in eukaryotic mRNA.
- 8) Discuss the principles of gene regulation with the example of the lac operon.
- 9) Describe the role of miRNAs in gene regulation.
- 10) Explain the mechanism of mismatch repair in DNA.

Q.3 A) Attempt any Two of the following

10

- 1) Explain the process of protein synthesis in prokaryotes, including the roles of initiation, elongation, and termination.
- 2) Describe the different post-transcriptional modifications of eukaryotic mRNA and their significance.
- 3) Discuss the differences between prokaryotic and eukaryotic translation processes.

- Q.3 B) Short note/Solve** **06**
Write a short note on the role of RNA polymerase in transcription.
- Q.4 A) Attempt any Two of the following(Each question carries 4 marks)** **08**
- 1) Describe the basic mechanism of recombinant DNA technology and its applications in medicine.
 - 2) Explain the process of RNA interference and its importance in gene regulation.
 - 3) Discuss the differences between the circular and linear DNA replication processes.
- B) Describe/Explain/Solve** **08**
Describe the various DNA repair mechanisms, including pyrimidine dimerization and SOS mechanism.
- Q.5 Attempt any Two of the following** **16**
- 1) Explain the Watson and Crick model of DNA, including its structural features and significance.
 - 2) Discuss the process of transcription in prokaryotes and eukaryotes, highlighting key differences and similarities.
 - 3) Describe the process of translation in eukaryotes, including the roles of different proteins and ribosome structures.

Set	P

B.Sc. (Semester - V) (Old) (CBCS) Examination: March/April - 2025
Mathematics (Special Paper-IX)
Algebra - II (19201524)

Day & Date: Sunday, 18-May-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
3) Figure to right indicate full marks.

Q.1 A) Multiple choice questions. 10

- 1) Let $T: R^3 \rightarrow R^3$ defined by $T(x, y, z) = (x + z, x + y + 2z, 2x + y + 3z)$ then nullity of T is _____.
a) 0 b) 1
c) 2 d) 3
- 2) The number of ideals of Z_{40} are _____.
a) 4 b) 5
c) 7 d) 8
- 3) Trace of square matrix is the _____.
a) sum of diagonal entries
b) difference of diagonal entries
c) product of diagonal entries
d) determinant of diagonal entries
- 4) Let V be the vector space and $s_1 \leq s_2 \leq v$, consider the following statements.
I) s_1 is linearly dependent
II) s_2 is linearly dependent
a) (I) $\Rightarrow$ (II) b) (II) $\rightarrow$ (I)
c) (I) $\Leftrightarrow$ (II) d) (I) $\nRightarrow$ (II)
- 5) The characteristics of ring $n\mathbb{Z}$ is _____.
a) 0 b) 1
c) n d) ∞
- 6) In an inner product space, the norm is defined by $\|u\| =$ _____.
a) $\langle u, u \rangle$ b) $\sqrt{\langle v, v \rangle}$
c) $\langle u, v \rangle^2$ d) $\frac{\langle u, u \rangle}{\|u\|}$

- 7) Let $T: V \rightarrow W$ be the linear transformation then null space $N(T)$ of T is _____.
 a) $\{x \in v/T(x) = 0\}$ b) $\{x \in v/T(x) = x\}$
 c) $\{x \in w/T(x) = 0\}$ d) The whole space W
- 8) Number of zero divisors of Z_8 are _____.
 a) 3 b) 4
 c) 5 d) 8
- 9) Over the field of real numbers $\mathbb{Q}$ has dimension _____.
 a) 1 b) 2
 c) 3 d) ∞
- 10) Let $T: R^2 \rightarrow R^3$ be the linear transformation defined by $T(a_1, a_2) = (a_1 + 3a_2, 0, 2a_1 - 4a_2)$ then $[T]_{\beta}^{\delta} =$ _____.
 a) $\begin{bmatrix} 1 & 3 \\ 0 & 0 \\ -2 & -4 \end{bmatrix}$ b) $\begin{bmatrix} 1 & 3 \\ 2 & -4 \\ 0 & 0 \end{bmatrix}$
 c) $\begin{bmatrix} 3 & 1 \\ -4 & 0 \\ 0 & 2 \end{bmatrix}$ d) $\begin{bmatrix} 3 & 1 \\ 0 & 0 \\ -4 & 2 \end{bmatrix}$

B) Fill in the blank/Definition/One sentence answer.**06**

- 1) Show that the vectors $v_1 = (1,0,0)$ $v_2 = (0,1,0)$ $u_3 = (0,0,1)$ are linearly independent.
- 2) Define maximal ideal in a ring.
- 3) Prove that $\|cx\| = |c|\|x\| \forall x \in v \text{ \& } C \in F$.
- 4) Let $T: R^3 \rightarrow R^2$ defined by $T(x, y, z) = (x - y, 2z)$ then $N(T) =$ _____.
- 5) Define basis of a vector space.
- 6) Find norm of the vector $v = (2,3,7) \in R^3$.

Q.2 Solve the following (Any Eight)**16**

- a) Let V be an inner product space and $x, y, z \in V$ then show that $\langle x, y + z \rangle = \langle x, y \rangle + \langle x, z \rangle$.
- b) Let $Q: R \rightarrow S$ be a ring homeomorphism then prove that $\text{Ker } Q$ is an ideal of R .
- c) Let $T: R^2 \rightarrow R^2$ be a linear transformation such that $T(1,1) = (1,3)$ $T(-1,1) = (3,1)$ find $T(a, b)$.
- d) If F is field then prove that F has no ideals other than $\{0\}$ & F
- e) Define division ring & integral domain.
- f) Prove that $\|x + y\|^2 + \|x - y\|^2 = 2(\|x\|^2 + \|y\|^2)$
- g) Show that intersection of two subspaces is subspace.
- h) Let $T: R^2 \rightarrow R^2$ defined by $T(a_1, a_2) = (2a_1 + a_2, a_1)$ find $N(T)$.

- i) If β and γ are standard ordered basis for $P_3(R)$ & $P_2(R)$ & $T: P_3(R) \rightarrow P_2(R)$ is linear defined by $T[f(x)] = f^1(x)$ find $[T]_{\beta}^{\gamma}$.
- j) Define zero divisor and find zero divisors of Z_{12} .

Q.3 A) Attempt the following (Any Two) 10

- 1) State and prove fundamental homeomorphism theorem for rings.
- 2) Let R be commutative ring with unity then prove that an ideal P of R is prime iff R/P is an integral domain.
- 3) Prove that $V = W_1 \oplus W_2 \Leftrightarrow V = W_1 + W_2, W_1 \cap W_2 = \{0\}$.

B) Prove that every finite integral domain is field. 06

Q.4 A) Attempt the following (Any Two) 08

- 1) Show that the vectors $\{(1,2,3,4), (0,1,-1,2), (1,5,1,8), (3,7,8,14)\}$ in R^4 are L.D.
- 2) Find range, rank, kernel and nullity of the linear transformation $T: R^2 \rightarrow R^3$ defined by $T(x_1, x_2) = (x_1 + x_2, x_1 - x_2, x_2)$
- 3) Prove that characteristic of an integral domain is either 0 or prime number.

B) State and prove dimension theorem. 08

Q.5 Attempt the following (Any Two) 16

- a) Let R be commutative ring with unity prove that an ideal M of R is maximal ideal of R if and only if R/M is field.
- b) State and prove replacement theorem.
- c) If β and γ are standard ordered bases of R^2 & R^3 respectively.

Let $T: R^2 \rightarrow R^3$ & $U: R^2 \rightarrow R^3$ defined by

$$T(a_1, a_2) = (a_1 + 3a_2, 0, 2a_1 - 4a_2)$$

and $U(a_1, a_2) = (a_1 - a_2, 2a_1, 3a_1 + 2a_2)$ compute

$$[T]_{\beta}^{\gamma} \quad [U]_{\beta}^{\gamma} \quad [T + U]_{\beta}^{\gamma}$$

Seat No.	

Set **P**

B.Sc. (Semester - V) (Old) (CBCS) : Examination March/April - 2025
Statistics (Special Paper-IX)
Statistical Inference - I (19201528)

Day & Date: Sunday, 18-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Use of log table and calculators is allowed.

Q.1 Multiple Choice Questions.**10**

- 1) If the expected value of an estimator is not equal to its parametric function, it is said to be a _____.
 - a) Unbiased estimator
 - b) Biased estimator
 - c) Consistent estimator
 - d) None of the above
- 2) Method of minimum Chi-Square of the estimation of parameters utilised:
 - a) Chi-square distribution function
 - b) Persons Chi-square statistic
 - c) Contingency table
 - d) All of the above
- 3) The types of estimates are _____.
 - a) point estimate
 - b) interval estimate
 - c) estimation of confidence region
 - d) all the above
- 4) An estimator which converges to a parameter θ in probability as the sample size tends to infinity is said to be _____.
 - a) sufficient estimator
 - b) efficient estimator
 - c) consistent estimator
 - d) unbiased estimator
- 5) The estimator $\frac{\sum Xi}{n}$ of population mean is _____.
 - a) An Unbiased estimator
 - b) An Consistent estimator
 - c) Both a) and b)
 - d) An biased estimator
- 6) Pitman-Koopman form of probability distribution is used to determine _____ estimator of the parameter.
 - a) unbiased
 - b) sufficient
 - c) efficient
 - d) consistent

- 7) Likelihood function is a function of _____
 - a) Sample only
 - b) Parameter only
 - c) Either sample or parameter
 - d) Sample and parameter
- 8) Moment estimators cannot be obtained for _____ distribution
 - a) Laplace
 - b) Lognormal
 - c) Cauchy
 - d) Exponential
- 9) An estimator is considered to be best if its distribution is:
 - a) Continuous
 - b) Discrete
 - c) Concentrated about the true parameter value
 - d) Normal
- 10) The M.L.E. of Exponential distribution based a random sample of size n given by _____
 - a) Sample mean
 - b) sample median
 - c) $X_{(n)}$
 - d) $X_{(1)}$

B) Fill in the blanks

06

- 1) The denominator in the Crammer-Rao inequality is known as _____
- 2) If T_1 and T_2 be two unbiased estimator of θ . The estimator T_2 is said to θ be more efficient than estimator T_1 if _____
- 3) Let 5, 8, 3, 6, 8 are observations from Poisson (λ) then unbiased estimate of λ is, _____
- 4) If $X_1, X_2, \dots, X_n$ is a random sample from $U(0, \theta)$ then sufficient statistic for θ is _____
- 5) A statistic $T = t(X_1, X_2, \dots, X_n)$ is said to be sufficient for a parameter θ , if the conditional distribution of $X_1, X_2, \dots, X_n$ given $T = t$ is _____
- 6) A statistic is a function of _____.

Q.2 Solve the following (Any Eight)

16

- Define a statistic and give one example.
- Define consistent estimator.
- Define information function $I(\theta)$ of parameter θ .
- State any two properties of Maximum Likelihood Estimator (MLE).
- Define likelihood function of a random variable X_1, X_2 with parameter θ
- Define a sample and a population.
- Define maximum likelihood estimator.
- Prove that sample SD is always biased estimator of population SD.
- Define a biased estimator and unbiased estimator.
- Show that sample mean is unbiased estimator of population mean.

Q.3 A) Attempt the following (Any Two)

10

- Let $X_1, X_2, \dots, X_n$ be iid r.v. with Poisson distribution with parameter λ then find sufficient statistic for λ .
- Obtain Fisher Information function $I(\theta)$ based on a random sample $X_1, X_2, \dots, X_n$ from exponential distribution with mean θ .
- State and prove sufficient condition for consistency for θ .

Q.3 B) Let $X_1, X_2, \dots, X_n$ be a r.s. from $N(\mu, \sigma^2)$ distribution. Find the estimators of μ and σ^2 by the Method of moments. **06**

Q.4 Attempt the following (Any Two) **08**

- 1) Obtain the MLE of the parameter θ based on a r.s. of size n from Bernoulli Distribution.
- 2) Prove that two distinct unbiased estimators of $\phi(\theta)$ give rise to infinitely many Unbiased estimators of $\phi(\theta)$.
- 3) Find moment estimator of θ if $f(x) = \begin{cases} (1 + \theta)X^\theta & ; 0 < X < 1 \\ 0 & ; \text{otherwise} \end{cases}$

Q.4 B) Find MLE and Moment estimator of θ based on a sample of size n from $f(x, \theta) = \begin{cases} 1 & \theta - \frac{1}{2} < x < \theta + \frac{1}{2} \\ 0 & \text{otherwise} \end{cases}$

Q.5 Attempt the following (Any Two) **16**

- 1) Let X_1, X_2 and X_3 is a r.s from $P(\theta)$ distribution
Let $T_1 = \frac{X_1 + X_2 + X_3}{3}$, $T_2 = \frac{X_1 + X_2 + X_3}{4}$
Show that T_1 and T_2 are unbiased estimator of θ and also find the efficiency of T_2 in relative to T_1
- 2) State and prove Crammer Rao Inequality.
- 3) Define Uniformly Minimum Variance unbiased Estimator(UMVUE) and show that it is unique when it exists.

Seat No.	

Set **P**

B.Sc. (Semester - V) (Old) (CBCS) : Examination March/April - 2025
Geology (Special Paper - IX)
Economic Geology (19201534)

Day & Date: Sunday, 18-May-2025
 Time: 12:00 PM To 02:00 PM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagrams wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of log table and calculators is allowed.

Q.1 Multiple choice questions. 10

- 1) _____ deposit is the ore deposit which has formed after the formation of the host rock in which they occur.
 - a) Syngenetic
 - b) Epigenetic
 - c) Exogenetic
 - d) None of the above
- 2) Which of the following is endogenetic ore forming process.
 - a) Residual and Mechanical concentration
 - b) Pegmatite / Pneumatolytic Oxidation
 - c) Supergene enrichment
 - d) Hydrothermal
- 3) Which of the following is the highest rank of coal?
 - a) Peat
 - b) Lignite
 - c) Bituminous coal
 - d) Anthracite
- 4) Zawar mine is famous for _____.
 - a) Gold
 - b) Iron
 - c) Lead and Zinc
 - d) Copper
- 5) Placer deposits are formed by _____.
 - a) Fluid boiling
 - b) Magma segregation
 - c) Gravitational separation
 - d) Wall rock alteration
- 6) Which of these is not an ore mineral of copper?
 - a) Cuprite
 - b) Bornite
 - c) Chalcopyrite
 - d) Molybdenite
- 7) An assemblage of high temperature metamorphic gangue minerals in contact metasomatic deposits is called :
 - a) Skarn
 - b) Gondite
 - c) Gossans
 - d) Bar deposits.

- 8) Generally tourmaline-rich rocks are products of:
- Metamorphism
 - Magmatic crystallisation
 - Metasomatism
 - Oxidation and supergene enrichment
- 9) Diamond in kimberlite are good example of:
- Disseminated deposit
 - Segregated deposit.
 - Injected deposit.
 - Pegmatitic deposit
- 10) Bauxite is _____ concentration deposit rich in Al.
- Rudaceous
 - Residual
 - Arenaceous
 - Hydrothermal

Q.1 B) Fill in the blanks **06**

- _____ are natural concentrations of useful minerals or rocks, which can be economically exploited.
- The process of conversion of peat into higher rank is called _____
- Copper - Nickle sulphide mineralization is generally associated with the _____ type of rocks.
- Hydrothermal deposits, which are formed at great depths, near the intrusive and within the temperature range of 300°C to 500°C is called _____
- The non-metallic minerals associated with ore minerals are called _____
- Ingaldhal copper deposits in Karnataka belongs to _____ formation.

Q.2 Solve any Eight of the following. **16**

- Name two types of petroleum traps.
- Give two examples of Residual deposits.
- List the ores of Manganese.
- Define Gossan.
- Name three mica belts in India.
- What are the condition required for formation of coal.
- Name the types of Magmatic deposits.
- List four ore minerals of iron with oxide composition.
- Define BIF.
- Name the zones of supergene enrichment deposits.

Q.3 A) Attempt any Two of the following. **10**

- Explain the process of formation of supergene enrichment deposits.
- Write the note on contact metasomatism.
- Discuss the distribution of Gold deposits in India.

Q.3 B) Write a brief note on Magmatic ore deposits processes. **06**

Q.4 A) Attempt any Two of the following. 08

- 1) Describe the sublimation process for formation of ore deposits.
- 2) Explain the concept and need of conservation of minerals, give examples.
- 3) Discuss in brief the classification of coal.

B) Discuss in detail the mechanical concentration of ore deposits.

Q.5 Attempt any Two of the following. 16

- 1)** Discuss in detail the conditions for formation of hydrothermal deposits with suitable examples.
- 2)** Give an account on the distribution of petroliferous basins of India.
- 3)** Describe the processes of formation and distribution of Iron ore deposits in India.

Seat No.	

Set **P**

B.Sc. (Semester - V) (Old) (CBCS) Examination: March/April - 2025
Microbiology (Special Paper - IX)
Virology (19201539)

Day & Date: Sunday, 18-May-2025
 Time: 12:00 PM To 02:00 PM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
 2) Draw a neat labelled diagram wherever necessary
 3) Figures to the right indicate full marks.

Q.1 Multiple choice questions**10**

- 1) _____ Adenovirus which infects mammals.
 - a) Aviadenovirus
 - b) Siadenovirus
 - c) Abadinovirus
 - d) Mastadenovirus
- 2) Genome of _____ virus is segmented.
 - a) TMV
 - b) Adeno
 - c) Influenza
 - d) Polio
- 3) _____ is the property of oncogenic cell.
 - a) loss of contact inhibition
 - b) Angiogenesis
 - c) Reduced serum requirement
 - d) All of the above
- 4) _____ is not a hypothesis of about cancer.
 - a) Viral gene hypothesis
 - b) Somatic mutation hypothesis
 - c) One gene one enzyme hypothesis
 - d) Defective immunity hypothesis
- 5) One step growth experiment was developed by _____.
 - a) Hershy and Chase
 - b) Beadle and Tatum
 - c) Watson and Crick
 - d) Ellin and Delbruck
- 6) Bacteriophages are readily counted by the process of _____.
 - a) ELISA
 - b) Pock assay
 - c) Plaque assay
 - d) Lmmunoassay
- 7) _____ is suitable for cultivation of plant viruses.
 - a) Cancerous cell
 - b) Laboratory animals
 - c) Embryonated chicken egg
 - d) Plant tissue culture

- 8)** Cauliflower mosaic virus belongs to _____
- a) Cauliviridae b) Caulimovirineae
c) Pararetroviridae d) None of the above
- 9)** Tumor in which tissue cells do not involve surrounding tissues and remain localized as a compact mass is called as _____
- a) Cancer b) Benign tumor
c) Malignant tumor d) Malignant growth
- 10)** Antigenic shift and drift mechanisms occur in _____
- a) Adenovirus b) SV40 virus
c) Influenza virus d) Polyoma virus

Q.1 B) Define the following

06

- 1) Prions
- 2) pocks
- 3) Lysogeny
- 4) Capsomers
- 5) Budding lysis
- 6) Brust size

Q.2 Solve any Eight of the following

16

- 1) What are viroids?
- 2) Define capsid.
- 3) What are temperate phages.
- 4) Draw structure of T4 bacteriophage.
- 5) What is defective immunity?
- 6) Give the structure of TMV
- 7) Enlist RNA oncogenic viruses.
- 8) Define prophage.
- 9) What is one step growth?
- 10) What is complex symmetry in virus?

Q.3 A) Attempt any Two of the following

10

- 1) Explain prevention and control of plant viral diseases.
- 2) Write an account on DNA oncogenic viruses.
- 3) Give in detail the viral classification on the basis of LHT system.

Q.3 B) Write in detail lytic cycle of T4 Bacteriophages.

06

Q.4 A) Attempt any Two of the following

08

- 1) Write an account on the cultivation of animal viruses?
- 2) Explain in detail Lysogeny of lambda virus.
- 3) Write down the steps involved in reproduction of Influenza virus.

Q.4 B) Explain in detail various hypothesis of cancer.

08

Q.5 Answer the following questions in detail.

16

- 1)** Write an account on isolation, cultivation and purification of Bacteriophages.
- 2)** Explain the characteristics of cancerous cells.
- 3)** Write details of reproduction of Adenoviruses.

Seat No.	

Set **P**

B.Sc. (Semester - V) (Old) (CBCS) Examination March/April - 2025
Electronics (Special Paper - IX)
Linear Integrated Circuits and Applications (19201548)

Day & Date: Sunday, 18-May-2025
 Time: 12:00 PM To 02:00 PM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagram whenever necessary
 3) Figures to the right indicate full marks.
 4) Use of log table and calculator is allowed.

Q.1 Chose correct *alternative* and rewrite the sentence**10**

- 1) Monolithic IC consists of _____
 a) passive components
 b) active components
 c) both passive and active components
 d) none of these

- 2) In precision rectifier Op-Amp is used to _____
 a) reduce breakdown voltage
 b) reduce cut-in voltage
 c) increase cut-in voltage
 d) increase breakdown voltage

- 3) In the notch filter the quality factor is _____
 a) less than 10
 b) zero
 c) greater than 10
 d) equal to bandwidth

- 4) _____ IC gives negative five volt regulated output.
 a) 7405
 b) 7805
 c) 7105
 d) 7905

- 5) When PLL is locked then VCO frequency _____ the input frequency.
 a) equal to
 b) less than
 c) more than
 d) less than or equal to

- 6) The PLL in normal condition operates _____
 a) in a capture mode
 b) in a free running mode
 c) in a filter mode
 d) in a lock range mode

- 7) To get negative nine regulated output then _____ regulated IC is used.
 a) 7809
 b) 7109
 c) 7909
 d) 7409

- 8)** The second low pass filter the numbers of RC combinations are _____
- a) four b) three
c) one d) two
- 9)** _____ circuit used in true RMS conversion.
- a) Log amplifier b) Peak detector
c) S/H circuit d) Precision rectifier
- 10)** In IC transistor the fabricated transistors are isolated from other components by a _____ technique.
- a) dielectric isolation b) insulator isolation
c) pn junction isolation d) none of these

Q.1	B) Define the following	06
	1) Monolithic IC	
	2) Peak detector	
	3) Cut off frequency of filter	
	4) Load regulation	
	5) Lock Range	
	6) Active clamper	

Q.2 Solve any Eight of the following **16**

- 1) State the advantages of Integrated circuit.
- 2) Draw the diagram of peak detector.
- 3) Define roll off rate of filter.
- 4) Draw the circuit diagram of voltage regulator using 78XX IC.
- 5) Define voltage controlled oscillator.
- 6) Calculate the value of IC resistance having sheet resistance of 200Ω / sq. and has aspect ratio L:W=20:1.
- 7) Calculate cut off frequency of second order low pass filter if $R_1 = R_2 = 100K \Omega$ and $C_1 = C_2 = 0.01\mu F$.
- 8) Draw the diagram of antilog amplifier.
- 9) Define wide band pass filter.
- 10) Define lock range of PLL.

Q.3 A) Attempt any Two of the following **10**

- 1) Explain Butterworth second order high pass filter.
- 2) Explain the fabrication process of resistor in IC.
- 3) With suitable diagram explain the working of active clipper.

Q.3 B) Describe functional block diagram of phase lock loop. **06**

Q.4 A) Attempt any Two of the following. 08

- 1) Explain the working of voltage-controlled oscillator.
- 2) Explain PLL IC 565 as a FM demodulator.
- 3) Explain working of active clipper circuit.

Q.4 B) Explain the functional block diagram of voltage regulator. **08**

Q.5 Attempt any Two of the following.

16

- 1)** Explain PLL IC 565 as a frequency multiplier.
- 2)** With suitable diagram explain band stop filters.
- 3)** Explain in brief the steps involved in the fabrication of the IC.

Seat No.	

Set **P**

B.Sc. (Semester - V) (Old) (CBCS) Examination: March/April - 2025
Computer Science (Special Paper-IX)
Visual Programming Using C# (19201543)

Day & Date: Sunday, 18-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 Multiple Choice questions**10**

- 1) In C# _____ access specifier is used in interface.
 - a) Private
 - b) Public
 - c) Protected
 - d) All of the above
- 2) How many catch blocks can be used with a single try block in C#?
 - a) One
 - b) Two
 - c) Many
 - d) None of the above
- 3) MSIL Is _____
 - a) Microsoft Intermediate Language
 - b) Meta source Language
 - c) Intermediate Language
 - d) A OR C.
- 4) _____ is a class of System.IO namespace, and it is useful to read a text or sequential series of characters in the file.
 - a) TextWriter
 - b) Char Reader
 - c) TextReader
 - d) none of these
- 5) _____ is a special method of a class, and it is used in a class to destroy the object or instances of classes.
 - a) Constructor
 - b) Destructor
 - c) static constructor
 - d) none of these
- 6) _____ is useful to loop through each item in an array or collection object to execute the block of statements repeatedly.
 - a) Foreach loop
 - b) If
 - c) Break
 - d) none of these
- 7) C# does not support _____
 - a) Abstraction
 - b) Polymorphism
 - c) multiple inheritance
 - d) Inheritance

- 8)** Two method with same name but different parameters is known as _____
- a) Overloading b) Multiplexing
c) Duplexing d) Loading
- 9)** In c#, the _____ keyword is useful to throw an exception manually during the execution of the program.
- a) Try b) Thrown
c) Throw d) catch
- 10)** _____ is not a type of constructor in C#?
- a) Static Constructor b) Private Constructor
c) Body Constructor d) Parameterized Constructor

Q.1 B) Fill in the blanks **06**

- 1) In c# _____ is used to organize multiple classes in our applications,
- 2) The _____ can be accessed directly by using a class name.
- 3) CLS stands for _____
- 4) _____ namespace contain Thread class .
- 5) all C# application begin execution with _____ method.
- 6) _____ Method can not be override

Q.2 Solve any Eight of the following **16**

- 1) What is multicast delegate?
- 2) Write a note of CTS and CLS.
- 3) What is the Namespace?
- 4) Differentiate out and ref parameters?
- 5) What is the difference between static, public, and void?
- 6) What is properties?
- 7) Write a note on managed code.
- 8) What is unboxing?
- 9) What is method overloading?
- 10) Define single inheritance.

Q.3 A) Attempt any TWO of the following **10**

- 1) Write program to demonstrate custom exception.
- 2) Explain Thread synchronization.
- 3) Write a program for function overriding.

Q.3 B) Explain .NET framework in detail **06**

Q.4 A) Attempt any TWO of the following **08**

- 1) Explain Thread Life Cycle.
- 2) What is interface? How it is differ from Abstract class?
- 3) Write a program for constructor overloading.

Q.4 B) what is CLR? Explain Components of CLR **08**

Q.5 Attempt any TWO of the following**16**

- 1) What is sealed method? Write a program to demonstrate sealed method.
- 2) Explain Label and Textbox control with example.
- 3) Explain features of C# in detail.

Seat No.	

Set	P

B.Sc. (Semester - V) (Old) (CBCS) : Examination March/April - 2025
Physics (Special Paper-X)
Solid State Physics (19201512)

Day & Date: Sunday, 25-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) Total number of atoms in HCP cell are _____.
 a) four b) three
 c) two d) one
- 2) The coordination number of simple cubic structure is _____.
 a) four b) Three
 c) six d) two
- 3) Total number of atoms in unit cell of BCC structure is/are _____.
 a) four b) Three
 c) six d) Two
- 4) Band gap energy of Germanium is _____.
 a) 2 eV b) 0.07 eV
 c) 0.7 eV d) 0 eV
- 5) For pure metals, electrical conductivity (σ) is proportional to _____.
 a) T b) $1/T^2$
 c) $1/T$ d) $1/T^3$
- 6) Wiedmann-Franz relation is _____.
 a) $(\sigma/K)\sigma T$ b) $(K/\sigma)\alpha T^{-1}$
 c) $(K/\sigma)\alpha T^2$ d) $(K/\sigma)\alpha T$
- 7) The quantum states E_{133} and E_{331} are _____.
 a) Non-degenerate energy states
 b) Degenerate energy states
 c) Degenerate as well as Non-degenerate energy states
 d) Sometimes non-degenerate energy states
- 8) Below Fermi energy state, all the energy states are _____.
 a) completely empty b) always empty
 c) completely filled d) none of these

- 9) Infinite potential well type model proposed by _____.
 a) Sommerfelds b) Kronig
 c) Hall d) Drude-Lorentz
- 10) At the point of inflection, the value of effective mass of electron is ____
 a) Infinity b) Zero
 c) very small d) same as that of rest mass

B) Fill in the blank: **06**

- 1) Intrinsic semiconductors are (good conductors/insulators) _____ at absolute zero of temperature.
- 2) Band gap energy of diamond is (1 eV/7 eV) _____.
- 3) If the sign of Hall coefficient is positive then the charge carriers are (holes/electrons) _____.
- 4) The magnetic susceptibility of diamagnetic materials is (positive/negative) _____.
- 5) (Diamond/graphite) _____ is an example of insulator
- 6) (X-rays/Light waves) _____ are used for crystal diffraction.

Q.2 Solve any Eight of the following. **16**

- a) Define Neel point.
- b) State Curie law for paramagnetic materials.
- c) Define Fermi-Dirac distribution function.
- d) State Hall Effect.
- e) Write the formula of interplaner distance d_{hkl} for orthorhombic crystal system.
- f) Draw body centered cubic structure.
- g) Define packing fraction.
- h) Define co-ordination number.
- i) State Bragg's diffraction condition.
- j) State any two examples of metals.

Q.3 A) Attempt any Two of the following. **10**

- i) Explain in detail effect of magnetic field on superconductivity.
- ii) Show that the packing fraction of simple cubic structure is 0.52.
- iii) Show that reciprocal of reciprocal lattice is a direct lattice.

B) Write note on ferrites. **06**

Q.4 A) Attempt any Two of the following. **08**

- i) Explain type-I superconductors.
- ii) Explain type-II superconductors.
- iii) Draw the planes (100) and (111)

B) Explain the principle of powder method of X-ray diffraction and draw the experimental arrangement and traces obtained from X-ray diffraction by crystal. **08**

Q.5 Attempt any Two of the following.

16

- a)** Distinguish between metals, semiconductors and insulators on the basis of band theory of solids.
- b)** Derive the expression for electrical conductivity (σ), thermal conductivity (K) and Wiedmann-Franz relation for any metal.
- c)** Explain formation of hysteresis loop in ferromagnetic materials.

Seat No.	

Set	P

B.Sc. (Semester - V) (Old) (CBCS) : Examination March/April - 2025
Chemistry (Special Paper-X)
Inorganic Chemistry (19201507)

Day & Date: Sunday, 25-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculator is allowed.

Q.1 A) Select the correct alternative.

10

- 1) Net CFSE = CFSE + _____.
 a) ionization energy b) pairing energy
 c) lattice energy d) electron affinity
- 2) Tetragonal complexes have additional stabilization over _____ complexes
 a) tetrahedral b) square planer
 c) regular octahedral d) trigonal bipyramidal
- 3) Urea contains _____ % nitrogen.
 a) 45 b) 60
 c) 15 d) 80
- 4) Zinc is associated with iron and manganese for the synthesis of _____.
 a) proteins b) pigment
 c) chlorophyll d) amino acids
- 5) The oxidation of CHCl_3 is retarded by addition of _____.
 a) acid b) alcohol
 c) base d) phenol
- 6) In the manufacture of ammoniacatalyst _____ is used
 a) Na_2O b) Zn-Cu
 c) Pt d) Fe (Mo)
- 7) The main function of myoglobin is to _____.
 a) store O_2 b) transport O_2
 c) store CO_2 d) transport CO_2
- 8) Major metal present in human body is _____.
 a) Mg b) Na
 c) K d) Ca

- 9) _____ are used in tracer technique
- a) non-metal b) Radio-isotopes
c) Transition element d) non-radioactive element
- 10) Nuclear fusion is also known as a _____ reaction.
- a) artificial b) chain
c) man made d) thermonuclear

B) Fill in the blanks:

06

- 1) $^{14}\text{N}_7 + ^1\text{H}_1 \rightarrow \underline{\hspace{2cm}} + ^4\text{He}_2$
- 2) Radioactivity was first discovered by .
- 3) 10 Dq value for tetrahedral complex is than octahedral complex.
- 4) Haemoglobin can carry oxygen molecules.
- 5) Contact catalysis is explained by theory.
- 6) Copper is capable of acting as carrier in enzyme.

Q.2 Solve any Eight of the following.

16

- a) What are the functions of nitrogen?
- b) What are the qualities of biofertilizers?
- c) What are the types of fertilizers?
- d) What is positive catalysis?
- e) What is the role of calcium in living being?
- f) What is endothermic nuclear reaction?
- g) What is projectile capture - particle emission reaction?
- h) What is artificial transmutation?
- i) Give the basic assumptions of CFT.
- j) What are high spin and low spin complexes? Give examples.

Q.3 A) Attempt any Two of the following.

10

- What is crystal field splitting? Explain it for tetrahedral complex with suitable example.
- Oxygen binding curve for hemoglobin shows sigmoid nature, why?
- Give the applications of catalysis in industry.

B) What are radioactive tracers? Explain in brief dating of C^{14} .

06

Q.4 A) Attempt any Two of the following.

08

- i) Explain the factors affecting 10Dq value.
- ii) Give the Merits and Demerits of MOT
- iii) Explain in brief the process of manufacture of triple superphosphate.

B) What are the important characteristics of catalyst?

08

Q.5 Attempt any Two of the following.

16

- Distinguish between Haemoglobin and Myoglobin
- What is chain reaction? Explain uncontrolled chain reaction.
- On the basis of MO diagram compare $[\text{FeF}_6]^{3-}$ complex with $[\text{Fe}(\text{CN})_6]^{3-}$ complex.

Seat No.	

Set **P**

B.Sc. (Semester - V) (Old) (CBCS) Examination: March/April - 2025
Botany (Special Paper-X)
Genetics (19201502)

Day & Date: Sunday, 25-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labeled diagrams wherever necessary.

Q.1 A) Select the correct alternative. 10

- 1) _____ is the father of genetics.

a) Sir Ian Wilmut	b) Gregor Johann Mendel
c) Thomas Hunt Morgan	d) J. Craig Venter
- 2) When F1 hybrid is crossed back only with double recessive parent is called _____.

a) back cross	b) dominant cross
c) test cross	d) hybrid cross
- 3) The tendency of two or more genes to stay together during inheritance is known as _____.

a) crossing	b) Mutation
c) Linkage	d) Coupling
- 4) The distance between two linked genes is measured in _____.

a) mm	b) cm
c) map unit	d) meter
- 5) Holandric *genes* are present only in _____.

a) Males	b) Females
c) Both a & b	d) None of these
- 6) Normally *Drosophila* shows _____.

a) White eye	b) Blue eye
c) black eye	d) red eyes
- 7) Polygenes are also called as _____.

a) multiple genes	b) multiple factors
c) cumulative genes	d) all of these
- 8) The height, weight, skin pigmentation, intelligence are examples of _____.

a) qualitative	b) quantitative
c) both a & b	d) none of these

- 9) Most of the cytoplasm of zygote is contributed by the _____.
a) Sperms b) Egg
c) Both a & b d) None of these
- 10) When a plant is germinated in dark, plastids remain _____.
a) Colourless b) Yellow coloured
c) Green coloured d) None of these

B) Answer the following questions

06

- 1) Define Purity of Gametes.
- 2) Define coupling and repulsion.
- 3) Define autosomes.
- 4) What is meant by maternal inheritance?
- 5) Enlist the quantitative characters.
- 6) What is meant by sex chromosomes?

Q.2 Solve any Eight of the following.

16

- a) Define Back Cross.
- b) What is synapsis?
- c) What is meant by complete linkage?
- d) Describe Sex chromosomes in *Drosophila*.
- e) What is meant by Holandric genes?
- f) Enlist the qualitative characters.
- g) Enlist the examples of extranuclear inheritance.
- h) Give the example of cytoplasmic inheritance.
- i) Which plastid is responsible for green colour development in plants.
- j) What happens when more than one plastid is in plants?

Q.3 A) Attempt any Two of the following.

10

- Mention principles of inheritance.
- What is meant by incomplete linkage?
- Write stages of crossing over.

B) Short note/Solve

06

Describe the balance concept of sex determination in drosophila.

Q.4 A) Attempt any Two of the following.

08

- Write on Mitochondrial and Chloroplast genome.
- What is crossing over? Explain mechanism of crossing over.
- Describe sex-linked inheritance in man.

B) Describe/Explain/Solve

08

What are complementary genes? Explain with suitable example.

Q.5 Attempt any Two of the following.

16

- Explain kinds of crossing over with suitable diagrams.
- Explain inheritance of mitochondrial genes in Yeast.
- Describe the Hardy-Weinberg law studied by you.

Seat No.	

Set P

B.Sc. (Semester - V) (Old) (CBCS) Examination: March/April - 2025
Zoology (Special Paper-X)
Principles of Genetics (19201521)

Day & Date: Sunday, 25-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labeled diagrams wherever necessary.

Q.1 A) Select the correct alternative. 10

- 1) Which of the following determines the sex of the offspring in male heterogametic conditions?
 - a) Sperm
 - b) egg
 - c) Mother
 - d) both sperm and egg
- 2) Transposons were first discovered in _____.
 - a) Rice
 - b) Bacteria
 - c) Mice
 - d) Maize
- 3) When a tall pea plant (TT) is crossed with dwarf plant (tt), what will be the F₂ generation _____.
 - a) All tall plants
 - b) All dwarf plants
 - c) Both tall and dwarf plants in 3:1
 - d) Both tall and dwarf plants in 1:1
- 4) If the distance between the gene on the chromosome is more, then the gene shows
 - a) less linkage
 - b) strong linkage
 - c) weak linkage
 - d) incomplete linkage
- 5) _____ is called as father of genetics
 - a) Francis Galton
 - b) Gregor Mendel
 - c) De- Robertis
 - d) Darwin
- 6) Crossing over occurs in _____.
 - a) Mitotic cells
 - b) Meiotic cells
 - c) Amitotic cells
 - d) Mutating cells
- 7) In *Mirabilis jalapa* plant, the appearance of the pink hybrid (Rr) between a cross of a red (RR) and white (rr) flower parent indicates
 - a) Segregation
 - b) Dominance
 - c) Incomplete dominance
 - d) Heterosis

- 8) The smallest unit of genetic material that produces a phenotypic effect on mutation is:
- a) Gene
 - b) Muton
 - c) Nucleic acid
 - d) Recon
- 9) The ratio 9:7 is due to ____.
- a) Lethal gene
 - b) Supplementary
 - c) Epistatic
 - d) Complementary
- 10) Which of the following is the significance of dominance?
- a) organisms with dominant genes have stronger vitality
 - b) the dominant gene does not express the deleterious mutation;
 - c) heterosis is due to a dominant gene
 - d) all of the above

B) Give One word answer**06**

- 1) Lethal allele
- 2) Crossing over
- 3) Mutation
- 4) Deletion
- 5) Point mutation
- 6) Transduction

Q.2 Solve any Eight of the following.**16**

- a) Multiple alleles
- b) Conjugation
- c) Transposable Genetic Elements
- d) Klinefelter's Syndrome
- e) Polygenic inheritance
- f) Silent mutation
- g) Recombination
- h) Linkage
- i) Bacteriophage
- j) Transformation

Q.3 A) Attempt any Two of the following.**10**

- i) Describe characters of Down's Syndrome
- ii) Explain Chromosomal mechanisms of sex determination-in Human
- iii) Explain Complementary gene interactions

B) Short note/Solve**06**

Explain Molecular mechanisms of crossing over.

Q.4 A) Attempt any Two of the following.**08**

- i) Write a note on sex-limited characters inheritance
- ii) Describe Somatic cell hybridization
- iii) Explain Turner's Syndrome

B) Describe/Explain/Solve

08

Discuss Types of gene mutations

Q.5 Attempt any Two of the following.

16

- a)** Describe Chromosomal mechanisms of sex determination in *Drosophila*.
- b)** Explain extra-chromosomal inheritance with examples
- c)** Discuss Types of chromosomal aberrations -Classification, with one suitable example of each

- 6)** If C is given by the equation $|z - a| = R$ then the value of
 $\int_C \frac{dz}{z-a}$ is _____.
 a) πi b) $2\pi i$
 c) $-\pi i$ d) $-2\pi i$
- 7)** If L is a straight line from the point $(1,0)$ to $(1,1)$ then the value of integral
 $\int_L \bar{z} dz$ is _____.
 a) $\frac{1}{2} + i$ b) $\frac{1}{2} - i$
 c) $1 + \frac{1}{2}i$ d) $1 - \frac{1}{2}i$
- 8)** To evaluate the integrals of types $\int_0^{2\pi} \phi(\cos \theta, \sin \theta) d\theta$,
 the contour used is _____.
 a) Semi – circle b) any circle
 c) unit circle d) Rectangle
- 9)** The residue of $f(z) = \frac{z}{(z-1)(z-2)}$ at $z = i$ is _____.
 a) 1 b) 0
 c) 2 d) -1
- 10)** The residue of $\frac{1}{\sin z - \cos z}$ at $z = \frac{\pi}{4}$ is _____.
 a) $\sqrt{2}$ b) $\frac{1}{\sqrt{2}}$
 c) $\frac{1}{2}$ d) 2

B) Fill in the blanks of the following.

06

- 1) A curve $z(t) = x(t) + iy(t)$, $\alpha \leq t \leq \beta$, is called Jordan arc if $t_1 \neq t_2 \Rightarrow \underline{\hspace{2cm}}$.
- 2) $\int_L z dz$ where L is any rectifiable arc joining the points $z = a$ and $z = b$, is equal to $\underline{\hspace{2cm}}$.
- 3) If $f(z) = u + iv$ be an analytic function then u and v are both $\underline{\hspace{2cm}}$ function.
- 4) If $v = 2xy$, then its corresponding harmonic conjugate u is $\underline{\hspace{2cm}}$.

- 5) If $z = 0$ is a simple pole of $f(z)$, then the residue at this poles is given by _____.
- 6) Residue of $\frac{z^3}{(z-1)(z-2)(z-3)}$ at $z = 2$ is _____.

Q.2 Attempt any Eight of following.**16**

- 1) If $f(z)$ and $g(z)$ are analytic function in a domain D . Prove that $\frac{d}{dz}(f(z) \cdot g(z)) = f(z) \frac{d}{dz}g(z) + g(z) \frac{d}{dz}f(z)$.
- 2) If $w = f(z) = u + iv$ is analytic function in region R then prove that $\frac{\partial w}{\partial x} = -i \frac{\partial w}{\partial y}$
- 3) Find the residue of $\frac{1}{(z^2+1)^3}$ at $z = i$.
- 4) What kind of singularity has the function $f(z) = \frac{1}{(0)(\frac{1}{2})}$ at $z = 0$
- 5) Expand $\frac{1}{(z+1)(z+3)}$ valied for $|z| < 1$
- 6) Show that $\frac{1}{4z-z^2} = \sum_{n=0}^{\infty} \frac{z^{n-1}}{4^{n+1}}$ when $0 < |z| < 4$
- 7) Construct the analytic function if $u = y^3 - 3x^2y$
- 8) Evaluate $\int_c \frac{e^z}{z(z-1)^2} dz$ where c is circle $|z| = 0$.
- 9) Define Portions of complex integration.
- 10) Evaluated $\int_L \frac{dz}{(z-a)}$ Where L represent a circle $|z-a| = r$.

Q.3 A) Attempt any two of the following.**10**

- 1) If $u - v = e^x(\cos y - \sin y)$, $f(z) = u + iv$ is an analytic function of $z = x + iy$, find $f(z)$ in terms of z .
- 2) Prove that $\int_0^{\pi} \frac{d\theta}{(a + \cos \theta)^2} = \frac{\pi a}{(a^2 - 1)^{3/2}}, a > 1$
- 3) Evaluate $\int_L \bar{z} dz$ from $z = 0$ to $z = 4 + 2i$
 - i) along the curve L defined by $z = t^2 + it$
 - ii) the line from $z = 0$ to $z = 2i$ also the line from $z = 2i$ to $z = 4 + 2i$

B) If ϕ and Ψ are functions of x and y satisfying Laplace's equation, show that $s + it$ is analyte function where**06**

$$s = \frac{\partial \phi}{\partial y} - \frac{\partial \psi}{\partial x}, \quad t = \frac{\partial \phi}{\partial x} + \frac{\partial \psi}{\partial y}$$

Q.4 A) Attempt any two of the following.**08**

1) If $f(z) = \frac{x^3(1+i)-y^3(1-i)}{x^2+y^2}, (x,y) \neq (0,0)$
 $= 0 \quad (x,y) = (0,0)$

Prove that C.R. equations satisfy at the origin.

2) Prove that $\int_0^{2\pi} e^{\cos \theta} \cdot \cos(n\theta - \sin \theta) d\theta = \frac{2\pi}{n!}$

3) Obtain the Taylor and Laurent's series which represent the function $\frac{z^2}{(z+2)(z+3)}$ in the region.

i) $|z| < 2$

ii) $2 < |z| < 3$

B) State and prove Cauchy's residue theorem.**08****Q.5 Attempt any two of the following.****16**

a) Prove that necessary and sufficient condition that $w = f(z) = u + iv$ is analytic in region R is that C.R. equations $u_x = v_y$ and $u_y = -v_x$ are sufficient in R , Where suppose that derivative continuous in R .

b) Prove that $\int_0^{\pi} \frac{a d\theta}{a^2 + \sin^2 \theta} = \frac{\pi}{\sqrt{1+a^2}}, \quad a > 0$

c) Evaluate $\int_L (3x + y)dx + (2y - x)dy$ along the

i) Straight line joining $(0, 1)$ to $(2, 5)$ and

ii) The straight line $(0, 1)$ to $(0, 5)$ and then from $(0, 5)$ to $(2, 5)$

- 7) Let (X, Y) is $BN(\mu_1, \mu_1, \sigma_1^2, \sigma_2^2, \rho)$ and $\rho = 0$ then X and Y are _____.
a) Uncorrelated b) Independent
c) neither a nor b d) both a and b
- 8) If a r.v. X is truncated above k then $P(|X| > k) =$ _____.
a) $2P(X < k)$ b) $P(X < -k)$
c) 1 d) 0
- 9) Let (X, Y) is $BN(\mu_1, \mu_1, \sigma_1^2, \sigma_2^2, \rho)$ and are independent then $\rho =$ _____.
a) 0.25 b) 0.75
c) 1 d) 0
- 10) If $X \sim \text{Weibull}(\alpha, \beta)$ and $Y = x^\beta$ then distribution of Y is _____.
a) Gamma b) Beta
c) Exponential d) Normal

B) Fill in the blanks

06

- 1) The Median of Logistic distribution is _____.
- 2) If $X \sim W(\alpha, \beta)$ Then the third quartile is _____.
- 3) The nature of probability curve of Log-Normal distribution is _____.
- 4) Let X and Y be i.i.d. Exponential random variable with mean θ , Then $X - Y$ has _____.
- 5) The mean and variance of Cauchy distribution is _____.
- 6) Let X be a random variable on the sample space such that $0 \leq P(X \in T) \leq 1$ then the conditional distribution $P[X \leq x/X \in T]$ define for any real x is called the _____ of x .

Q.2 Solve any Eight of the following.

16

- a) Write a short note on regression of X on Y of bivariate normal distribution.
- b) Define Power series distribution.
- c) Sketch Probability curve of Laplace distribution.
- d) Define Double exponential distribution.
- e) State p.d.f. of Weibull distribution with parameters (α, β) .
- f) State mean, variance and coefficient of variation of Weibull distribution.
- g) State p.d.f. of truncated exponential distribution to the left below 'a'.
- h) State conditional expectation and variance of X given $Y = y$.
- i) Write p.d.f. of Log-Normal distribution.
- j) Sketch the probability curve of Logistic distribution.

Q.3 A) Attempt any Two of the following.

10

- If $X \sim \text{exp}(1)$ then find the distribution on $Y = \log(e^X - 1)$.
- Derive the p.m.f. of truncated Binomial distribution to left truncated at $x = 0$.
- Derive distribution function of Laplace distribution.

- B)** Suppose X_T is truncated Poisson random variable with $\lambda = 2$, truncated at $X = 0$. **06**

Find

- i) $P(X_T = 2)$
- ii) $E(X_T)$
- iii) $V(X_T)$

- Q.4 A) Attempt any Two of the following.** **08**

- i) Derive Distribution function of Pareto distribution.
- ii) Find the p.d.f of Bivariate Normal Distribution. If $N(\mu_1, \mu_1, \sigma_1^2, \sigma_2^2)$ as parameters.
- iii) Determine the mode of the Logistic distribution.

- B)** Calculate the first and second quartiles of the Cauchy distribution. **08**

- Q.5 Attempt any Two of the following.** **16**

- a) Derive p.d.f of truncated normal distribution to the right above 'b'. and Find mean of truncated normal distribution to the right above 'b'.
- b) Find Conditional Distribution of Bivariate normal distribution of Y given $X = x$
- c) Find mean and variance of Logistic distribution.

Seat No.	

Set	P

B.Sc. (Semester - V) (Old) (CBCS) Examination: March/April - 2025
Geology (Special Paper-X)
Hydrogeology (19201535)

Day & Date: Sunday, 25-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labeled diagrams wherever necessary.

Q.1 A) Select the correct alternative. 10

- 1) What is the type of the springs emerging at an unconformity of lower non-permeable formation?

a) Contact	b) gravity
c) hot	d) Depression
- 2) What type of hydrogeological character is that if the rock or formation stores but does not transmit a significant amount of water?

a) aquitards	b) aquiclude
c) aquifer	d) aquifuge
- 3) What does the 'capillary zone of groundwater' refer to?

a) saturated zone
b) uppermost part of unsaturated zone
c) zone in which water is drawn upward from the water table by capillary action
d) none of above
- 4) Which of the following deposits will probably provide the poor ground-water supply?

a) high altitude shale terrain	b) till
c) alluvium	d) lake clay
- 5) Mention type of aquifer, whose groundwater is in direct vertical contact with the atmosphere through surface soil pores?

a) confined	b) Unconfined
c) perched	d) artesian
- 6) What better defines 'the capacity of a rock to transmit water through its pores'?

a) porosity	b) void ratio
c) permeability	d) flow

- 7) Which of the following usually has the highest porosity but low permeability?
 - a) gravel
 - b) sand
 - c) clay
 - d) boulder
- 8) What is the water cycle part of?
 - a) Remote sensing
 - b) Petrology
 - c) Hydrogeology
 - d) surface runoff
- 9) What does highly porous rock promote?
 - a) infiltration
 - b) transpiration
 - c) precipitation
 - d) runoff
- 10) Which part of the plant is involved in transpiration?
 - a) runners
 - b) stem
 - c) leaves
 - d) Root

B) Answer the following

06

- 1) What is permeability? Which rock is good in it?
- 2) What is a water table? Is it fixed in position?
- 3) What does secondary porosity term in hydrogeology mean?
- 4) What does retention capacity term in hydrogeology mean?
- 5) What is hydrogeology?
- 6) Define perched aquifer.

Q.2 Solve any Eight of the following.

16

- a) What is connate water? Add note on its controlling factors.
- b) What is hydrogeology? Why is it important to study?
- c) What is a leaky aquifer? What are its limitations?
- d) What is a perched water table? Explain its lateral limits.
- e) What is Transmissivity? Add note on role of temperature in its functioning.
- f) What is an aquifer? Just write a list of its different types.
- g) What is an artesian well? Why does it overflows?
- h) What is a recharge zone? Where is it in Granitic terrain?
- i) Define hydrological cycle? How does temperature play an important role in it?
- j) What is a basin boundary? Give example in your area?

Q.3 A) Attempt any Two of the following.

10

- i) Describe in detail the Gravity Spring. and its functioning. Draw figure?
- ii) Explain the vadose zone and draw its diagram.
- iii) Describe the 'aquifer on aquifer' condition. Draw figures.

B) Describe the significance of lineation in aerial photographs wrt groundwater exploration

06

Q.4 A) Attempt any Two of the following. 08

- i) Explain the relation of slope for its significance in groundwater studies.
- ii) Describe the secondary porosity in rocks with examples. Draw sketches.
- iii) Describe the groundwater significance of nonpermeable and permeable rocks.

B) Describe the relation of nature of bed folded structures for its significance of groundwater. Draw sketches. 08

Q.5 Attempt any Two of the following. 16

- a) Explain how the rock textures function, wrt to groundwater? Draw sketches.
- b) Explain watershed elements. Draw figures of watershed. Show stream ordering.
- c) What is open-nonartesian well? Explain the confined aquifer Draw its diagram.

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labeled diagrams wherever necessary.
4) Use of log tables and calculators are allowed.

- The chemicals used to control all kinds of pests are known as _____.
 - Compost
 - Bioinsecticide
 - Biofertilizer
 - Pesticide
- The manure composed from solid excreta and dung of animals are known as _____.
 - Humus
 - Farm Yard Manure
 - Green manure
 - Vermicomposting
- Vanillic acid is the product formed after the biodegradation of _____.
 - Cellulose
 - Lignin
 - Hemicellulose
 - Hydrocarbons
- The whip smut of sugarcane is caused by _____.
 - Xanthomonas campestris*
 - Ustilago scietamineum*
 - Xanthomonas citri*
 - puccinia purpurea*
- The Minerals are abundant in the _____ of soil.
 - Horizon C
 - Horizon A
 - Horizon D
 - Horizon B
- The PSB solubilize the bound form of phosphates by secreting _____.
 - Vitamins
 - Phosphorylase
 - Organic acid
 - Lipopolysaccharide
- _____ is a biological method of disposal of municipal solid waste.
 - Landfills
 - Shredding
 - Pulverization
 - Composting
- _____ is the fungicide.
 - Bordeaux mixture
 - 2,4-D
 - BHC
 - DDT

- The transformation of nitrates to gaseous nitrogen is
- 9) accomplished by microorganisms in a series of biochemical reactions. The process is known as _____.
 - a) Nitrification
 - b) Denitrification
 - c) Nitrogen fixation
 - d) Ammonification
 - 10) The crystal proteins are _____ which require proteolytical conversion into smaller toxic peptides in the midgut of insects produced by *Bacillus thuringiensis*.
 - a) α toxin
 - b) γ toxin
 - c) β toxin
 - d) δ toxin

B) State True or False**06**

- 1) The Loss of productivity of soil is a phenomenon of desertification.
- 2) Zinc play an important role in biological nitrogen fixation.
- 3) In pit method of composting the layering at bottom consists aquatic weed bed.
- 4) The first transgenic virus resistant plant is a tobacco.
- 5) Normal C:N ration in humus is 10:10.
- 6) A process using microbes to convert toxic industrial wastes to less toxic or non-toxic compounds is called as bioremediation.

Q.2 Solve any Eight of the following.**16**

- a) Define ecosystem.
- b) Enlist the significance of phosphorous cycle.
- c) Define plant pathology.
- d) Differentiate clay and sandy soil.
- e) What is humus?
- f) What is green manure?
- g) What is a genetically modified crop?
- h) What is causative agent of whip-smut of sugarcane?
- i) What is PSB?
- j) Define rhizosphere.

Q.3 A) Attempt any Two of the following.**10**

- i) Write a note on composition, production & significance of Town Compost.
- ii) Discuss in detail cellulose degradation.
- iii) Describe in detail application of biotechnology in agriculture.

B) Discuss in detail *Bacillus thuringiensis* as bioinsecticide.**06****Q.4 A) Attempt any Two of the following.****08**

- i) Explain in detail structure and properties of soil.
- ii) Discuss in detail nitrogen cycle.
- iii) Give a detailed account on vermicompost production.

- B)** Explain in detail mechanism and steps involved in nitrogen fixation by *Rhizobium* **08**

Q.5 Attempt any Two of the following. 16

- a)** Discuss in detail carbon cycle.
- b)** Describe in detail degradation of lignin.
- c)** Explain in detail symptoms, transmission and control of oily spots on pomegranate.

Seat No.	

Set P

B.Sc. (Semester - V) (Old) (CBCS) : Examination March/April - 2025
Electronics (Special Paper-X)
Fundamentals of Microcontroller (19201549)

Day & Date: Sunday, 25-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative. 10

- 1) The registers R0 and R1 are normally used for _____ mode.
 - a) indirect addressing
 - b) direct addressing
 - c) bit addressing
 - d) immediate addressing
- 2) Which of the following pin of 8051 microcontroller is used for serial reception?
 - a) INT0
 - b) INT1
 - c) RxD
 - d) TxD
- 3) The 8051 microcontroller is _____ device.
 - a) 16 bit
 - b) 8 byte
 - c) 8 bit
 - d) 16 byte
- 4) The Program Status Word (PSW) register is the _____ of 8051 microcontroller.
 - a) data register
 - b) flag register
 - c) interrupt register
 - d) Timer register
- 5) To store quotient after the execution of DIV A, B the _____ is used.
 - a) R0 register
 - b) B register
 - c) A & B register
 - d) A register
- 6) The SJMP instruction is of _____ addressing method.
 - a) Long
 - b) Relative
 - c) Absolute
 - d) All of these
- 7) Which SFR register is used for selection of the Register Bank?
 - a) Accumulator
 - b) SCON
 - c) PSW
 - d) TCON
- 8) Timer 0 or Timer 1 in Mode 1 of 8051 microcontroller works as _____ mode.
 - a) 8-bit
 - b) 16-bit auto reload
 - c) 8-bit auto reload
 - d) 16-bit

- 9) Which IC is used to convert TTL signal into RS232 signal to communicate serially?
 - a) MAX232
 - b) MAX223
 - c) MAX323
 - d) None of the above
- 10) In case of 8051 microcontroller which of the following instruction belongs to immediate addressing mode?
 - a) MOV A, F5H
 - b) MOV A, #AAH
 - c) MOV A, 06H
 - d) MOV A, @R1

B) State True or False

06

- 1) In 8051 microcontroller there are two 8 bit timers/counters called T0 and T1.
- 2) Register PCON used to controls processor power down, sleep modes and serial data baud rate.
- 3) The accumulator A has A5H data then after executing the instruction ORL A, #0FFH the result will be same as data in accumulator.
- 4) The 8051 microcontroller has five interrupts, out of these 1 external interrupts, 2 timer interrupts and 2 serial port interrupts.
- 5) To double the baud rate of Timer-1 for serial communication, the SMOD bit of PCON is used.
- 6) The SFRs, Stack Pointer, is bit addressable.

Q.2 Solve any Eight of the following.

16

- a) Draw the clock and reset circuit of 8051 Microcontroller.
- b) State features of 8051 microcontroller.
- c) List the instructions used for byte level operations.
- d) What is the concept of subroutine
- e) How to configure Timer-0 as Timer in Mode-0 and Timer-1 as Counter in Mode-1?
- f) Illustrate the multiplication instruction.
- g) Mention the names of any four SFRs.
- h) What are the addressing modes in 8051 Microcontroller?
- i) State the need of clock signal in 8051?
- j) Give the role of $\overline{EA}$ pin in 8051.

Q.3 A) Attempt any Two of the following.

10

- Explain the functional block diagram of 8051 microcontroller.
- What is interrupts in 8051 and explain it.
- To generate square wave at port pin P0.1, write Assembly Language Program.

B) Explain PSW and Stack Pointer of 8051 microcontroller.

06

Q.4 A) Attempt any Two of the following.

08

- i) Compare microprocessor and microcontroller.
- ii) Write an Assembly Language Program to blink LED at port pin P1.3. Use Timer-1 in Mode-1.
- iii) Explain pin configuration of microcontroller 8051.

- B)** Explain serial communication facility of 8051 microcontroller. With suitable Assembly Language Program, explain serial transmission. **08**

Q.5 Attempt any Two of the following. **16**

- a)** Classify and explain the instruction set of 8051.
- b)** Explain memory organization of microcontroller 8051.
- c)** Write an Assembly Language Program to
 - i) Toggle the bits of port 0 and 1.
 - ii) Logical ORing of two numbers stored at 8500 & 8501.

Seat No.	

Set P

B.Sc. (Semester - V) (Old) (CBCS) : Examination March/April - 2025
Computer Science (Special Paper-X)
Core Java (19201544)

Day & Date: Sunday, 25-May-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Select the correct alternative. 10

- 1) Which feature of Java makes it possible to run a Java program on different platforms?
a) Object-Oriented b) Platform-Independent
c) Syntax d) Memory Management
- 2) Which keyword is used to define a constant variable in Java?
a) final b) static
c) const d) immutable
- 3) Which control structure is used to execute a block of code multiple times?
a) if b) switch-case
c) for d) try-catch
- 4) Which of the following is not a Java access modifier?
a) Public b) private
c) protected d) package
- 5) Which method must be implemented by all threads in Java?
a) start() b) run()
c) init() d) execute()
- 6) Which method is used to find the length of a string in Java?
a) length() b) size()
c) getSize() d) getLength()
- 7) What is the correct way to create an ArrayList of Strings?
a) ArrayList<String> list = new Array List [];
b) ArrayList list = new List<String>();
c) ArrayList list = new ArrayList<String>();
d) ArrayList<String> list = new ArrayList<>();

- 8) Which of these events is generated when a button is pressed?
 - a) Action Event
 - b) Key Event
 - c) Window Event
 - d) AdjustmentEvent
- 9) Which keyword is used for inheritance in Java?
 - a) Extends
 - b) new
 - c) Super
 - d) this
- 10) What keyword is used to explicitly raise a exception?
 - a) catch
 - b) throw
 - c) throws
 - d) raise

B) Fill in the blanks**06**

- 1) Exception and Error are direct subclasses of _____.
- 2) _____ is a subsystem of JVM which is used to load class files
- 3) _____ has multiple methods having same name but different in parameters
- 4) The _____ keyword in Java is a reference variable which is used to refer immediate parent class object.
- 5) Java _____ block is used to handle the Exception by declaring the type of exception within the parameter.
- 6) The Java _____ class is used to arrange the components in a line, one after another

Q.2 Solve any Eight of the following.**16**

- a) What is class and object?
- b) Write use of this keyword.
- c) Difference between static and non-static method.
- d) What is package?
- e) What is event?
- f) What is Serialization and de-Serialization?
- g) Write note on map interface.
- h) What is multithreading?
- i) Difference between method overloading and overriding.
- j) What is Encapsulation?

Q.3 A) Attempt any Two of the following.**10**

- i) What is abstract? Explain abstract class with example.
- ii) Write a program to find vowels and consonants into string.
- iii) Explain data type in detail.

B) Write operators in Java Programming.**06****Q.4 A) Attempt any Two of the following.****08**

- i) Write a program to handle NullPointerException.
- ii) Explain hierarchy of Swing classes.
- iii) What is File and explain java file classes with example

B) Write Collection classes and interfaces in Java.**08**

Q.5 Attempt any Two of the following.**16**

- a)** What is String and explain all methods of String class.
- b)** What is exception? Explain how to handle exception in java.
- c)** Write GUI program to implementing the following swing components.
 - i) JButton
 - ii) JTextField
 - iii) JTextArea
 - iv) JPasswordField
 - v) JCheckBox
 - vi) JRadioButton
 - vii) JComboBox
 - viii) JTree

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Physics (Special Paper - XI)
Classical Mechanics (19201513)

Day & Date: Monday, 05-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) Any rigid body having large number of particles has _____ degrees of freedom.

a) 2	b) 3
c) 5	d) 6
- 2) In conservative force field _____ remains constant.

a) linear momentum	b) angular momentum
c) energy	d) both (a) and (b)
- 3) In southern hemisphere, due to Coriolis's force, cyclone deflects towards _____.

a) North	b) South
c) East	d) West
- 4) In absence of resistance; the range of projectile is _____.

a) $2uv/g$	b) uv/g
c) $uv/2g$	d) $2v/g$
- 5) Acceleration of Atwood's machine is _____.

a) $\ddot{x} = \frac{(M1 - M2)g}{(M1 + M2)}$	b) $\ddot{x} = -\frac{(M1 - M2)g}{(M1 + M2)}$
c) $\ddot{x} = \frac{(M1 + M2)g}{(M1 - M2)}$	d) $\ddot{x} = \frac{(M1 - M2)}{(M1 + M2)}$
- 6) In the symmetric mode of oscillations, the particles are always _____.

a) In phase	b) out of phase
c) with constant phase	d) in opposite phase
- 7) Hamilton's principle is _____ principle.

a) differential	b) calculus
c) integral	d) extreme

- 8) In rigid body motion, the quantities I_{xy} , I_{yz} , I_{zx} are called _____.
 a) Moment of inertia b) Product of inertia
 c) Measured inertia d) Tensor
- 9) The principle of virtual work is _____.
 a) $\sum F_i^a, \delta r_i = 0$ b) $\sum f_i, \delta r_i = 0$
 c) $\sum F_i, \delta r_i = 0$ d) $\sum F_i, \delta r_i + \sum f_i, \delta r_i = 0$
- 10) The energy transfer from an oscillator to its coupled partner is periodic and takes place with the period _____.
 a) $T = \frac{2\pi}{\omega_1 - \omega_2}$ b) $T = \frac{3\pi}{\omega_1 - \omega_2}$
 c) $T = \frac{5\pi}{\omega_1 - \omega_2}$ d) $T = \frac{4\pi}{\omega_1 - \omega_2}$

B) Fill in the blank.**06**

- 1) If a particle is at rest in a rotating frame of reference, the Coriolis's force acting on it is _____.
- 2) A rigid body in motion can be completely specified if its _____.
- 3) D'Alembert's principle is _____ principle.
- 4) When two particles are in motion in a plane then it will have _____ degrees of freedom.
- 5) If force acting on a particle is zero, its _____ is conserved.
- 6) Minimum surface of revolution is _____.

Q.2 Solve any Eight of the following.**16**

- a) Define pseudo force and give its one example.
- b) State and prove conservation theorem for linear momentum of a particle.
- c) What is inertial frame of reference? Give one example of it.
- d) State Hamilton's principle.
- e) What are degrees of freedom?
- f) Define oscillator and give its one example.
- g) Define a rigid body.
- h) Define range of a projectile.
- i) State Euler's theorem.
- j) State principle of virtual work.

Q.3 A) Attempt any Two of the following.**10**

- 1) State and prove Brachistochrone problem.
- 2) State and prove the conservation theorem for angular momentum of a system of particles.
- 3) Obtain angular momentum of a rigid body.

B) Deduce Lagrange's equations from Hamilton's principle.**06**

- Q.4 A) Attempt any Two of the following. 08**
- 1) Obtain an expression for kinetic energy of a rigid body in component form.
 - 2) Explain the energy transfer mechanism in coupled oscillatory system.
 - 3) Explain the concept of constraints with suitable examples.
- B) State and explain D'Alembert's principle and obtain Lagrange's equations from it. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Derive an expression for time of flight and range of projectile in resistive medium.
 - b) What is Coriolis's force? Explain the effect of Coriolis's force on a body falling freely under the action of gravity.
 - c) Explain normal modes and normal coordinates of coupled oscillatory system.

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Chemistry (Special Paper - XI)
Organic Chemistry (19201508)

Day & Date: Monday, 05-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to right indicate full marks.
 3) Use of log table and calculators is allowed.
 4) Draw neat labelled diagrams wherever necessary.

Q.1 A) Multiple choice questions.**10**

- Mass spectrometer disperses beam of cations on the basis of _____ ratio.
 - e/m
 - n/e
 - m/e
 - e/n
- The reactions in which change in carbon skeleton are known as _____ rearrangement.
 - Hofmann
 - Claisen
 - Wagner-Meerwein
 - Curtius
- Radiofrequency radiations are used in _____.
 - NMR spectroscopy
 - IR spectroscopy
 - Mass spectroscopy
 - Raman spectroscopy
- In mass spectrum, intensity assigned to base peak is _____.
 - 100%
 - 0%
 - 50%
 - 90%
- The plot of absorbance versus wave number is known as _____.
 - mass spectrum
 - IR spectrum
 - NMR spectrum
 - UV spectrum
- Alanine is the example of _____.
 - β -amino acid
 - δ -amino acid
 - α -amino acid
 - γ -amino acid
- Succinic acid is _____.
 - Monocarboxylic acid
 - dicarboxylic acid
 - tricarboxylic acid
 - hydroxyl acid
- The ions which are produced by bond cleavages in the parent ion is called as _____.
 - Parent ion
 - rearrangement ions
 - fragment ions
 - complex ions

- 9) The number of fundamental modes of vibrations in the case of carbon dioxide is _____.
a) 4 b) 3
c) 6 d) 9
- 10) Metal used in Reformatsky reaction is _____.
a) magnesium b) silver
c) zinc d) iron

B) Write One sentence answer

06

- 1) Write basic principle involved in mass spectroscopy.
- 2) What is tautomerism?
- 3) What is metastable ion?
- 4) Which base is used in Oppenauer oxidation?
- 5) What is meant by (M + 2) peak in mass spectroscopy?
- 6) What is the range of finger print region?

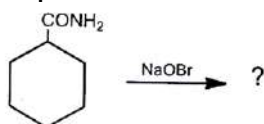
Q.2 Solve any Eight of the following.

16

- Write statement for Stobbe condensation.
- What is basic principle of IR spectroscopy?
- Complete the following reaction.



- Write the reaction involved in ketonic hydrolysis of ethyl acetoacetate.
- What are the products when acetophenone is subjected to MPV reduction?
- What are isotope ions?
- Write two uses of mass spectroscopy.
- Complete and name the reaction.

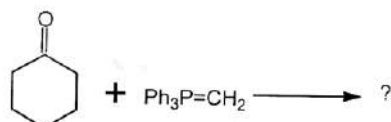


- i) What are ion-molecule complex ions in mass spectrometry?
- j) What is splitting of signals?

Q.3 A) Attempt any Two of the following.

10

- 1) Complete the following reaction, write its mechanism and name the reaction.



- 2) Explain 1, 3 diaxial interaction and stability in methyl cyclohexane.
- 3) Explain shielding and de-shielding effect.

B) Explain the term spin-spin coupling. How many signals are expected from? **06**

- 1) acetaldehyde
- 2) ethyl acetate
- 3) ethyl bromide
- 4) ethanol

Q.4 A) Attempt any Two of the following. **08**

- 1) Write note on aromatic region.
- 2) How will you prepare succinic acid from diethyl malonate?
- 3) Draw and name the four different conformers of cyclohexane.

B) Write the applications of IR spectroscopy in structure determination of organic compound. **08**

Q.5 Attempt any Two of the following. **16**

- a)** Explain NMR instrument with diagram. Write note on chemical shift.
- b)** What is reactive methylene group? How will you prepare crotonic acid and butanoic acid from ethyl acetoacetate?
- c)** Explain conformations and stability of cyclohexane with energy profile diagram.

TABLE - 1
Characteristic Infrared Absorptions of Functional Groups

GROUP		FREQUENCY RANGE cm^{-1}	INTENSITY
A.	Alkyl		
	C - H (stretching)	2853 - 2962	(m - s)
	Isopropyl - $\text{CH}(\text{CH}_3)_2$	1380 - 1385	(s)
	and	1365 - 1370	(s)
	tert - Butyl - $\text{C}(\text{CH}_3)_3$	1385 - 1395	(m)
	and	- 1365	(s)
B.	Alkenyl		
	C-H (stretching)	3010 - 3095	(m)
	C = C (stretching)	1620 - 1680	(v)
	R - $\text{CH} = \text{CH}_2$	985 - 1000	(s)
	and	905 - 920	(s)
	$\text{R}_2\text{C} = \text{CH}_2$ (out of plane C-H bendings)	880 - 900	(s)
	cis - $\text{RCH} = \text{CHR}$	675 - 730	(s)
	trans - $\text{RCH} = \text{CHR}$	960 - 975	(s)
C.	Alkynyl		
	$\equiv \text{C} - \text{H}$ (stretching)	- 3300	(s)
	$\text{C} \equiv \text{C}$ (stretching)	2100 - 2260	(v)
D.	Aromatic		
	Ar - H (stretching)	- 3030	(v)
	Aromatic substitution type (C-H out-of-plane bendings)		
	Monosubstituted	690 - 710	(very s)
	and	730 - 770	(very s)
	o - Disubstituted	735 - 770	(s)
	m - Disubstituted	680 - 725	(s)
	and	750 - 810	(very s)
	p - Disubstituted	800 - 840	(very s)
E.	Alcohols, Phenols, Carboxylic Acids		
	OH (alcohols, phenols, dilute solutions)	3590 - 3650	(sharp v)
	OH (alcohols, phenols, hydrogen bonded)	3200 - 3550	(broad s)
	OH (carboxylic acids, hydrogen bonded)	2500 - 3000	(broad v)
F.	Aldehydes, Ketones, Esters and Carboxylic Acids		
	C = O stretch 1720	1630 - 1780	(s)
	aldehydes - 1720 {Stre 2700 - 2900	1690 - 1740	(s)
	ketones	1680 - 1750	(s)
	esters	1735 - 1750	(s)
	carboxylic acids	1710 - 1780	(s)
	amides	1630 - 1690	(s)
G.	Amines		
	N - H	3300 - 3500	(m)
H.	Nitriles		
	$\text{C} \equiv \text{N}$	2220 - 2260	(m)

TABLE - 2
Approximate Proton Chemical Shifts in NMR

TYPE OF PROTON	CHEMICAL SHIFT, DELTA, PPM (δ)	
1° Alkyl, RCH_3	0.8 - 1.0	
2° Alkyl, RCH_2R	1.2 - 1.4	
3° Alkyl R_3CH	1.4 - 1.7	
Allylic, $\text{R}_2\text{C} = \underset{\text{R}}{\underset{ }{\text{C}}} - \text{CH}_3$	1.6 - 1.9	Ester $\text{R} - \overset{\text{O}}{\parallel}{\text{C}} - \text{O} - \text{CH}_2 - \text{R}$ 4 to 4.5 N - CH_3 2.3
Benzylic, ArCH_2	2.2 - 2.5	
Alkyl chloride, RCH_2Cl	3.6 - 3.8	
Alkyl bromide, RCH_2Br	3.4 - 3.6	
Alkyl iodide, RCH_2I	3.1 - 3.3	
Ether, ROCH_2R	3.3 - 3.9	
Alcohol, HOCH_2R	3.3 - 4.0	
Ketone, RCCH_3 $\parallel$ O	2.1 - 2.6	
Aldehyde, RCH $\parallel$ O	9.5 - 9.6	
Vinylic, $\text{R}_2\text{C} = \text{CH}_2$	4.6 - 5.0	
Vinylic $\text{R}_2\text{C} = \underset{\text{R}}{\underset{ }{\text{CH}}}$	5.2 - 5.7	
Aromatic, ArH	6.0 - 9.5	
Acetylenic, $\text{RC} \equiv \text{CH}$	2.5 - 3.1	
Alcohol hydroxyl, ROH	0.5 - 6.0 ^a	
Carboxylic, RCOH $\parallel$ O	10 - 13 ^a	
Phenolic, ArOH	4.5 - 7.7 ^a	
Amino $\text{R} - \text{NH}_2$	1.0 - 5.0	

^aThe chemical shifts of these groups vary in different solvents and with temperature and concentration.

TABLE - 3
U.V. Absorption rules for Diene Chromophores

1) Parent	215 nm	
2) Each extra conjugation	30 nm	
3) Homoannular	39 nm	
4) Exocyclic double bond	05 nm	
5) Each alkyl (R) substituent directly attached to double bonded carbon	05 nm	- OH, - OR, Cl, Br 5 (nm) - SR, (30 nm), - NR ₂ (60 nm)

U.V. Absorption rules for Enone System

1) Parent	215 nm			
2) Each extra conjugation	30 nm			
3) Homoannular	39 nm			
4) Substituents				
a) Alkyl group at α	10 nm			
b) Alkyl group at β	12 nm			
c) Alkyl group at γ, δ	18 nm			

	α	β	γ
Cl	15	12	
OH, OR	35	30	
SR		85	
NR ₂		95	
O		75	
Acyl	6	6	6

Seat No.	

Set P

B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Botany (Special Paper - XI)
Molecular Biology (19201503)

Day & Date: Monday, 05-May-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.
4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) Two complementary strands of DNA held together by _____ bond.
a) covalent bond b) ionic bond
c) peptide bond d) hydrogen bond
- 2) Initiation codon in eukaryote is _____.
a) AUG b) UAG
c) UAA d) AUC
- 3) Translation occurs in the _____.
a) nucleus b) mitochondria
c) chloroplast d) cytoplasm
- 4) Out of following _____ sugar is present in RNA.
a) Ribose b) Deoxyribose
c) Glucose d) Fructose
- 5) Transformation in bacteria was demonstrated by _____.
a) Arthur Kornberg b) Griffith
c) George Mendel d) Watson
- 6) Transfer of genetic information from DNA to RNA is called _____.
a) translation b) replication
c) transcription d) transduction
- 7) Pyrimidine base in DNA is _____.
a) Adenine b) Guanine
c) Uracil d) Cytosine
- 8) DNA polymerase discovered by _____.
a) Arthur Kornberg b) Griffith
c) George Mendel d) Watson

Q.5 Attempt any Two of the following.

16

- a)** Describe the operon model for regulation in gene activity.
- b)** Enumerate the steps involved in translation of prokaryotes.
- c)** Explain in brief organization of DNA in Eukaryotes.

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (Old) (CBCS) : Examination March/April - 2025
Zoology (Special Paper - XI)
Endocrinology (19201522)

Day & Date: Monday, 05-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Multiple choice questions.**10**

- 1) _____ is the primary target of the releasing and inhibition hormones of the hypothalamus.
 - a) Anterior pituitary
 - b) Liver
 - c) Testis
 - d) Ovary
- 2) Diabetes mellitus is caused by deficiency of _____.
 - a) Glucagon
 - b) Testosterone
 - c) Progesterone
 - d) Insulin
- 3) Exothermic goiter is due to over secretion of _____ gland.
 - a) Adrenal
 - b) Thymus
 - c) Thyroid
 - d) Parathyroid
- 4) Leydig cells activated by hormone _____.
 - a) FSH
 - b) ICSH
 - c) ADH
 - d) LH
- 5) Ca^{2+} is a _____ messenger.
 - a) Primary
 - b) Secondary
 - c) Tertiary
 - d) Quaternary
- 6) Prolactin hormone regulates formation of _____.
 - a) Milk
 - b) Urine
 - c) Blood
 - d) Plasma
- 7) Pars intermedia secrete only one hormone _____.
 - a) LH
 - b) FSH
 - c) ADH
 - d) MSH
- 8) Seminiferous tubules found in _____.
 - a) Ovary
 - b) Kidney
 - c) Testis
 - d) Liver

- 9) Circadian rhythm controlled by _____ gland.
- a) Pineal b) Parathyroid
- c) Thyroid d) Testis
- 10) Pituitary gland is a part of _____ Brain.
- a) Mid b) Hind
- c) Fore d) Future brain

B) Fill in the blanks.

06

- 1) Progesterone maintain _____.
- 2) Skin pigmentation controlled by _____ hormone.
- 3) Offence and defense mechanism control by _____ gland.
- 4) Graafian follicle found in _____.
- 5) Blood calcium level regulated by _____ gland.
- 6) Full form of ACTH is _____.

Q.2 Solve any Eight of the following.

16

- a) Endocrine gland
- b) GnRH
- c) Feedback mechanism
- d) Hypothyroidism
- e) LH
- f) Islets of Langerhans
- g) ADH
- h) Neurosecretion
- i) Estrogen
- j) Disorder of ovary

Q.3 A) Attempt any Two of the following.

10

- 1) Explain hormones of Testis.
- 2) Describe location, structure and function of pineal gland.
- 3) Define placenta and give placental disorders.

B) Write short note on characteristics of hormones.

06

Q.4 A) Attempt any Two of the following.

08

- 1) Role of posterior pituitary hormones.
- 2) Describe structure, hormone and its role of ovary in endocrinology.
- 3) Explain hormonal action of cellular level.

B) Describe the role of anterior pituitary glands in endocrine system.

08

Q.5 Attempt any Two of the following.

16

- Describe hormone regulation mechanism by hypothalamus.
- Explain disorder of pituitary gland.
- Describe neurohormones.

Seat No.	

Set | P

B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Mathematics (Special Paper - XI)
Real Analysis (19201526)

Day & Date: Monday, 05-May-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figure to right indicate full marks.

Q.1 A) Choose the correct alternative for each of the following. 10

- Choose the correct alternative for each of the following.
- 1) The series $\sum_{n=2}^{\infty} \frac{1}{n(\log n)^P}$ is convergent if _____.
a) $P = 1$
b) $P < 1$
c) $P \leq 1$
d) $P > 1$
 - 2) The sequence $\{(-1)^{n-1}\}$ is _____.
a) only bounded above
b) Only bounded below
c) bounded
d) unbounded
 - 3) If s is the universal set and χ is the characterized function then χ_s is _____.
a) 0
b) 1
c) $-\infty$
d) ∞
 - 4) The sequence $\left\{\log\left(\frac{1}{n}\right)\right\}_{n=1}^{\infty}$ _____.
a) Converges
b) Diverges to ∞
c) Diverges to $-\infty$
d) Oscillates
 - 5) If B is an infinite subset of countable set A then B is _____.
a) uncountable
b) countable
c) equivalent
d) countable and uncountable
 - 6) The series $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \dots$ is _____.
a) Divergent
b) Convergent
c) Oscillatory
d) Both (a) and (b)
 - 7) Every Cauchy sequence of real number is _____.
a) Divergent
b) Unbounded
c) Convergent
d) Oscillatory

- 8) If $f: A \rightarrow B$ and $x \in A, y \in A$ then $f(x \cup y) = \underline{\hspace{2cm}}$.
 a) $f(x) \cap f(y)$ b) $f(x) \cup f(y)$
 c) $f^{-1}(x) \cap f^{-1}(y)$ d) $f^{-1}(x) \cup f^{-1}(y)$
- 9) If $f(x) = x^2 (-\infty < x < \infty)$ then $f^{-1}(7)$ is _____.
 a) $\{\sqrt{7}\}$ b) $\{-\sqrt{7}\}$
 c) $\{\sqrt{7}, -\sqrt{7}\}$ d) ϕ
- 10) The series $\sum_{n=1}^{\infty} \frac{1}{n}$ is _____.
 a) Convergent b) Divergent
 c) Conditionally convergent d) Absolute convergent

B) Fill in the blanks.**06**

- 1) The series $1 + r + r^2 + r^3 + \dots$ is oscillatory if _____.
 If χ is the characteristics function on the set A and B then
 2) $\chi_{A \cup B} = \underline{\hspace{2cm}}$.
 3) If $s_n = (-1)^n$ then $\liminf_{n \rightarrow \infty} s_n = \underline{\hspace{2cm}}$.
 4) If $\sum_{n=1}^{\infty} a_n$ is convergent then $\lim_{n \rightarrow \infty} a_n = \underline{\hspace{2cm}}$.
 5) If $\lim_{n \rightarrow \infty} \left(1 + \frac{2}{n}\right)^n = \underline{\hspace{2cm}}$.
 6) If $0 < x < 1$ then $\sum_{n=0}^{\infty} x^n$ converges to _____.

Q.2 Solve any Eight of following.**16**

- a) Define cartesian product of A and B with example.
 b) Prove that set of all integers is countable.
 c) Prove that every convergent sequence converges to unique limit.
 d) If $\lim_{n \rightarrow \infty} S_n = L$ and $\lim_{n \rightarrow \infty} t_n = M$ then prove that $\lim_{n \rightarrow \infty} (S_n + t_n) = L + M$.
 e) Write the formula for the sequence $0, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \underline{\hspace{2cm}}$.
 f) Define oscillatory sequence with example.
 g) Prove that $(A - C) \cap (B - C) \subset (A \cap B) - C$
 h) If $s = (s_n) = (2n - 1)$ and $\sigma = ni = i^2$ write down the different term of s and subsequence s_{σ}
 i) Define Monotone sequence.
 j) Find limit sup and limit inf. s_n where $\{s_n\}_{n=1}^{\infty} = \sin n \frac{\pi}{2} + (-1)^n$

Q.3 A) Attempt any two of the following. **10**

- 1) Prove that countable union of countable set is countable.
- 2) If the sequence of real no $\{s_n\}_{n=1}^{\infty}$ is convergent. Then $\{s_n\}_{n=1}^{\infty}$ is bounded.
- 3) Prove that the series $\sum(\sqrt{n^2 + 1} - n^2)$ is convergent.

B) If $\lim_{n \rightarrow \infty} \sup |a_n|^{1/n} = A$ then the series of real number $\sum_{n=1}^{\infty} a_n$ **06**

- 1) Converges absolutely if $A < 1$
- 2) Diverges if $A > 1$
- 3) If $A = 1$ test fails

Q.4 A) Attempt any two of the following. **08**

- 1) If $f: A \rightarrow B$ and $X \subset B, Y \subset B$ then $f^{-1}(X \cup Y) = f^{-1}(X) \cup f^{-1}(Y)$.
- 2) Prove that $1 + \frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + \dots$ converges.
- 3) For that $a, b \in R$ such that $||a| - |b|| \leq |a - b|$
Then prove that $\{s_n\}_{n=1}^{\infty}$ converges to $|L|$ if $\{s_n\}_{n=1}^{\infty}$ converges to L .

B) If A and B are subset if s then **08**

- 1) $(A \cup B)' = A' \cap B'$
- 2) $(A \cap B)' = A' \cup B'$

Q.5 Attempt any two of the following. **16**

- a) An infinite subset of a constable is countable.
- b) If $\{s_n\}_{n=1}^{\infty}$ is convergent then $\lim_{n \rightarrow \infty} \inf s_n = \lim_{n \rightarrow \infty} s_n$
- c) 1) If $0 < x < 1$ then $\sum_{n=0}^{\infty} x^n$ converges to $\frac{1}{1-x}$
- 2) If $x \geq 1$ then $\sum_{n=0}^{\infty} x^n$ diverges.

Seat No.	

Set	P

B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Statistics (Special Paper - XI)
Sampling Techniques (19201530)

Day & Date: Monday, 05-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to right indicate full marks.
 3) Use of log table and calculators is allowed.

Q.1 A) Multiple choice questions. 10

- 1) Systematic sampling means _____.
 a) Selection of n contiguous units
 b) Selection of n units situated at equal distances
 c) Selection of n largest units
 d) Selection of n middle units in a sequence
- 2) Probability of selection of varies at each subsequent draw in _____.
 a) SRSWOR b) SRSWR
 c) both (a) and (b) d) neither (a) nor (b)
- 3) How many types of allocation are in common use?
 a) one b) two
 c) three d) four
- 4) Circular systematic sampling is used when _____.
 a) N is a multiple of n
 b) N is a whole number
 c) N is not divisible by n
 d) None of the above
- 5) Sapling errors can be reduced by _____.
 a) choosing a proper probability sampling
 b) selecting a sample of adequate size
 c) using a suitable formula for estimation
 d) all the above
- 6) Under proportional allocation the size of the sample from each stratum depends on _____.
 a) Total sample size b) Size of the stratum
 c) Population size d) All the above
- 7) The errors in a survey other than sampling error are called _____.
 a) formula error b) planning error
 c) non- sampling error d) none of the above

- 8) Regarding the number of strata, which statement is true?
- lesser the number of strata, better it is
 - more the number of strata, poorer it is
 - more number of strata, better it is
 - not more than ten items should be there in a stratum
- 9) A sample consists of ____.
- all units in the population
 - 50 per cent units in the population
 - 5 per cent units in the population
 - any fraction of the population
- 10) The total number of possible samples of size n , drawn from population size N by SRSWOR is ____.
- n
 - N
 - NCn
 - N^n

B) Define the following.**06**

- Sample
- Probability sampling
- Auxiliary variable
- Sampling frame
- Sampling error
- Sampling unit

Q.2 Solve any Eight of the following.**16**

- Define non-sampling error.
- Give a real-life situation where stratified sampling is used.
- State characteristics of a good questionnaire.
- What is meant by proportional allocation.
- State the objectives of sample survey.
- Give a real-life situation where systematic sampling is used.
- Give a real-life situation where cluster sampling is used.
- Define non-random sampling.
- State the advantages of sampling method over census method.

Q.3 A) Attempt any Two of the following.**10**

- Explain sampling for proportion, obtain its unbiased estimator for population proportion.
- Describe stratified random sampling procedure.
- Show that ratio estimator is biased.

B) Write short note on systematic sampling.**06**

Q.4 A) Attempt any Two of the following. 08

- 1) Describe, in brief the cluster sampling.
- 2) Find under what condition ratio estimate is more efficient than SRS.
- 3) Explain regression estimators of population mean.

B) Describe the idea of two-stage and multistage sampling in details. 08

Q.5 A) Attempt any Two of the following. 16

- a) Discuss in details about the determination of the sample size.
- b) In presence of linear trend of the form $Y_i = a + bi$; $i = 1, 2, \dots, N$, compare SRSWOR, Stratified random sampling and systematic sampling.
- c) With usual notations prove that Neyman's allocation has better precision than proportional allocation; and also prove that proportional allocation has better precision than SRS.

Seat No.	

Set	P

B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Geology (Special Paper - XI)
Applied Geology - Engineering Geology (19201536)

Day & Date: Monday, 05-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Select the correct alternative. 10

- 1) Lithology does not effects on which parameter?
 - a) Type of tunnel
 - b) Method of tunnelling
 - c) Strength and extent of lining
 - d) Cost of the project
- 2) Rock types and geological structures can be studied using: _____.
 - a) electrical resistivity
 - b) rock core drilling
 - c) geophysical survey
 - d) field mapping
- 3) Hidden rocks having light density gives _____ gravity anomaly.
 - a) high/positive
 - b) low/negative
 - c) Neutral
 - d) none of these
- 4) Instruments called the 'geophone' are used _____ in geophysical exploration method.
 - a) Seismic survey
 - b) Magnetic survey
 - c) Gravity survey
 - d) Electrical resistivity survey
- 5) In the execution stage of construction, what type of task is undertaken by the engineering geologist?
 - a) the geologist plots topographic, geological features and geologically weaknesses at the site
 - b) The geologists perform core logging
 - c) The geologists perform geophysical surveys
 - d) The geologists prepare regional geological and structural maps
- 6) What is the maximum compressive force expressed per unit area, which a stone can withstand without rupturing?
 - a) Shear strength
 - b) Tensile strength
 - c) Crushing strength
 - d) Bending strength

- 7) What may cause subsidence of foundation of heavy construction?
 - a) Excess groundwater withdrawal
 - b) Sliding
 - c) Fall
 - d) all of these
- 8) Pick the rock which is objectionable for use in moist conditions.

a) Granite	b) Marble
c) Gabbro	d) Limestone
- 9) Type of dam where the forces acting on the dam are transmitted onto the abutment rocks is _____.

a) Gravity dam	b) Arch dam
c) Geotechnical dam	d) Embankment dam
- 10) Lithology does not effects on which parameter?
 - a) Type of tunnel
 - b) Method of tunneling
 - c) Strength and extent of lining
 - d) Cost of the project

B) Answer the following in one sentence.**06**

- 1) Special purpose (Thematic) geological maps are prepared in which stage of engineering project?
- 2) What is liquefaction?
- 3) What is the type of soil found in Indo-Gangetic plains?
- 4) In which type of survey electric current is used.
- 5) Which type of geological structure can be rectified by grouting for tunneling?
- 6) "Schistosity dipping towards downstream of the river". Is this condition being favorable for dam construction?

Q.2 Solve any Eight of the following.**16**

- a) What is the agent of mass movement?
- b) What are the characteristics of glacial soil?
- c) What are the two types of clay structure?
- d) What is invert in tunnel?
- e) What is the use of gallery of the dam?
- f) What is reservoir of the dam?
- g) Which soil occurs at abyssal zones of ocean?
- h) What is modulus of elasticity?
- i) What is geophone? Where it is used?
- j) Name the types and sub types of flowages in landslides.

Q.3 A) Attempt any Two of the following.**10**

- 1) What are solutions to control landslides?
- 2) Describe concrete dam.
- 3) Write a note on "Engineering geological work at construction stage."

B) Write a note on selection of site for tunnel construction in folded region. Draw diagrams. **06**

Q.4 A) Attempt any Two of the following. 08

- 1) Explain fall in mass movement. Add note on meshing & bolting.
- 2) Describe 1:1 and 2:1 layer in clays with appropriate figures.
- 3) Describe magnetic survey method for site investigation.

B) Explain uniaxial compressive strength. **08**

Q.5 Attempt any Two of the following. 16

- a)** Earthen and gabion dams. What are their significances?
- b)** What types of precautionary measures one should take during the construction of tunnels in hard and soft rocks?
- c)** Explain the parameters and characters that are crucial in a geological report in a structurally disturbed region.

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Microbiology (Special Paper - XI)
Immunology (19201541)

Day & Date: Monday, 05-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Choose the correct alternative and rewrite the sentences again. 10

- 1) _____ antibody produced in primary immune response.

a) IgM	b) IgG
c) IgD	d) IgA
- 2) The antigen present in the blood is filtered and eliminated by _____.

a) lymph node	b) Spleen
c) Thymus	d) Bone Marrow
- 3) The antigen peptide presented by MHC II is composed from _____ amino acid.

a) 10-12	b) 8-10
c) 14-16	d) 1-8
- 4) _____ blood group is called universal blood acceptor.

a) A ⁺	b) B ⁺
c) O ⁻	d) AB ⁺
- 5) Serum sickness is example of _____ hypersensitivity.

a) Type I	b) Type II
c) Type III	d) Type IV
- 6) The non-parasitic antigen responsible to cause allergy is called as _____.

a) allergen	b) antigen
c) mitogen	d) isogen
- 7) The endogenous antigens are processed by _____ pathway.

a) Cytosolic	b) Endocytic
c) Phagocytosis	d) Both a and c
- 8) _____ medium is used to screen the hybrid cells in monoclonal antibody production.

a) TAC	b) PEG
c) HAT	d) CAT

9) In humans MHC loci or HLA complex is present on chromosome number _____.

a) 6	b) 17
c) 10	d) 11

10) Auto-antibodies against acetyl choline receptors are produced in _____.

a) Pernicious anemia	b) Rheumatoid arthritis
c) Myasthenia gravis	d) SLE

B) Define the following.

06

- 1) What is MAC in complement pathway?
- 2) Draw a neat labeled diagram of B lymphocyte.
- 3) Define auxotroph.
- 4) What is pernicious anemia?
- 5) Enlist the role of NK cells.
- 6) What is graves' disease?

Q.2 Solve any Eight of the following.

16

- a) What is Allograft?
- b) What is complement?
- c) What is MALT?
- d) Define secondary immune response.
- e) HLA typing.
- f) What is blood transfusion?
- g) What is atopy?
- h) What is hemolytic anemia?
- i) Enlist cells involved in cell mediated immunity.
- j) Enlist the granulocytes along with their role.

Q.3 A) Attempt any Two of the following.

10

- 1) Give a detailed account on non-organ specific autoimmunity.
- 2) Discuss in brief classical complement pathway.
- 3) Give a brief account on structure of thymus.

B) Define monoclonal antibody. Discuss in brief hybridoma technology.

06

Q.4 A) Attempt any Two of the following.

08

- 1) Discuss in brief applications of monoclonal antibody.
- 2) Discuss in detail types of graft. Add a note on graft rejection.
- 3) Describe in detail structure and function of lymph node.

B) Discuss in detail delayed type of hypersensitivity.

08

Q.5 Attempt any Two of the following.

16

- a) Discuss in detail mechanism and cells involved in humoral immunity.
- b) Define immediate type of hypersensitivity. Describe in detail mechanism of Type-I hypersensitivity.
- c) Describe in detail structure and role of MHC I and MHC II.

- 8) The piezo-electric transducer, formed by the material, having piezo-electric property, _____.
 - a) Rochelle-salt
 - b) Tourmaline
 - c) Quartz
 - d) All of these
- 9) The photoconductive material used in LDR is _____.
 - a) gallium arsenide
 - b) gallium phosphide
 - c) cadmium sulphide
 - d) silicon dioxide
- 10) The behavior of a measurement system subjected to rapidly changing input quantity is called _____.
 - a) Fidelity
 - b) dynamic error
 - c) dynamic response
 - d) measurement lag

B) One sentence answer.

06

- 1) Give two examples of Passive Transducers.
- 2) Give two examples of actuator.
- 3) Enlist the temperature transducers
- 4) Draw the symbol of Phototransistor.
- 5) Enlist Photoelectric Transducers.
- 6) Define measurand.

Q.2 Solve any Eight of the following.

16

- a) State any four points to be considered while selecting a transducer for any application.
- b) Compare active and passive transducers.
- c) Distinguish between RTD and thermistor.
- d) What is transducer?
- e) Draw the diagram of Resistive Position transducer.
- f) Give the principle of operation of Inductive Transducer.
- g) What is LDR?
- h) What is basic requirement of transducers?
- i) What is need of system calibration?
- j) Basic difference between sensor and transducer.

Q.3 A) Attempt any Two of the following.

10

- 1) Draw diagram & explain capacitor microphone.
- 2) Write a note on piezoelectric transducer.
- 3) Explain Potentiometer with diagram.

B) Write a note on solenoid.

06

Q.4 A) Attempt any Two of the following.

08

- 1) Explain the construction and working of Electromagnetic Relay.
- 2) Explain Photovoltaic cell.
- 3) Explain Pyrometers.

B) Draw the block diagram of measurement system and explain in brief.

08

Q.5 Attempt any Two of the following.

16

- a)** Explain the working of LVDT with neat diagram.
- b)** Explain Thermocouple in brief.
- c)** Discuss static and dynamic characteristics & responses of instrument.

Seat No.	

Set	P

B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Computer Science (Special Paper - XI)
Operating System (19201545)

Day & Date: Monday, 05-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Select the correct alternative. 10

- 1) What is the ready state of a process?
 - a) when process is scheduled to run after some execution
 - b) when process is unable to run until some tasks has been completed
 - c) when process is using the CPU
 - d) none of the above
- 2) Which File type can be represented by _____.
 - a) file name
 - b) file extension
 - c) file identifier
 - d) none of these
- 3) If the value of a binary semaphore S is 0, and a process executes a WAIT instruction on S, then _____.
 - a) S will remain zero and the process will proceed
 - b) S will remain zero and the process will be placed on a queue
 - c) S will become one and the process will proceed
 - d) S will become one and the process will be placed on a queue
- 4) The time required to move the disk head to the desired track is known as _____.
 - a) Access Time
 - b) Track Time
 - c) Latency Time
 - d) Seek Time
- 5) What is a medium-term scheduler?
 - a) It selects which process has to be brought into the ready queue
 - b) It selects which process has to be executed next and allocates CPU
 - c) It selects which process to remove from memory by swapping
 - d) None of these
- 6) Which of the following do not belong to queues for processes?
 - a) Job Queue
 - b) PCB queue
 - c) Device Queue
 - d) Ready Queue

- 7) In a time-sharing operating system, when the time slot given to a process is completed, the process goes from the running state to the _____.
a) Blocked state b) Ready state
c) Suspended state d) Terminated state
- 8) The idea of overlays is to _____.
a) keep in memory only those instructions
b) data that are needed at any given time
c) enable a process to be larger than the amount of memory allocated to it
d) all the above
- 9) When to check for deadlock?
a) every time a resource request is made
b) at fixed time intervals
c) both (a) and (b)
d) none of these
- 10) Process synchronization can be done on _____.
a) hardware level b) software level
c) both (a) and (b) d) none of these

B) Fill in the blank.**06**

- 1) Several processes access and manipulate the same data concurrently and the outcome of the execution depends on the particular order in which the access takes place, is called _____.
2) Semaphore is an _____ to solve the critical section problem.
3) _____ is the concept in which a process is copied into main memory from the secondary memory according to the requirement.
4) _____ is the address generated by CPU.
5) In FIFO page replacement algorithm, when a page must be replaced _____.
6) _____ is a unique number, identifies the file within the file system.

Q.2 Solve any Eight of the following.**16**

- a) What is purpose of system calls?
b) What do you mean by context switching?
c) What are the benefits of threads?
d) What is Disk Reliability?
e) Define critical section.
f) Differentiate between paging and segmentation.
g) What do you mean by Best Fit and First fit?
h) List the various File Attributes
i) Define Thrashing.
j) What is a scheduler?

- Q.3 A) Attempt any Two of the following. 10**
- a) What is demand paging? How page fault occurs?
 - b) Explain Directory Structure.
 - c) Explain the process scheduling algorithm.
 - 1) Priority scheduling
 - 2) Shortest job first scheduling
- B) What methods determines how a file's records are allocated into blocks? 06**
- Q.4 A) Attempt any Two of the following. 08**
- 1) Write short notes on Real time system.
 - 2) Explain process control block.
 - 3) Describe necessary conditions for a deadlock situation to arise.
- B) Consider the following disk request sequence for a disk with 90 tracks: 08**
- 12, 34, 52, 14, 25, 68, 39 R/W head is starting at 53
Find the number of movements using following disk scheduling algorithms:
- 1) FCFS
 - 2) SSTF
 - 3) SCAN
 - 4) C-SCAN
- Q.5 Attempt any Two of the following. 16**
- a) Given five memory partitions of 100Kb, 500Kb, 200Kb, 300Kb, 600Kb (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of 212Kb, 417Kb, 112Kb, and 426Kb (in order). Which algorithm makes the most efficient use of memory?
 - b) How does deadlock avoidance differ from deadlock prevention? Write about deadlock avoidance algorithm in detail.
 - c) Explain with the help of examples LRU and Optical page replacement algorithms. Discussion the advantages and disadvantages.

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculators is allowed.

10

- Page 1 of 3

- 9) 1 barn is equal to _____
- | | |
|---------------------------|----------------------------|
| a) 10^{-28} m^2 | b) 10^{-28} cm^2 |
| c) 10^{28} m^2 | d) 10^{28} cm^2 |
- 10) α particles are _____
- | | |
|------------------|-------------|
| a) photon | b) electron |
| c) helium nuclei | d) neutron |

Q.1 B) Answer the following questions**06**

- 1) What is Dead Time?
- 2) The atomic mass of an Atom is 90.97015 amu and mass number is 90. Calculate the Mass Defect of the Atom.
- 3) How many Dee's are there in Cyclotron?
- 4) State the function of Lucite in Scintillation Counter.
- 5) What is the shape of nucleus?
- 6) How many nucleons are there in Hydrogen atom?

Q.2 Solve any Eight of the following.**16**

- 1) State the properties of β particles.
- 2) Define Resolving time.
- 3) Draw neat diagram of Scintillation Counter.
- 4) Define nuclear cross section. State its unit.
- 5) State the principle of Phase stable orbit.
- 6) Mass number of an atom is 59 & its atomic mass is 59.80613amu. Find packing fraction of the atom.
- 7) Define α -disintegration energy.
- 8) Define Nuclear Magnetic Moment.
- 9) Define amu.
- 10) Define nucleons and name them.

Q.3 A) Attempt any Two of the following.**10**

- 1) Explain Pick-up Reaction
- 2) Explain the continuous nature of β - ray spectrum.
- 3) What are Elementary Particles? Give the classification of Elementary particles.

- B)** Define a Nuclear reaction. State the types of nuclear reactions. Hence calculate the Q value of the following nuclear reaction & comment on the result.

06

Given:- Mass of ${}_{13}\text{Al}^{27} = 27.9706 \text{ amu}$

Mass of ${}_1\text{H}^2 = 2.014102 \text{ amu}$

Mass of ${}_{12}\text{Mg}^{25} = 25.97216 \text{ amu}$

Mass of ${}_2\text{He}^4 = 4.00388 \text{ amu}$

- Q.4 A) Attempt any Two of the following. 08**
- 1)** Define Nuclear reaction. State and explain the types of nuclear reactions.
 - 2)** Discuss advantages and disadvantages of Cyclotron.
 - 3)** Write a note on Quarks.
- B) Define nuclear reaction cross-section. Determine nuclear reaction cross-section of a nuclear reaction and discuss its geometrical significance. 08**
- Q.5 Attempt any Two of the following. 16**
- 1)** Define Binding energy. Explain the characteristic Binding energy curve. The atomic mass of Calcium is 41.97216 amu and atomic mass number is 41. Calculate the Binding Energy and Packing fraction for Calcium.
 - 2)** Explain construction and working of GM counter. Explain Geiger plateau region.
 - 3)** State the principle & explain the working of Betatron. Derive the expression for kinetic energy gained by the electron.

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Chemistry (Special Paper - XII)
Analytical and Industrial Physical Chemistry (19201509)

Day & Date: Tuesday, 06-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) The equation $I_t = I_0 \cdot 10^{-\alpha t}$ represents.
 - a) Lambert's law
 - b) Grotthus law
 - c) Beer's law
 - d) Einstein's law
- 2) For ultraviolet spectroscopic study, cells used are made of _____.
 - a) polymer
 - b) quartz
 - c) glass
 - d) silica
- 3) _____ electrode is the indicator electrode.
 - a) Glass
 - b) Calomel
 - c) Hydrogen
 - d) Silver-silver chloride
- 4) _____ electrode is the reference electrode.
 - a) Glass
 - b) Hydrogen
 - c) Platinum
 - d) Quinhydrone
- 5) In chromium plating, generally _____ anode is used.
 - a) lead
 - b) chromium
 - c) nickel
 - d) zinc
- 6) The process of cleaning the article in acid is known as _____.
 - a) pickling
 - b) washing
 - c) tumbling
 - d) All of these
- 7) The material most commonly used in making prisms in flame photometry is _____.
 - a) glass
 - b) quartz
 - c) metal
 - d) non-metal
- 8) In total consumption burner, _____ of sample is used.
 - a) 5%
 - b) 50%
 - c) 95%
 - d) 100%

- 9) The unit of the cell constant is _____.
a) S b) S cm^{-1}
c) cm^{-1} d) cm
- 10) In conductivity cells the electrodes used are made up of _____.
a) gold b) silver
c) platinum d) lead

B) Fill in the blank and define the term.

06

- 1) Define the term
- Opacity
- 2) _____ electrode is the indicator electrode.
- 3) In the process of electroplating _____ play an important role.
- 4) Give two characteristics of burner.
- 5) Define cell constant.
- 6) Conductometric method is also useful in _____ titration.

Q.2 Solve any Eight of the following.

16

- a) Define pH. Mention its range.
- b) How the conductivity water is prepared?
- c) What is the function of burners in flame photometry?
- d) Mention advantages of premix burner.
- e) State Lambert-Beer's law.
- f) Define
 - 1) optical density,
 - 2) molar absorption coefficient.
- g) Represent Glass electrode.
- h) Which mineral acid is usually used for cleaning of the article to be plated?
- i) What do you mean by the term throwing power in electrode- position process?
- j) Write note on Anodising.

Q.3 A) Attempt any Two of the following.

10

- 1) State and explain Beers law. Mention it's applications.
- 2) What is potentiometry? What are the advantages of potentiometric titration?
- 3) What are the basic principles of electroplating?

B) What is flame photometry? Explain its principle.

06

Q.4 A) Attempt any Two of the following.

08

- 1) Discuss in detail barrier layer photocell.
- 2) What are the advantages of premix burners?
- 3) Mention different types of conductivity cell used for conductance measurement.

B) Describe in detail the electroplating of the following.

08

- 1) Nickel
- 2) Chromium

Q.5 Attempt any Two of the following.**16**

- a)** Discuss the use of glass electrode with reference to its limitations and precautions during pH measurements.
- b)** Describe in brief factors affecting the nature of the electrodeposit.
- c)** Discuss the nature of titration curve obtained in case of:
 - 1) Strong acid against strong base
 - 2) Strong acid against weak base

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B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Botany (Special Paper-XII)
Plant Breeding (19201504)

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.

10

- 1) Intellectual Property Rights (IPR) in India Covers _____.
 - a) Patents
 - b) Copyrights
 - c) Trademarks
 - d) All the above
- 2) Emasculation is concerned with _____.
 - a) Mass selection
 - b) Clonal selection
 - c) Pureline selection
 - d) Hybridization
- 3) A cross between F1 generation and recessive parent is known as _____.
 - a) Monohybrid cross
 - b) Dihybrid cross
 - c) Backcross
 - d) Clonal Selection
- 4) Polyploidy can induce in cell culture by _____.
 - a) Methanol
 - b) Acetone
 - c) Colchicine
 - d) All the above
- 5) The artificial mutation is called _____ mutation.
 - a) Spontaneous
 - b) Gene
 - c) Micro
 - d) Induced
- 6) Property Rights (IPR) protects the use of information and ideas that are of _____.
 - a) Social value
 - b) Commercial value
 - c) Ethical value
 - d) Moral value
- 7) _____ is the main aim of Plant breeder.
 - a) To grow taller and taller plants
 - b) To grow only seeds
 - c) To grow only fruits
 - d) To increase the yield of fruit and grain per acre of land

- 8) _____ is the important variety of groundnut obtained by mass selection.
- | | |
|-----------|--------------|
| a) Neelam | b) Gangapuri |
| c) RS-10 | d) Niphad-4 |
- 9) _____ is the branch of Botany which deals with development of improved plant variety.
- | | |
|-----------------------|---------------------|
| a) Plant Biochemistry | b) Plant Breeding |
| c) Plant Anatomy | d) Plant Embryology |
- 10) The oldest method of plant breeding is _____.
- | | |
|-----------------|------------------|
| a) Introduction | b) Mutation |
| c) Selection | d) Hybridization |

B) Answer in one sentence.**06**

- 1) Define mutation.
- 2) What is patent in IPR?
- 3) What is clone?
- 4) Enlist any two international institute of crop breeding.
- 5) What is copyright?
- 6) Define hybridization.

Q.2 Solve any Eight of the following.**16**

- a) Enlist the forms of Intellectual Property.
- b) What is mean by emasculation?
- c) What is acclimatization?
- d) Enlist the methods for self-pollinated crops.
- e) What is the use of Trademark?
- f) Which is the aim of plant breeding?
- g) Enlist any four National institutes for crop breeding.
- h) What is recipient parent?
- i) Enlist mutagens for artificial induction of mutation.
- j) Write any two advantages of IPR.

Q.3 A) Attempt any Two of the following.**10**

- 1) Describe types of property.
- 2) Give an account of old-world center of origin of crop plants.
- 3) Discuss role of polyploidy in crop improvement.

B) Write a note on procedure of plant hybridization.**06****Q.4 A) Attempt any Two of the following.****08**

- 1) Describe the scope of plant breeding.
- 2) Describe mass selection method.
- 3) Write an advantage of Intellectual Property Rights.

B) Describe the objectives of plant breeding.**08**

Q.5 Attempt any Two of the following.

16

- a)** Describe briefly procedure of back cross method.
- b)** Describe the role of Biotechnology in crop improvement.
- c)** Describe in brief international crop breeding institute.

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Botany (Special Paper- XII)
Economic Botany (19201505)

Day & Date: Tuesday, 06-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Multiple choice questions. 10

- 1) The center of origin of *Cicer arietinum* (chick-pea) is _____ region.

a) Great Britain	b) Chinese-Japanese
c) South American	d) Southeast Turkey
- 2) Lucerne is a _____.

a) Grass	b) Food Legume
c) Fodder	d) None of these
- 3) _____ is obtained from *Azadirachta indica*.

a) Dye	b) Natural Insecticide
c) Rubber	d) Fibre
- 4) Above 200 °C, the rubber _____.

a) Loses elasticity	b) Becomes brittle
c) Melts	d) Becomes hard
- 5) The clove oil contains _____.

a) Eugenol acetate	b) Eugenol
c) Zingiberene	d) Both a) and b)
- 6) *Tinospora cordifolia* is a _____ shrub.

a) Climbing	b) Prostrate
c) Erect	d) Parasitic
- 7) The long fibers of Cotton are known as _____.

a) Lint	b) Staple
c) Puz	d) Both a) and d)
- 8) Coir yarn is obtained from the fruits of _____.

a) <i>Gossypium arboreum</i>	b) <i>Gossypium hirsutum</i>
c) <i>Coccus nucifera</i>	d) <i>Medicago sativa</i>
- 9) Fruit of _____ is one of the components of ayurvedic medicine "TriphalaChurna".

a) <i>Papaver somniferum</i>	b) <i>Adathodazeylanica</i>
c) <i>Syzygium aromaticum</i>	d) <i>Emblica officinalis</i>

- 10) _____ is the legume cultivated for cooking oil.
- | | |
|--------------|------------|
| a) Red Gram | b) Coconut |
| c) Groundnut | d) Cotton |

B) Answer the following.

06

- 1) What is the botanical name of Soyabean?
- 2) Define dyes.
- 3) Give the botanical name of Henna.
- 4) Give the botanical name of Adulsa.
- 5) Define drug.
- 6) Give the botanical name of saffron.

Q.2 Solve any Eight of the following.

16

- a) What is mean by fodder legume? Give its two examples.
- b) What are plant fibers?
- c) State the botanical name and source of drug ginger.
- d) What are plant dyes? Give any two environmental advantages of plant insecticides.
- e) Give any two economic importance of groundnut.
- f) State the economic importance of custard apple.
- g) State the different chemical constituents of *Tinospora*.
- h) State the morphology of cotton.
- i) What are textile fibers?
- j) Give the botanical name of chickpea and red gram.

Q.3 A) Attempt any Two of the following.

10

- 1) Describe the physical properties of rubber.
- 2) Give the morphology and economic importance of Indigo.
- 3) Describe morphology and medicinal uses of turmeric.

B) Write short note on the following.

06

Write on Clove as a medicinal plant.

Q.4 A) Attempt any Two of the following.

08

- 1) Give the botanical name, source, and economic importance of Lucerne.
- 2) Give the morphology, source and economic importance of Lawsonia.
- 3) Describe the botanical name source and economic importance of saffron.

B) Describe/Explain/Solve the following.

08

Give a brief account of cultural practices of *Glycine max*.

Q.5 Attempt any Two of the following.

16

- a)** Describe the *Withaniasomnifera* drug with respect to botanical name, source, chemical constituents, morphology, and medicinal importance.
- b)** Give botanical name, source and economic importance of Kutch.
- c)** Describe the *Hevea species* with respect to botanical name, source, chemical constituents, morphology, and medicinal importance.

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B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Zoology (Special Paper – XII)
Wildlife Conservation & Management (19201523)

Day & Date: Tuesday, 06-May-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.

0.1 A) Multiple choice questions. 10

- 1) The practice of protecting plant and animal species and their habitats is called _____.
a) Biodiversity b) Ecology
c) Wildlife conservation d) Ecosystem
- 2) Wildlife traditionally refers to _____ species.
a) mammals b) birds
c) reptiles and Amphibians d) undomesticated animal species
- 3) Which one of the following is the cause for man wildlife conflict?
a) Increase in the forest area
b) Adequate rainfall
c) Curiosity of wild life
d) Reduction in the availability of natural resources
- 4) Biosphere reserve, sacred forests and sacred lakes are the types _____ conservation.
a) Ex-situ b) In-situ
c) Conservation d) Environmental management
- 5) _____ is an effective tool for managing, analyzing, and visualizing wildlife data in order to target areas where conservation practices are needed.
a) GIS b) GIB
c) RS d) WCS
- 6) Gene banks are practicing for the preservation of _____.
a) Species diversity b) Genetic diversity
c) Ecosystem diversity d) Animal diversity
- 7) The most widely used diversity index in the ecological literature is _____.
a) Shannon-Wiener diversity b) Brillouin index
c) Simpson's index d) Pielou index

- 8) _____ is an ecological highly developed community in which populations of plants or animals remain stable and exist in balance with each other and their environment.
- a) Succession b) Climax community
c) Forest d) Terrestrial community
- 9) The maximum number of individuals that can be supported by a given environment is called _____.
a) Biotic potential b) Carrying capacity
c) Population size d) Environmental resistance
- 10) _____ is a project Tiger Reserve lies in the Nainital district of Uttarakhand.
a) Jim Corbett N.P. b) Bandipur N.P.
c) Sundarban N.P. d) Tadoba N.P.

B) Fill in the blank.

06

- 1) *Ardeotis nigriceps* is the scientific name of _____.
- 2) Area which is reserved for the conservation of animals only are called _____.
- 3) In year of _____ wildlife protection act implemented in India.
- 4) The species are seriously at risk of extinction are referred as _____.
- 5) Geographical features of habitat are analyzed with help of _____ technology.
- 6) _____ is the place that provides food, protection, and site for breeding to the animal.

Q.2 Solve any Eight of the following.

16

- a) Define the term wildlife.
- b) What are the values of wildlife?
- c) Define the term ecological succession
- d) What is the significance of fecal analysis?
- e) What is mean by carrying capacity?
- f) Define Quarantine.
- g) Negative values of wildlife
- h) Importance of wildlife conservation
- i) Care of injured and diseased animal
- j) Climax community

Q.3 A) Attempt any Two of the following.

10

- 1) What are the conservation ethics? Give the cause of wildlife depletion.
- 2) Describe the different physical parameters of habitat.
- 3) Write a note on preservation of genetic diversity.

B) Write a note on remote sensing technology for habitat analysis.

06

- Q.4 A) Attempt any Two of the following. 08**
- 1) Describe the different biological parameters of habitat.
 - 2) What is cover construction? Give the different methods for restoration of degraded habitat.
 - 3) Describe the different common diseases of wild animal.
- B) What is Bio-telemetry? Give the GIS application in wildlife conservation. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Write a note on different Great Indian Bustard reserve in India and its management.
 - b) Describe the different schedules of wildlife protection act 1972.
 - c) Write a note on National parks in India and tiger reserves in India.

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Mathematics (Special Paper-XII)
Partial Differential Equations (19201527- A)

Day & Date: Tuesday, 06-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative each of the following. **10**

- 1) The equation $P(xyz)p + Q(x, y, z)q = R(x, y, z)$ is _____.
 - a) Linear equation
 - b) Semi-linear equation
 - c) Quasi Linear equation
 - d) Non-Linear equation.
- 2) By elimination of arbitrary constant a and b from $z = (x + a)(y + b)$ we get the p.d.e. _____.
 - a) $z = pq$
 - b) $z = p/q$
 - c) $z = q/p$
 - d) $2z = p/q$
- 3) One solution of $xp - yq = xy$ is _____.
 - a) $x + y = c$
 - b) $x = c$
 - c) $y = c$
 - d) $xy = c$
- 4) The general solution of $(y - z)p + (z - x)q = x - y$ is _____.
 - a) $\emptyset(x + y + z, x^2 + y^2 + z^2) = 0$
 - b) $\emptyset(xyz, x + y + z) = 0$
 - c) $\emptyset(xyz, x^2 + y^2 + z^2) = 0$
 - d) $\emptyset(xy + z, x + y + z) = 0$
- 5) The complete integral of $p^2 + q^2 = 1$ is _____.
 - a) $z = ax - y\sqrt{1 + a^2} + c$
 - b) $z = ax + y\sqrt{1 - a^2} + c$
 - c) $z = ax + y(1 - a^2) + c$
 - d) $z = ax - y\sqrt{1 - a^2} + c$
- 6) The singular integral of $z = px + qy + 5pq$ is _____.
 - a) $5z + x + y = 0$
 - b) $5z + xy = 0$
 - c) $5z - xy = 0$
 - d) $5z + x - y = 0$

- 7) The standard form II of non linear p.d.e of order one is _____.
 a) $z = px + qy + f(p, q)$ b) $z = f(p, q)$
 c) $z = px + q^2y + f(p, q)$ d) $z = px - qy - f(p, q)$
- 8) The C.I. of $f(p, q) = 0$ is _____.
 a) $Z = ax + by + c$ b) $z = ax - yf(a)$
 c) $z = ax + by + f(a, b)$ d) $z = ax + yf(a) + c$
- 9) The PI of $(D - D')(D + D' + 1)z = e^{2x+3y}$ is _____.
 a) $\frac{-1}{6}e^{2x+3y}$ b) $6e^{2x+3y}$
 c) $\frac{1}{6}e^{2x+3y}$ d) e^{2x+3y}
- 10) The P.I of $\frac{1}{D-mD'}f(xy)$ is _____.
 a) $\int f(x, c + mx)dx$ b) $\int f(y, c - mx)dx$
 c) $\int f(x, c - mx)dx$ d) $\int f(y, c + my)dy$

B) Fill in the blanks**06**

- 1) The solution of $(D^2 - D^2 + D - D')Z = 0$
- 2) The C.F. of $(D^2 - D')z = xe^{x+y}$ is _____.
- 3) The PI of $(D^2 - DD' - 6D'^2)z = \cos(2x + y)$ is _____.
- 4) The equation $\left(\frac{\partial^2 z}{\partial x^2}\right) - 2\left(\frac{\partial^2 z}{\partial x \partial y}\right) + \left(\frac{\partial^2 z}{\partial y^2}\right) = 0$ is of order _____.
- 5) The auxiliary equation of $Pp + Qq = R$ are _____.
- 6) The integral which does not contains an arbitrary constant is called ____.

Q.2 Solve any Eight of the following.**16**

- a) Eliminate arbitrary constant a and b from
 $z = (x - a)^2 + (y - b)^2$
- b) Eliminate arbitrary function from $z = f(x^2 - y^2)$
- c) Solve $p \tan x + q \tan y = \tan z$
- d) Define C.I.
- e) Solve $2p + 3q = 1$
- f) Find complete integral of $z = \left(\frac{\partial z}{\partial x}\right)\left(\frac{\partial z}{\partial y}\right)$
- g) Solve $(D^2 - a^2 D'^2)z = 0$
- h) Solve $D^2(x^3 y^5)$
- i) Solve $(D - D'^2)Z = 0$

j) Find P.I. of $(D^2 - 2DD' + D'^2)z = e^{x+2y}$

Q.3 A) Attempt any Two of the following. 10

i) Find the integral surface of the linear P.D.E.

$$x(y^2 + z)p - y(x^2 + z)q = (x^2 - y^2)z$$

ii) Solve $(DD' + D - D' - 1)z = xy$

iii) Derive the p.d.e by eliminating arbitrary function ϕ from the equation $\phi(u, v) = 0$ where u and v are function of x, y and z

B) Solve $(D^3 - 4D^2D' + 4DD'^2)Z = 2\sin(3x + 2y)$ 06

Q.4 A) Attempt any Two of the following. 08

i) Solve $\left(\frac{b-c}{a}\right)yzp + \left(\frac{c-a}{b}\right)zxq = \left(\frac{a-b}{c}\right)xy$

ii) Solve $z = px + qy + \log(pq)$

iii) Solve $(D^2 - DD' - 2D)z = e^{2x+y}$

B) Explain the method of finding complementary function of linear homogeneous p.d.e. with constant coefficient $f(DD')z = f(x, y)$ when the roots are distinct. 08

Q.5 Attempt any Two of the following. 16

a) Explain the Charpit's method for solving the non-linear partial differential equation of order one.

b) Explain method of solution of Lagrange's partial differential equation $Pp + Qq = R$ with usual notation.

c) i) Solve $(D^2 + D')z = 2y - x^2$

ii) Solve $(D^2 + 2DD' + D'^2)z = e^{2x+3y} + \sin(2x + 3y)$

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April – 2025
Statistics (Special Paper - XII)
Operations Research (19201531)

Day & Date: Tuesday, 06-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagrams wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of log table and calculator is allowed.

Q.1 A) Multiple choice questions.**10**

- 1) Graphical method is applicable for solving LPP which has only.
 - a) 2 variables
 - b) 3 variables
 - c) More than 3 variables
 - d) None of these
- 2) A feasible solution to an LP problem _____.
 - a) must satisfy all of the problem's constraints simultaneously
 - b) need not satisfy all of the constraints, only some of them
 - c) must be a corner point of the feasible region
 - d) must optimize the value of the objective function
- 3) Constraints in an LP model represents _____.
 - a) Limitations
 - b) Requirements
 - c) balancing limitations and requirements
 - d) all of the above
- 4) Every basic feasible solution of a general assignment problem, having a square pay-off matrix of order, n should have assignments equal to
 - a) $2n + 1$
 - b) $2n - 1$
 - c) $m + n - 1$
 - d) $m + n$
- 5) While plotting constraints on a graph paper, terminal points on both the axes are connected by a straight line because _____.
 - a) the resources are limited in supply
 - b) the objective function is a linear function
 - c) the constraints are linear equations or inequalities
 - d) all of the above
- 6) Which of the following method is method of obtaining initial basic feasible solution to transportation Problem?
 - a) Hungarian
 - b) North – West
 - c) Simplex
 - d) Newton Raphson

- 7) The role of artificial variables in the simplex method is _____.
 - a) to aid in finding an initial solution
 - b) to find optimal dual prices in the final simplex table
 - c) to start phases of simplex method
 - d) all of the above
- 8) The difference between the expected profit under conditions of risk and the expected profit with perfect information is called _____.
 - a) Expected value of perfect information
 - b) Expected marginal loss
 - c) Expected opportunity loss
 - d) None of the above
- 9) The concept of utility is used to _____.
 - a) measure the utility of money
 - b) take into account aversion of risk
 - c) both (a) and (b)
 - d) none of the above
- 10) Monte Carlo is _____.
 - a) a technique for modeling
 - b) a book
 - c) a technique for Simulation
 - d) None of these

B) Fill in the blanks.**06**

- 1) The consequence resulting from a specific combination of a decision alternative and a state of nature is _____.
- 2) The value at least one basic variable is zero then a basic feasible solution is called _____.
- 3) A given Transportation problem is said to be _____ if the total supply is equal to the total demand.
- 4) Monte Carlo is technique for _____.
- 5) To calculate penalty for each row and each column by taking the difference between the _____ unit costs, in VAM.
- 6) In graphical method of solving a LPP, the bounded region is known as _____ region.

Q.2 Solve any Eight of the following.**16**

- a) Define Optimal Solution in LPP.
- b) Define Solution in LPP.
- c) How to balance Unbalanced T. P.?
- d) Give the Mathematical form of Assignment Problem.
- e) Define Artificial Variable.
- f) Give a Canonical form of LPP.
- g) Define a Feasible Solution in LPP.
- h) Define Total elapsed time in Sequencing Problem?
- i) What is an opportunity loss in decision making Problem?
- j) Define LPP.

Q.3 A) Attempt any Two of the following. 10

- 1) Explain the procedure of generating random number from Binomial distribution.
- 2) Write the Procedure of North-West Corner Method.
- 3) Write the steps involved in the Procedure of Monte Carlo Simulation.

B) Write a note on Decision Making under Risk. 06

Q.4 A) Attempt any Two of the following. 08

- 1) Write the procedure of processing n jobs on two machines.
- 2) Give the Steps involved in Minimax regret criterion.
- 3) Write the advantage and disadvantages of Simulation.

B) Solve Following LPP 08

Maximize $Z = 5x_1 - 2x_2$

Subject to the constraints,

$$4x_1 + x_2 \geq 6$$

$$4x_1 + 3x_2 \geq 5$$

$$x_1, x_2 \geq 0$$

Q.5 Attempt any Two of the following. 16

- a)** Find the Initial Basic Feasible Solution to the following Transportation problem by using VAM method.

		Destination				Supply
		D ₁	D ₂	D ₃	D ₄	
Source	S ₁	6	5	8	5	30
	S ₂	5	11	9	7	40
	S ₃	8	9	7	13	50
	Demand	35	28	32	25	

- b)** Determine the optimal sequence of jobs and compute the total elapsed time based on following information. Processing time on machine is given in hours and passing is not allowed.

Job	A	B	C	D	E	F	G
Machine A	3	8	7	4	9	8	7
Machine B	4	3	2	5	1	4	3
Machine C	6	7	5	11	5	6	12

- c)** Explain Hungarian method of solving assignment problem.

- 7) Hat matrix is given by _____.
 a) $X(X'X)^{-1}$ b) $X'(X'X)^{-1}$
 c) $X'(X'X)^{-1}X$ d) $X(X'X)^{-1}X'$
- 8) Backward elimination process begins with the assumption that _____.
 a) no regressors are in the model
 b) some regressors are in the model
 c) all regressors are in the model
 d) None of These
- 9) Value of adjusted R^2 always lies between _____.
 a) 0 and 1 b) -1 and 1
 c) 0 and ∞ d) $-\infty$ and ∞
- 10) Which of the following is a criterion for evaluating a regression model?
 a) large value of MS_{res} b) Partial F statistic
 c) Mallows's C_p statistic d) VIF

B) Fill in the blanks.**06**

- 1) In the regression equation, $Y = 10 + 5X + \varepsilon$, the slope is _____.
- 2) In simple linear model, to test hypothesis about intercept parameter _____ test is used.
- 3) The transformation $\ln\left(\frac{\pi(x)}{1-\pi(x)}\right)$ is called _____.
- 4) In multiple linear regression model, variance of least square estimator of β is _____.
- 5) In simple linear regression model, the distribution of error term is assumed to be _____.
- 6) The sum of the residuals weighted by the corresponding fitted value is always equal to _____.

Q.2 Solve any Eight of the following.**16**

- a) State the assumptions of error term in simple linear regression model.
- b) Define the matrix H . State Properties of H .
- c) Define coefficient of determination R^2 .
- d) Explain the term variable selection in linear regression.
- e) Obtain the confidence interval for β_1 .
- f) With usual notations, show that $\text{Cov}(I - H) = 0$
- g) Write simple linear regression model.
- h) Define dichotomous independent variable with illustration.
- i) With usual notations, show that $(1 - H)X = 0$
- j) Discuss the logit transformation in the context of logistic regression model.

- Q.3 A) Attempt any Two of the following. 10**
- 1) Define residual vector in regression analysis. Obtain its mean and Variance.
 - 2) What is logistic regression model? Give a real-life situation when this model is Appropriate.
 - 3) Define the ANOVA approach to test the significance of regression in a simple regression model.
- B) Explain the residual plot. Outline the procedure of construction of normal probability plot. 06**
- Q.4 A) Attempt any Two of the following. 08**
- 1) Describe forward selection method for variable selection and state its limitations.
 - 2) Describe the Pearson's chi - square test for goodness of fit of a logistic model.
 - 3) In multiple regression model $Y = X\beta + \varepsilon$ show that $\hat{\beta} = (X'X)^{-1}X'\varepsilon$ In Usual.
- B) In usual notations, prove that. 08**
- 1) $\text{Var}(\hat{Y}) = \sigma^2 H$
 - 2) $\text{Var}(\hat{\beta}) = (X'X)^{-1}\sigma^2$
- Q.5 Attempt any Two of the following. 16**
- a) Describe a multiple linear regression model. Stating the assumptions, obtain the mean and variance of least square estimator (LSE) $\hat{\beta}$ of β .
 - b) Derive the maximum likelihood estimators of parameters of logistic regression model with covariate.
 - c) Explain the concept of simple linear regression with illustration. Derive least squares estimators of the regression coefficients in the model.

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Geology (Special Paper- XII)
Applied Geology – Prospecting and Mining Geology (19201537)

Day & Date: Tuesday, 06-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) When the material collected to represent a rock type, or formation or an ore body in the quantitative sense then it is termed as: _____.
 a) Specimen
 b) Sample
 c) Both specimen and sample can be used
 d) Quantitative specimen
- 2) Which of the following criteria are associated with the chemical composition and behaviour of elements in the earth's crust?
 a) Geological
 b) Geophysical
 c) Geochemical
 d) None of the above
- 3) The spacing of the trenches, pits and boreholes depend on: _____.
 a) The length of the ore body.
 b) The modes of occurrence of the deposits.
 c) The depth of the deposits.
 d) The outcrops of the deposits.
- 4) In the _____ configuration, the current and potential electrode pairs have a common mid point and the distance between adjacent electrodes are equal.
 a) Double dipole
 b) Schlumberger
 c) Wenner
 d) pole-pole
- 5) Those elements that provide good clues in the search for hidden ore bodies because they generally form large haloes are known as _____.
 a) Primary
 b) Pathfinder
 c) Indicator
 d) None of the above

- 6) The amount of a particular element presents in the parent rock not affected by dispersion or migration is known as: _____.
 - a) Anomaly
 - b) Threshold
 - c) Background value
 - d) None of these
- 7) What is the name of solid waste that was produced during mining?
 - a) Tailing
 - b) Rocks
 - c) Minerals
 - d) Deposits
- 8) Which of the following is natural energy source in geophysical method?
 - a) IP method
 - b) Electrical method
 - c) Seismic method
 - d) Gravity method
- 9) The most sensitive instrument for magnetic survey is _____.
 - a) magnetic field balance
 - b) fluxgate magnetometer
 - c) proton precession magnetometer
 - d) optically pumped magnetometer
- 10) A criteria covers the geological settings associated primarily with the age of various sedimentary series (or intrusions) enclosing a mineral is _____.
 - a) Stratigraphic criteria
 - b) Geomorphological criteria
 - c) Structural criteria
 - d) None of the above

B) Fill in the blank:**06**

- 1) Self potential method is the most suitable method for prospecting of _____ minerals.
- 2) Extraction of mineral and metal from the earth is called as _____.
- 3) The _____ sampling which best suited to bedded, banded and vein type of deposits.
- 4) The amount of a particular element presents in the parent rock not affected by dispersion or migration is known as _____.
- 5) Which geophysical method is used for detailed exploration of oil and gas?
- 6) The openings in the mine, which serve as a means of entry is known as: _____.

- Q.2 Solve any Eight of the following. 16**
- Define Curie point.
 - Name are the types of electrical sounding methods.
 - Give two examples of magnetic geological criteria.
 - Name the instrument used in Gravity methods of exploration.
 - Name any two types of mining used to extract the ore minerals.
 - Give two examples of path finder elements of gold deposits.
 - What is mean by geochemical mobility?
 - Name any two data corrections of gravity geophysical method.
 - Give two applications of Seismic geophysical method.
 - Name the sampling methods used for placer deposits.
- Q.3 A) Attempt any Two of the following. 10**
- 1) Explain the difference between Wenner and Schlumberger electrical method.
 - 2) Define Sampling, Discuss in brief any five types of sampling methods.
 - 3) Describe in short, the field procedure of seismic method with neat labelled diagram.
- B) Write a short note of self potential electrical method. 06**
- Q.4 A) Attempt any Two of the following. 08**
- 1) Describe in detail the applications of magnetic method.
 - 2) Write a brief note on geochemical dispersion halos. Draw diagram.
 - 3) Explain vertical electrical sounding with suitable diagram.
- B) Define mining. Describe the types of surface mining with suitable examples. 08**
- Q.5 Attempt any Two of the following. 16**
- Explain the environmental impact of mining.
 - Discuss in brief the instrumentation, field procedure, data interpretation and applications of Gravity method.
 - Describe in detail the different geological criteria used for Iron ore deposit exploration.

Seat No.	

Set	P

B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Microbiology (Special Paper - XII)
Industrial Microbiology (19201542)

Day & Date: Tuesday, 06-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Multiple choice Questions.

10

- 1) _____ is the factors that contribute Microbial growth in food?
 - a) pH
 - b) Moisture
 - c) Oxidation Reduction Potential
 - d) All of above
- 2) Black gram is used in the production of _____.

a) Idli	b) Bread
c) Cheese	d) Vinegar
- 3) Insulin is a _____.

a) Enzyme	b) Hormone
c) Fatty acid	d) Carbohydrate
- 4) a_w value of pure water is _____.

a) 0	b) 0.5
c) 1	d) 2
- 5) Cheddar cheese is a _____ type of the cheese.

a) Soft	b) Hard
c) Semi Hard	d) Internal mold
- 6) Which of the operation does not come under downstream processing?

a) Media preparation	b) Filtration
c) Cell disruption	d) Chromatography
- 7) _____ increases grain Germination.

a) Malting	b) Milling
c) Mashing	d) Boiling
- 8) Lager are the beer in which fermentation is carried out by _____.

a) Middle yeast	b) Top yeast
c) Bottom yeast	d) All of the above

- 9) Ames test is a preliminary test for detection of _____.
a) Allergen b) Pyrogen
c) Carcinogen d) Oncogene
- 10) L- Lysine is _____.
a) Vitamin b) Amino acid
c) Fatty acid d) Protein

B) Give one word/ one sentence answers of the following. 06

- 1) Name of the organism used for streptomycin fermentation.
- 2) Define Beer.
- 3) Name of the organism involved in lager beer fermentation.
- 4) Which cells in the body produces insulin?
- 5) Enlist the byproduct of the Streptomycin fermentation?
- 6) What is used as a precursor in Vit B₁₂ fermentation?

Q.2 Solve any Eight of the following. **16**

- a) What are the types of beer?
- b) Name the organism used for bread fermentation.
- c) What are the types of wines?
- d) Define Rennet.
- e) Give names of any 4 cheeses.
- f) Define food poisoning.
- g) What are various tests used for pyrogenicity?
- h) Give examples of antifoam agent.
- i) What are flavored yogurts?
- j) What is precipitation?

Q.3 A) Attempt any Two of the following. 10

- 1) Discuss in detail fermentation of bread.
- 2) Write a note on preparation of cheddar cheese.
- 3) Write a note on harvest/ Recovery of the streptomycin from fermentation broth.

B) Write a short note on principles and methods of food preservation. **06**

Q.4 A) Attempt any Two of the following. 10

- 1) What are various types of spoilage of Milk?
- 2) Describe the strategy used for production of Insulin by rDNA technology.
- 3) Write a note on various ingredients used in beer fermentation.

B) Write a short note on pyrogenicity testing for pharmaceutical products. 06

Q.5 Attempt any Two of the following.

16

- a)** Write in Detail the process of Idli fermentation with emphasis on Nutritional Importance.
- b)** Describe in detail the production of wines.
- c)** Explain how distillation is used for product recovery.

Seat No.	

Set	P

B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Electronics (Special Paper - XII)
Electronics Communication (19201552)

Day & Date: Tuesday, 06-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) Which of the following is an example of simplex communication?
 - a) Walkie-talkies
 - b) Television broadcasting
 - c) Telephone calls
 - d) Video conferencing
- 2) Which of the following is not a type of noise in communication systems?
 - a) Thermal noise
 - b) Shot noise
 - c) Phase noise
 - d) Modulation noise
- 3) Which of the following is an analog modulation technique?
 - a) ASK
 - b) FSK
 - c) AM
 - d) PCM
- 4) In amplitude modulation (AM), the amplitude of the carrier wave varies according to the:
 - a) Frequency of the carrier wave
 - b) Amplitude of the modulating signal
 - c) Phase of the modulating signal
 - d) Frequency of the modulating signal
- 5) A ratio detector is used for:
 - a) Demodulating AM signals
 - b) Generating carrier waves
 - c) Demodulating FM signals
 - d) Modulating digital signals
- 6) What is the key feature of pulse position modulation (PPM)?
 - a) Pulse width remains constant
 - b) Pulse position varies with the modulating signal
 - c) Amplitude of the pulse varies
 - d) Frequency remains constant

- 7) What is the primary characteristic of a $\lambda/2$ antenna?
 - a) Operates at half the wavelength of the signal
 - b) Has high power consumption
 - c) Does not radiate in a specific direction
 - d) Requires a mathematical evaluation for usage
- 8) The directivity of an antenna refers to:
 - a) Power wasted in transmission
 - b) Ability to focus power in a specific direction
 - c) Frequency response of the antenna
 - d) Noise suppression
- 9) Which wave propagation method is used for TV transmission?
 - a) Ground waves
 - b) Sky waves
 - c) Space waves
 - d) Tropospheric waves
- 10) What is the primary function of a radio receiver?
 - a) Transmit electromagnetic waves
 - b) Convert electromagnetic waves into audio signals
 - c) Amplify the transmitted signal
 - d) Modulate the carrier signal

B) Answer in one sentence.**06**

- 1) What are the types of electronic communication system?
- 2) What is the role of blanking and synch signal?
- 3) Define noise. List its types.
- 4) What is audio and video signal?
- 5) What is skip distance. Give its formulae.
- 6) What are types of radio receiver?

Q.2 Attempt Any Eight of the following.**16**

- a) What is modulation in communication systems?
- b) What is Pulse Amplitude Modulation (PAM)?
- c) What is a Yagi antenna?
- d) What is radio wave propagation?
- e) What is the function of the RF amplifier in an AM receiver?
- f) What is a composite video signal?
- g) What is the basic principle of a telephone system?
- h) What is DTMF?
- i) What is the frequency range of a Yagi antenna?

Q.3 A) Attempt any Two of the following.**10**

- 1) Differentiate between analog and digital modulation techniques.
- 2) What is the modulation index of AM, and how is it calculated?
- 3) Define and illustrate the concept of a radiation pattern for an antenna.

B) Explain the working of an electronic telephone exchange.**06**

- Q.4 A) Attempt any two of the following. 08**
- 1) Explain space wave propagation and its typical applications.
 - 2) What is the superheterodyne principle? Explain its working with the help of a frequency conversion process.
 - 3) Explain the differences between Black and White television and color Television in terms of transmission and reception.
- B) Explain telephone communication with necessary block diagram. 08**
- Q.5 Attempt any two of the following: 16**
- a) Explain the principle of amplitude modulation (AM) with a neat diagram. Derive its mathematical expression.
 - b) List and explain any five key antenna parameters with their significance in communication systems.
 - c) What are the distinguishing features of a Yagi antenna? Discuss its construction, radiation pattern, and applications.

Seat No.	

Set P

B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Computer Science (Special Paper - XII)
Python (19201546)

Day & Date: Tuesday, 06-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. 10

- 1) Combining data and method into single unit is called as _____.
 a) Polymorphism b) Abstraction
 c) Inheritance d) Encapsulation
- 2) _____ is/are Tokens in Python.
 a) Identifiers b) Keywords
 c) Operators d) All of these
- 3) _____ operators are used to compare two or more than two expressions.
 a) Conditional b) Logical
 c) Arithmetic d) None of these
- 4) _____ and _____ are identity operators.
 a) in, not in b) is, not in
 c) is, is not d) in, is not
- 5) _____ operator have lowermost precedence in python.
 a) ** b) and
 c) or d) not
- 6) _____ operator is used to check whether multiple variables have different memory location.
 a) is not b) and
 c) diff d) None of these
- 7) Which of the following is/are the keyword/s?
 a) def b) for
 c) async d) All of these
- 8) What will be the output of an expression (100//5**2)?
 a) 2000 b) 40
 c) 4 d) 4.0

- 9) _____ operator transfer all the bits of input to right side.
- a) not b) is
c) >>> d) None of these
- 10) What will be the output of 15>45?
- a) True b) False
c) 45 greater than 15 d) None of these

B) Solve the following questions.

06

- 1) The variables which are declared inside methods, constructors or blocks are called _____.
- 2) _____ method delete the specified element from set.
- 3) _____ module is imported to delay execution of current thread.
- 4) _____ does not receive an implicit first argument (neither self nor cls).
- 5) _____ returns a tuple containing the start, and end positions of the match from match object.
- 6) _____ mode is used to open a binary file for writing purpose.

Q.2 Answers any Eight of the following.

16

- a) Define module.
- b) List various data types in python.
- c) Define list with example.
- d) Define search() Function.
- e) Define class method.
- f) Write down syntax for range() function.
- g) Write a note on assert keyword.
- h) Write a note on exception handling.
- i) Write a note on lambda function.
- j) Write a note on global variable.

Q.3 A) Answer of the following. (Any Two)

10

- 1) Characteristics of python.
- 2) Explain bitwise right shift operator with program.
- 3) Explain parameterized constructor with program.

B) Write a short note on Hierarchical Inheritance.

06

Q.4 A) Answer of the following. (Any Two)

08

- 1) Explain super() method with example.
- 2) Explain random module with example.
- 3) Define regular expression. Write a program to show use of subn() method.

B) Write a python program to copy one file into another file.

08

Q.5 Answer any Two of the following.

16

- a)** Explain OOP's concepts in details.
- b)** Define Abstract class. Write a program of it.
- c)** Write a program which shows even numbers between 1 -10 in reverse manner.

Seat No.	

Set **P**

B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Certificate Course in Testing and Repairs of Electric Appliances
(Special Paper-XI) (19201515)

Day & Date: Wednesday, 07-May-2025
 Time: 12:00 PM To 03:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagrams wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of logarithmic table and calculator is allowed.

Q.1 A) Choose the correct alternative. 10

- 1) To prevent damage from lightning, lightning conductors are used on tall structures. The lightning conductor _____.
 - a) Should be made of a good conductor but can be of any shape
 - b) Should be in the form of a vertical rod
 - c) Can be of any shape
 - d) Should be made of a good conductor like copper with sharp-pointed edges
- 2) Due to earthing _____ current goes into ground.
 - a) leakage
 - b) reverse
 - c) majority
 - d) forward
- 3) A resistor having resistance of 25 ohm has a potential difference of 5 volt across it. How much will be its power $P =$ _____.
 - a) 125 watt
 - b) 25 watt
 - c) 625 watt
 - d) 5 volt
- 4) Standard frequency of commercial a. c. in India is _____ Hz.
 - a) 230
 - b) 440
 - c) 110
 - d) 50
- 5) _____ wiring is mainly done in modern buildings.
 - a) Metal conduit
 - b) Concealed
 - c) lead sheathed or CTS
 - d) PVC conduit
- 6) An ammeter is used to measure _____.
 - a) current
 - b) voltage
 - c) resistance
 - d) All of these
- 7) An electric fan converts electrical energy into _____ energy.
 - a) light
 - b) heat
 - c) rotary mechanical
 - d) solar

- 8) Mica is used in electrical appliances such as electric iron because mica is _____.
 a) a good conductor of heat but a bad conductor of electricity
 b) a bad conductor of heat but a good conductor of electricity
 c) a good conductor of heat as well as electricity
 d) a bad conductor of heat as well as electricity
- 9) Which of the following is unit of inductor?
 a) farad
 b) pascal
 c) ohm
 d) henry
- 10) In banks, for cashiers' cabin two tube lights are used in single unit instead of one. This is done to avoid _____ effect.
 a) Faraday
 b) Lenz
 c) Stroboscopic
 d) Zeeman

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. 06

- 1) A 5-ohm resistance has potential difference of 10 volts across it. The heat produced in 5 seconds will be _____ joule.
- 2) Two resistances; of 80 ohms are connected in parallel, the resultant resistance of the parallel combination will be _____ ohm.
- 3) A 100 ohm resistance is carrying current of 0.5 A. the p. d. across it will be _____ volt.
- 4) Name the electrical quantity which is measured in hertz.
- 5) A ceiling fan is rotating with full speed but not throwing air. The possible repairs required may be _____.
- 6) An automatic iron converts electric energy into _____ energy.

Q.2 Solve any Eight of the following. 16

- a) What is need of Earthing?
- b) Why fuse wire is used in electrical circuits?
- c) How a fuse wire works?
- d) What is leakage current?
- e) A consumer uses two electric bulbs, each of 60 watt, for 5 hours daily. Calculate the units of electricity consumed in a month, assuming that the month is of 30 days
- f) A 5-ohm resistance carries a current of 10 amperes through it. The heat produced in 2 seconds will be _____ joule.
- g) Discuss ohms law.
- h) Explain how effective resistance of a series combination of two resistances is determined?
- i) Describe working principle of an electric motor.
- j) Distinguish between exhaust fan and cabin fan.

- Q.3 A) Attempt any Two of the following. 10**
- i) Explain meaning of electrical safety precaution, "Keep Distance" and "Never underestimate the power of electricity".
 - ii) With neat diagram explain construction and working of an electric iron.
 - iii) What is need of maintenance of electric equipment?
- B) Explain joules heating effect of electric current. Mention instruments working on this principle. 06**
- Q.4 A) Attempt any Two of the following. 08**
- i) With neat diagram explain construction and working of electric geyser.
 - ii) With neat diagram explain construction and working of electric air cooler.
 - iii) Distinguish between fluorescent tube and incandescent lamp
- B) Average value of voltage measured is 30.3 volt. Calculate maximum value of voltage and R.M. S. value of voltage. 08**
- Q.5 Attempt any Two of the following. 16**
- a) With neat diagram explain construction and working of cabin fan.
 - b) Discuss how a table fan is opened for repairs and how are different parts inspected for repairs.
 - c) Draw different parts of electric iron and explain their working.

Seat No.	

Set P

B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Thin Film Deposition and Characterization Techniques
(Special Paper-XI) (19201516)

Day & Date: Wednesday, 07-May-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculator is allowed.

Q.1 A) Select the correct alternative. 10

- 1) X-ray diffraction technique primarily used for _____.
 - a) measuring the electrical conductivity of a sample
 - b) analyzing the crystal structure of a sample
 - c) determining the elemental composition of a sample
 - d) imaging the internal structure of a sample
- 2) _____ is the gas phase deposition method.
 - a) SILAR
 - b) CBD
 - c) SPD
 - d) Electrodeposition
- 3) A contact angle _____ indicates that the surface is hydrophobic.
 - a) equals to 60 degrees
 - b) greater than 90 degrees
 - c) less than 90 degrees
 - d) less than 45 degrees
- 4) _____ material is commonly used for transparent conductive thin films.
 - a) Indium tin oxide
 - b) Gold
 - c) Aluminum
 - d) Silver
- 5) Thin films are typically characterized by their _____.
 - a) high thickness
 - b) low surface area
 - c) low transparency
 - d) uniform composition and thickness
- 6) Which of the following environmental factors affect the efficiency of substrate cleaning process?
 - a) Humidity
 - b) Temperature
 - c) Air quality
 - d) All of the above
- 7) Sol-gel method is _____ approach.
 - a) bottom-up
 - b) top-up
 - c) top-down
 - d) up-bottom

- 8) The precursor solution is typically sprayed onto the substrate using _____.
 - a) a fine mist of droplets
 - b) an aerosol generator
 - c) a high-pressure nozzle
 - d) a vapor-phase deposition system
- 9) Conductive substrates typically refers to materials that _____.
 - a) have a high thermal conductivity
 - b) are resistant to electric current
 - c) are magnetic in nature
 - d) allow the flow of electric
- 10) _____ material is often selected for its optical transparency and scratch resistance in smartphone screens.
 - a) Plastic
 - b) Glass
 - c) Aluminum
 - d) Silicon

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. 06

- 1) Water loving material surface means _____.
- 2) What does 'C' stand for in JCPDS data of X-ray diffraction?
- 3) SILAR involves _____ steps in formation of thin film.
- 4) Modified chemical bath deposition method is also known as _____.
- 5) _____ characterization technique can be used to observed the surface fracture of material.
- 6) The substrates are generally boiled in concentrated _____ acid.

Q.2 Solve any Eight of the following. 16

- a) Sketch the labeled diagrams that showing superhydrophilicity and Superhydrophobicity.
- b) State the Beer-Lambert's law for absorption spectroscopy.
- c) Write the names of four chemical methods.
- d) Mention any four examples of conductive substrates.
- e) What are the limitations of SILAR method?
- f) What do you mean by absorption and adsorption?
- g) State the techniques for characterizing thin films?
- h) What is ultrasonic cleaning, and how does it work?
- i) What are general deposition parameters for Sol-gel method?
- j) What is electrical conductivity? Write the formula for electrical conductivity.

Q.3 A) Attempt any Two of the following. 10

- i) Discuss the advantages and disadvantages of physical and chemical methods for thin film preparation.
- ii) What are top-down and bottom-up approaches for thin film preparation? Write one example of each.
- iii) Write a short note on substrate cleaning equipment and techniques.

- B)** Calculate the molarity and normality of a solution prepared by dissolving 2.5 moles of HCl in enough water to make 500 ml of solution. **06**

Q.4 A) Attempt any Two of the following. 08

- i) Draw a block diagram Uv-Vis spectrophotometer; state its principal and advantages.
- ii) A crystal lattice with spacing between planes of 2.0 angstroms is subjected to X-ray diffraction at an angle of incidence of 30 degrees. Calculate the wavelength of X-ray for the 1st order diffraction.
- iii) Describe in brief water contact angle.

- B)** Write a note on chemical bath deposition method. **08**

Q.5 Attempt any Two of the following. 16

- a) Discuss important factors for material selection processes.
- b) Draw a neat labelled diagram of SPD and explain it.
- c) Describe construction and working of SEM.

Seat No.	

Set P

B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Scientific Research Substrate Cleaning Paper Writing and Publications
(Special Paper-XI) (19201517)

Day & Date: Wednesday, 07-May-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculator is allowed.

Q.1 A) Select the correct alternative.

10

- 1) Good Research is always _____.
a) Slow b) Fast
c) Narrow d) Systematic
- 2) To calculate the impact factor of journals _____ years of its citation is considered.
a) Three b) Two
c) One d) None
- 3) In MS Excel, the content of the cell is shown in _____.
a) Name box b) Formula bar
c) Both of the above d) None of these
- 4) _____ is one of several software used for plotting the graph and analysing quantitative data.
a) MS-Excel b) MS-Word
c) PPT d) Origin
- 5) The research journal must have _____ to be considered as standard journal.
a) Large volume b) Free accessibility
c) Attractive cover page d) Peer review process
- 6) Diagrammatic representation in technical reports is used:
a) To make it colorful
b) To give good effects
c) To confuse the reader
d) To make the report more interesting and easy to understand
- 7) Sample project file in origin software consists _____.
a) Collection of graphs b) Collection of analysis
c) Both a and b d) None of the above

- 8) Citation index is _____.
 a) a kind of bibliographic index between publications
 b) an index of citation between publications
 c) Both a and b
 d) None of the above
- 9) The intersection of a column and a row in MS Excel worksheet is known as _____.
 a) Row
 b) Cell
 c) Column
 d) Tab
- 10) Ethical Neutrality is a feature of _____.
 a) Deduction
 b) Scientific method
 c) Observation
 d) experience

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. 06

- 1) Population Census is an example of _____ type of research.
- 2) Origin can produce _____ graphs.
- 3) APA Style, MLA Style, Chicago Manual, Blue Book, OSCOLA are famously known as _____.
- 4) _____ is the first step of Research process.
- 5) _____ is a quality of Good Researcher.
- 6) The _____ feature of MS-excel quickly completes a series of data.

Q.2 Solve any Eight of the following. 16

- a) What is h-index in research?
- b) Name two software's for plotting graph.
- c) What-is the importance of research?
- d) What is peer review process for journals? Why it is used?
- e) In which software do you prepare presentations?
- f) What is scientific writing?
- g) How do you prepare index for technical reports?
- h) List the types of charts in MS Excel software.
- i) What is the advantage of origin over MS Excel?
- j) What is Scopus?

Q.3 A) Attempt any Two of the following. 10

- i) Prepare graph to explain the effect of rainfall in the urban and rural areas. Discuss the effect and outcome of graph.
- ii) Explain the procedure for peer review of journals for publishing a research paper.
- iii) If you need to add a table in your scientific report, how do you add the table? Write necessary steps to add the table in the report.

B) Write short note on scientific writing. Give few examples using scientific words. 06

Q.4 A) Attempt any Two of the following. 08

- i) What are the contents of the research paper? Briefly explain each one.
- ii) Plot the graph of students result analysis in 1st class, 2nd class, Distinction etc. (Consider 10 students in the class)
- iii) Prepare a technical report on "Effect of mobile usage in daily life".

B) What is a research journal? Explain how one can publish the research article in any journal. 08

Q.5 Attempt any Two of the following. 16

- a) A class of 15 students scored some marks in six subjects. Using MS Excel worksheet list the subject and marks obtained by the students in the given subjects. Use formulae to find total marks, percentage of marks of the class.
- b) With an example describe how the power point presentation of ten slides can be prepared for a conference? Specifically, explain preparation of the first and last slide of the presentation.
- c) Explain the steps followed to plot graph using origin. Use minimum 15 rows and 2 columns.

Seat No.	

Set P

**B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Medical Physics (Special Paper-XI) (19201518)**

Day & Date: Wednesday, 07-May-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) Q. No 1 and 2 are compulsory.
2) Attempt any three questions from Q.no. 3 to Q. no. 7
3) Figures to the right indicate full marks.

Q.1 A) Choose the correct alternative. 10

- 1) Why is it advised to have a full bladder before an abdominal ultrasound?
 - a) To lower impedance
 - b) To have a good acoustic window
 - c) To increase the water content
 - d) To allow for better propagation of waves
- 2) Which digits are used in the binary number system?

a) 0 and 1	b) 1 and 2
c) 1 and 3	d) 0 and 2
- 3) Who was the inventor of the Electrocardiogram?

a) Steward	b) Hubert Mann
c) Wilhelm His	d) Willem Einthoven
- 4) What are the critical sound wave properties utilized in ultrasound technology?

a) Propagation	b) Refraction only
c) Reflection only	d) Reflection and Refraction
- 5) What type of blood does the heart pump in a single circulation?

a) Mixed blood	b) Oxygenated blood
c) Deoxygenated blood	d) Only blood nutrients
- 6) In a normal heartbeat, where does the depolarization stimulus originate?

a) Sinoatrial Node (SA node)	b) His bundle
c) Epicardium	d) Atrioventricular Node (AV node)
- 7) How are X-rays produced in a standard X-ray machine?
 - a) Nuclear fusion
 - b) Nuclear fission
 - c) Bombardment of cathode rays on a radioactive material
 - d) Superheating an element

- 8) What does the acronym LASER stand for?
 - a) Light Amplification of Stimulated Emission of Radiations
 - b) Light Absorbing Solar Energy Resource
 - c) Light Amplification of Singular Emission of Radiations
 - d) Light Absorbent and Stimulated Emission of Radiations
- 9) What can be determined by counting the QRS complexes on an ECG?
 - a) Cardiac output
 - b) Stroke volume
 - c) Rate of heartbeat
 - d) Rate of breathing
- 10) What differentiates soft X-rays from hard X-rays?
 - a) Polarization
 - b) Intensity
 - c) Frequency
 - d) Velocity

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product/Write true or false etc. 06

- 1) What does the acronym MRI stand for?
- 2) Which area can be imaged with ultrasound in infants but not in adults?
- 3) Endoscopy uses optic fibers.
 - a) True
 - b) False
- 4) Dental X-ray is commonly referred to as?
- 5) Does T1 relaxation time rise with an increase in the magnetic field?
 - a) True
 - b) false
- 6) A flame emission detector is classified as a radiation detector.
 - a) True
 - b) False

Q.2 Answer the following. 16

- a) How are ultrasonic waves generated using piezoelectric materials? Describe the process and its applications.
- b) What is meant by medical diagnostic and therapeutic radiation? Explain their significance in healthcare.
- c) Discuss the benefits of using PET (Positron Emission Tomography) and X-rays in medical imaging.
- d) Explain the differences between visible and infrared (IR) radiation and their applications in various fields.

Q.3 Answer the following. 16

- a) How does an X-ray tube function? Explain its working with a labelled diagram, highlighting the key components.
- b) Describe the principle and use of sonography in medical diagnostics, outlining its operational process.

Q.4 Answer the following. 16

- a) Discuss the applications of lasers in the medical field, focusing on their role in various treatments and procedures.
- b) Provide an overview of contact CT Scanning, explaining its process and significance in medical imaging.

- Q.5 Answer the following. 16**
- a)** Explain the structure and operation of a Geiger-Muller (GM) tube with the help of a diagram.
 - b)** Describe how an Electrocardiogram (ECG) works and its importance in monitoring heart activity.
- Q.6 Answer the following. 16**
- a)** Summarize the evolution of computers through different generations, noting the major advancements in each.
 - b)** Define electromagnetic waves and explain the concept of Doppler Shift, including its applications.
- Q.7 Answer the following. 16**
- a)** Explain the different types of luminescence and provide examples where each type can be observed.
 - b)** List the types of optical radiation and explain the characteristics of any one type in detail.

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**B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Energy Resources (Special Paper-XI) (19201519)**

Day & Date: Wednesday, 07-May-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative. 10

- 1) What is the term for the process of converting solid biomass into liquid fuel?

a) Pyrolysis	b) Fermentation
c) Trans esterification	d) Gasification
- 2) Which material is commonly used to capture and convert solar energy in photovoltaic cells?

a) Silicon	b) Aluminum
c) Copper	d) Zinc
- 3) Which renewable energy source involves harnessing the energy stored in Earth's rotational motion?

a) Tidal	b) Solar
c) Wind	d) Geothermal
- 4) Which renewable energy source utilizes the temperature difference between the surface and depths of the ocean?

a) Ocean Thermal Energy	b) Wave Energy
c) Tidal Energy	d) Ocean Current Energy
- 5) Which type of wind turbine has a horizontal-axis rotor with the generator and other components located at the top of the tower?

a) Vertical-axis wind turbine	b) Darrieus wind turbine
c) Savonius wind turbine	d) Horizontal-axis wind turbine
- 6) Which material is commonly used for manufacturing rotor blades in modern wind turbines?

a) Wood	b) Steel
c) Aluminum	d) Composite materials
- 7) Which isotope of uranium is commonly used as fuel in nuclear reactors?

a) Uranium-235	b) Uranium-238
c) Plutonium-239	d) Thorium-232

- 8) What is the main drawback of using fossil fuels as an energy source?
 - a) Abundant reserves
 - b) Low energy density
 - c) Minimal environmental impact
 - d) Limited accessibility
- 9) In a boiling water reactor (BWR), what directly serves as a coolant and neutron moderator?
 - a) Water
 - b) Graphite
 - c) Heavy water
 - d) Liquid sodium
- 10) Which type of renewable energy technology uses the kinetic energy of flowing water to generate electricity?
 - a) Tidal energy
 - b) Wave energy
 - c) Hydropower
 - d) Ocean thermal energy

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. 06

- 1) The primary component of natural gas is _____.
- 2) _____ energy is derived from the Earth's internal heat.
- 3) The process of converting sunlight into electricity using photovoltaic cells is _____.
- 4) Which is the most commonly used fossil fuel for electricity generation worldwide?
- 5) What is Nuclear Fusion?
- 6) Define Geothermal Energy.

Q.2 Solve any Eight of the following. 16

- a) Explain the concept of renewable energy and provide two examples.
- b) Describe the process of nuclear fission and its role in generating electricity.
- c) Explain the role of control rods in a nuclear reactor.
- d) Explain the process of biogas production.
- e) Discuss the disadvantages of using biomass as an energy source.
- f) Explain the working principle of a tidal energy system and one advantage of tidal energy over some other renewable sources.
- g) Explain the concept of ocean thermal energy conversion (OTEC) and one advantage of OTEC over other forms of renewable energy.
- h) Discuss two environmental benefits of wind energy.
- i) Explain the concept of concentrated solar power (CSP).
- j) Discuss two environmental benefits of using solar water heaters for residential or commercial applications.

Q.3 A) Attempt any Two of the following. 10

- i) Classify fuel cells
- ii) Explain the principle of the solar photovoltaic cell.
- iii) Briefly describe wind and tidal energy.

B) Write a note on solar cell. **06**

Q.4 A) Attempt any Two of the following. 08

- i) Define beam and diffuse radiation?
- ii) Explain different types of biofuels.
- iii) What are the main advantages and disadvantages of biomass energy?

B) Differentiate between renewable and non-renewable energy sources? **08**

Q.5 Attempt any Two of the following. 16

- a)** Explain the effect of following parameters on the short circuit current, open circuit voltage and power generated by PV Cell:
 - i) Radiation intensity
 - ii) Temperature
- b)** Describe the classification of fuel cell. With a neat sketch explain the working of fuel cell.
- c)** A wind turbine with 12 m diameter span has cut in speed of 6 m/s, at which it develops 3.5 KW. Find the
 - i) Efficiency of turbine
 - ii) Axial Force
 - iii) Find the effect of wind velocity if it is 20 m/s, on wind turbine power and axial force. Assume Density of air as 1.25 Kg/m^3

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B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Geoinformatics (Special Paper - XI) (19201538)

Day & Date: Wednesday, 07-May-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative.

10

- 1) A linear geologic feature observed on the satellite image which represent subsurface weak zone is _____.
 - a) Lineament
 - b) Strike
 - c) Dip
 - d) Dam
- 2) What is the percentage of forward overlap in stereo pair?
 - a) 20
 - b) 30
 - c) 50
 - d) 60
- 3) India falls in which zone of UTM?
 - a) N42 – 47
 - b) S42 – 47
 - c) N43 – 45
 - d) S43 – 45
- 4) Digital Number (DN) of each pixel represent its _____ value.
 - a) Brightness value
 - b) Dimensional
 - c) Ground value
 - d) Temperature
- 5) The study of the characters of the geological features on earth surface using the aerial photograph is _____.
 - a) Photointerpretation
 - b) Photogrammetry
 - c) Photo resolution
 - d) Photo reading
- 6) A passive sensor uses _____.
 - a) Sun as the source of energy
 - b) Flash light as a source of energy
 - c) Its own source of energy
 - d) None of these
- 7) Which data model requires less space for computer storage?
 - a) Raster
 - b) Elevation
 - c) Vector
 - d) None of these

- 8) Raster data is stored in _____ format
 - a) Tabular
 - b) X-Y co-ordinate
 - c) Pixel / grid
 - d) Flowchart
- 9) Ultraviolet light is greatly absorbed by _____ in the atmosphere.
 - a) Oxygen
 - b) Ozon
 - c) Water vapour
 - d) Nitrogen
- 10) Which of the following information is not printed on the aerial photographs?
 - a) Serial No
 - b) Clock
 - c) Wind speed
 - d) Date

B) Answer the following questions in one sentence.

06

- 1) What are two types of infrared rays?
- 2) What is resolution?
- 3) What is polygon?
- 4) Diffused reflection occurs when electromagnetic radiation reflects from which surface?
- 5) What is strike?
- 6) What is GIS?

Q.2 Solve any Eight of the following.

16

- a) What is active remote sensing?
- b) What is lateral overlap?
- c) Define photogrammetry.
- d) What is lineament?
- e) Difference between vertical and oblique aerial photographs?
- f) In false colour composite images showing healthy vegetation appears which colour?
- g) True colour composite shows which band numbers?
- h) Which one of the following is very helpful to determine height of a feature in aerial photographs?
- i) What is node?
- j) What is fiducial marks?

Q.3 A) Attempt any Two of the following.

10

- Explain temporal and spatial resolution.
- Describe in brief spectral reflectance curve.
- Explain Push-broom scanners.

B) Describe any four elements of photointerpretation?

06

Q.4 A) Attempt any Two of the following.

08

- Describe any two drainage patterns with their significance.
- Describe pattern and texture in aerial photographs.
- Advantages of vector data model.

B) Describe components of global positioning system. **08**

Q.5 Attempt any Two of the following. **16**

- a) Describe non - spatial data.
- b) Describe electromagnetic radiation.
- c) What is raster data structure? Explain advantage and disadvantages.

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B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
Linux (Special Paper - XI) (19201547)

Day & Date: Wednesday, 07-May-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative.

10

- Which of the following symbols represent redirection?
a) - b) <
c) & d) |
- The command to change the owner of a file is _____.
a) chgrp b) chown
c) chmod d) set
- The command to copy a file to another directory, and delete the original, is _____.
a) ls b) cp
c) cat d) mv
- A hidden file in LINUX begins with character _____.
a) * b) \$
c) ? d) .
- The command to display a list of running processes is _____.
a) pr b) man
c) sh d) ps
- In "vi" to replace a single character with another character we use _____.
a) c b) a
c) r d) s
- What command is used to remove files?
a) dm b) rm
c) delete d) erase

- 8) The sort command in LINUX
 - a) Used to sort a file
 - b) Used to sort the list of files in a directory
 - c) Both a and b
 - d) None of the above
- 9) The Linux command used to find out the number of characters in a file is _____.

a) nc	b) wc
c) chcnt	d) c
- 10) Mounting a file system results in the loading of _____.

a) Boot block	b) Super block
c) inode table	d) All of these

B) State True/False**06**

- 1) The end key moves the cursor at the beginning of line.
- 2) The command "mkdir" cannot take multiple arguments.
- 3) Bourne shell offers a command history feature.
- 4) The command "uname -r" shows the version number of UNIX kernel.
- 5) Wildcards are special characters which are used to replace or represent one or more characters.
- 6) The kernel acts as a bridge between application & the underlying hardware.

Q.2 Solve any Eight of the following.**16**

- a) What is KDE?
- b) What are the types of file system?
- c) Define boot loader.
- d) How to create user?
- e) Explain head and tail command
- f) What is Meta characters?
- g) Use of rpm command.
- h) What is Killing process?
- i) What is shell variable?
- j) Define piping.

Q.3 A) Attempt any Two of the following.**10**

- i) Explain file structure of Linux.
- ii) Explain different simple filter command.
- iii) What is a shell? How does it work with the kernel & user?

B) Write note on Killing process.**06****Q.4 A) Attempt any Two of the following.****08**

- i) What is the purpose of chmod command? Explain with example.
- ii) Explain different communication command.
- iii) What is Kernel? Give its function.

B) Explain the features and architecture of Linux. **08**

Q.5 Attempt any Two of the following. **16**

- a)** Explain three mode of vi editor and briefly describe input /insert mode with all operations.
- b)** Which are the different file types available in Linux? Discuss each type in detail along with appropriate examples.
- c)** How files are internally organized in Linux file system? Explain it briefly.

Seat No.	

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B.Sc. (Semester - V) (New) (Old) (CBCS) Examination: March/April - 2025
MS-EXCEL (Special Paper-XI) (19201533)

Day & Date: Wednesday, 07-May-2025
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labeled diagrams wherever necessary.
3) Figures to right indicate full marks.
4) Use of log table and calculator is allowed.

Q.1 A) Choose the correct alternative.

10

- 1) Workbook is a collection of _____.
a) Worksheets
b) Page set-up
c) Buttons
d) Diagrams
- 2) _____ is a powerful tool used to create and format spreadsheets.
a) Adobe Photoshop CS
b) Mozilla Firefox
c) Microsoft office Power point
d) Microsoft Office Excel
- 3) Excel is a program that is used to prepare a _____.
a) Slide presentation
b) Spreadsheet
c) Text document
d) Database
- 4) Which term is used to join the selected cells in one cell?
a) Filter
b) Wrap
c) Pivot
d) Merge
- 5) The result is a _____ value either TRUE or FALSE.
a) Logical
b) Arithmetic
c) Algorithm
d) Logarithm
- 6) _____ is the intersection of a row with a column.
a) Cell
b) Row
c) Column
d) All of these
- 7) To displays the Find and Replace dialog box. with the Find tab selected press _____.
a) Alt + F
b) Tab + F
c) Esc + F
d) Ctrl + F
- 8) Pre- defined and built in formulas in Excel are known as _____.
a) Auto sheets
b) Charts
c) Functions
d) Tables

9) A formula in Excel always begins with an ____.

- a) Equal sign
- b) Colon
- c) Comma
- d) Space

10) Which of the following identifies a cell in Excel?

- b) Address
- b) Formula
- c) Name
- d) Label

B) Fill in the blanks.

06

- 1) Press _____ to undo in MS-EXCEL.
- 2) _____ of the worksheet appears vertically and are identified by letters at the top of the worksheet window.
- 3) Press _____ to select all rows and columns in the worksheet.
- 4) Press _____ to save the active file with its current file name, location, and file format.
- 5) _____ are equations that perform calculations on values in your worksheet.
- 6) _____ function is used to add the values in the function argument.

Q.2 Solve any Eight of the following.

16

- 1) Which function is used to calculate sum of numbers?
- 2) Which function is used to generate random numbers?
- 3) Write the name of file formats that are used to save a MS-EXCEL file.
- 4) How can you add cells, rows or columns in Excel?
- 5) What is the use of the IF function in Excel?
- 6) What do you mean by cells in an Excel sheet?
- 7) Explain what is a spreadsheet?
- 8) What are charts in MS- Excel?
- 9) Write the function for calculating p.m.f. of Poisson distribution with $\lambda = 2$.
- 10) Which function is used to calculate mean of numbers?

Q.3 A) Attempt any Two of the following.

10

- 1) What is the order of operations used when evaluating formulas in Excel?
- 2) What is difference between a function and a formula in Excel?
- 3) How can you draw a 10 random numbers from 0 to 1?

B) Write short notes on 'Data' tab in Excel.

06

Q.4 A) Attempt any Two of following.

08

- 1) Explain MS Excel in brief.
- 2) How do you find averages in MS- excel?
- 3) How will you write the formula for the following?
Multiply the value in cell B1 by 20, add 6 in the result, and divide it by 3.

B) Explain different graphs in MS-Excel.

08

Q.5 Attempt any Two of the following.

16

- a) Explain RAND and RANDBETWEEN functions with examples.
- b) Explain the SUM and SUMIF functions with examples.
- c) What are the different types of COUNTIF functions in Excel?

Seat No.	

Set	P

B.Sc. (Semester - VI) (New) (CBCS) : Examination March/April - 2025
English Compulsory
Literary Mindscapes Volume (22221600)

Day & Date: Wednesday, 30-April-2025
 Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 Rewrite the following question by choosing the correct alternative. 08

- 1) According to Shastriji, whatever your station in future life, you should first of all think of yourselves as _____.
 a) Citizens of India b) Leaders of India
 c) Warriors of India d) Ministers of India

- 2) The story 'God sees the Truth but Waits' is written by _____.
 a) Leo Tolstoy b) Jawaharlal Nehru
 c) Milton d) Lal Bahadur Shashtri

- 3) Aksinoy was fond of _____ when he was young.
 a) Singing b) Dancing
 c) Sleeping d) Reading

- 4) The poem 'Endless Time' presents the idea that time is _____ for God.
 a) infinite b) finite
 c) limited d) short

- 5) _____ is the narrator of the poem 'My Last Duchess'.
 a) The Duchess b) The Duke
 c) The King d) The Emissary

- 6) _____ are the things that are read and heard by us.
 a) Novels and songs b) Lovely tales
 c) Poetry and music d) Dramas and plays

- 7) The poem 'Tree at my Window' is written by _____.
 a) Robert Browning b) Robert Frost
 c) John Keats d) Rabindranath Tagore

- 8) He ran _____.
 a) with fast b) fast
 c) fastly d) most fastly

- Q.2 Write answers of the following questions in short. (Any Four) 12**
- a) What does Lal Bahadur Shastri expect from student?
 - b) What was the major change in the character of Aksionov in prison?
 - c) What is the theme of the poem 'Endless Time'?
 - d) Describe the personality of the duchess.
 - e) Give the central idea of the poem 'Ode to Beauty'.
 - f) What challenges did the poet and the tree face together in 'Tree at my Window'?
- Q.3 a) Discuss in detail various Literacy skills. 10**
- OR**
- b) Discuss in detail various Life Skills.**
- Q.4 Write a note on other important skills – Global Awareness, Environmental consciousness, Civic literary and Health Literary etc. 10**

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (CBCS) : Examination March/April - 2025
Physics (Special Paper-XIII)
Electrodynamics (22221617)

Day & Date: Sunday, 18-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Choose correct alternatives from the options. 10

- 1) Poisson's equation is _____
 - a) $\nabla^2 \phi = \frac{\rho}{\epsilon_0}$
 - b) $\nabla^2 \phi = 0$
 - c) $\nabla^2 \phi = \rho \epsilon_0$
 - d) $\nabla^2 \phi = -\rho \epsilon_0$
- 2) Electric field intensity $\vec{E}$ in terms of scalar potential ϕ is given by _____
 - a) $\vec{E} = -\nabla\phi$
 - b) $\vec{E} = \frac{1}{\nabla\phi}$
 - c) $\vec{E} = \nabla\phi$
 - d) $\vec{E} = \phi$
- 3) Self-inductance per unit length of a long solenoid with n turns per unit length and cross-sectional area A is _____
 - a) $\mu_0 n A$
 - b) $n^2 A$
 - c) $\mu_0 n^2 A$
 - d) $\mu_0^2 A$
- 4) The electric displacement vector in dielectric medium is _____
 - a) $(\epsilon_0 \vec{E} - \vec{P})$
 - b) $\epsilon_0 \vec{E}$
 - c) $(\epsilon_0 \vec{E} + \vec{P})$
 - d) $(\epsilon_0 \vec{E} + 2 \vec{P})$
- 5) The wave impedance of free space is _____
 - a) 0Ω
 - b) 376.6Ω
 - c) 37.66Ω
 - d) 3776Ω
- 6) If magnetic monopole existed, then which of following Maxwell's equations will be modified :
 - a) $\text{div} D = \rho$
 - b) $\text{div} B = 0$
 - c) $\text{Curl } E = -\frac{\partial \vec{B}}{\partial t}$
 - d) $\text{Curl } H = j + \frac{\partial \vec{D}}{\partial t}$

- 7) Momentum density ($\vec{G}$) and pointing's vector ($\vec{N}$) are related to each other in a medium characterized by μ and ϵ as _____
- a) $(\vec{G}) = \vec{N}/\mu\epsilon$ b) $(\vec{G}) = \mu\epsilon \vec{N}$
 c) $(\vec{G}) = \sqrt{\mu\epsilon} \vec{N}$ d) $(\vec{G}) = \vec{N} \epsilon/\mu$
- 8) If there are free charges on the interface of two dielectrics then normal component of electric displacement vector at the interface is _____
- a) continuous b) discontinuous
 c) zero d) always Continuous
- 9) When a wave gets reflected from the surface of a denser medium, there occurs a phase change of _____
- a) 0° b) 90°
 c) 180° d) 270°
- 10) An oscillating charge _____
- a) radiates
 b) does not radiates
 c) may or may not radiate
 d) nothing can be said

B) Fill in the blank**06**

- 1) The nature of electromagnetic waves is _____
- 2) Laplace's equation is _____
- 3) Mathematical formulations of empirical laws in electricity and magnetism are known as _____
- 4) Self-inductance and mutual inductance are measured in _____
- 5) The equation of continuity is in accordance with the law of conservation of _____
- 6) _____ charge cannot radiate

Q.2 Answer the following (Any Eight)**16**

- a) State Lenz's law.
- b) Give examples which shows phenomenon of electromagnetic induction.
- c) Define Electromotive force (e.m.f.).
- d) State the principle of transformer.
- e) State coulomb's law in electrostatics.
- f) State Biot-Savart's law.
- g) What is retardation time?
- h) Show that nature of Electromagnetic waves as a Transverse.
- i) What is mutual inductance?
- j) Determine the electrostatic force between the two charges of magnitude 3C and 1C separated by a distance 1 m in air.
 (Given $K = 9 \times 10^9 \text{ Nm}^2/\text{C}^2$)

!!!!

- Q.3 A) Attempt the following (Any Two) 10**
- 1) Obtain the boundary conditions for electromagnetic field vectors ($\vec{D}$, $\vec{E}$) at the interface of two media.
 - 2) For electromagnetic waves through linear dielectrics, show that $\vec{E}$, $\vec{H}$ and $\vec{K}$ are orthogonal.
 - 3) Show that $T+R = 1$ and find the value of reflection and transmission coefficients for normal incidence at the glass-air interface, If refractive indices of glass and air are respectively 1.5 and 1.
- B) Write a note on total internal reflection. 06**
- Q.4 a) Attempt the following (Any Two) 08**
- 1) What is self inductance and obtain an expression for self inductance of a solenoid?
 - 2) Obtain integral and differential form of Faraday's law.
 - 3) Obtain an expression for total power radiated by an electric dipole.
- b) Show that a charged particle moves along a circular path with a constant speed in a uniform magnetic field ($\vec{B}$). 08**
- Q.5 Attempt the following (Any Two) 16**
- a) State and prove Ampere's circuital law and obtain differential form of Ampere's circuital law.
 - b) What is radiation reaction? Deduce an expression for radiation reaction force for an electric dipole.
 - c) Establish the law of conservation of energy for electromagnetic field and explain the meaning of Poynting's vector.

Max. Marks: 80

Q.1 A) choice questions, (one Mark each) 10

- Page 1 of 3

- 8)** The composition of phenol in phenol-water system at CST is _____
- a) 10% b) 50%
- c) 34% d) 100%
- 9)** Which of the following reaction belongs to complex reactions?
- a) parallel reactions b) consecutive reactions
- c) Reversible reactions d) all of these
- 10)** Which of the following is a path dependent function?
- a) Heat b) Entropy
- c) Gibbs free energy d) Enthalpy

B) Fill in the blank/definitions/one sentence answer/one word answer/Give name/predict the product. 06

- 1) What is hot band in vibrational spectrum?
- 2) The Hooke's law is expressed as
- 3) The critical solution temperature for triethylamine-water system is
- 4) At what condition $\Delta A = \Delta G$?
- 5) What is temperature coefficient of a reaction?
- 6) Write logarithmic form of Arrhenius equation.

Q.2 Solve any Eight of the following **16**

- 1) What is fractional distillation?
- 2) What is the standard state of a gas and liquid?
- 3) State Raoult's law.
- 4) Mention different steps involved in a chain reaction.
- 5) Calculate the frequency of a radiation having wavelength $4500 \text{ \AA}$.
- 6) Give the expression for the estimation of force constant.
- 7) Give any two examples of parallel reaction.
- 8) Give the half life time expression for third order reaction.
- 9) What is Rayleigh scattering?
- 10) Which transition is referred as the fundamental vibrational transition?

Q.3 A) Attempt any Two of the following. 10

- 1) What is Helmholtz free energy? Give physical significance of it.
- 2) Explain diagrammatically various vibrational overtone transitions appeared in anharmonic oscillator.
- 3) Derive the expression for rate constant of a third order reaction with equal initial concentrations of reactants.

B) Short note/ Solve **06**

Calculate the reduced mass and moment of inertia of $^{79}\text{Br}^{35}\text{Cl}$ molecule. The bond length of Br-Cl is $2.14 \text{ \AA}$.

- Q.4 A) Attempt any Two of the following** **08**
- 1)** With the help curves, explain the total and partial vapour pressures of ideal solutions at constant temperatures.
 - 2)** Discuss the solubility of partially miscible liquid, phenol-water system.
 - 3)** Derive the expression for vibrational energy of a diatomic molecule having simple harmonic oscillations.
- B) Describe/Explain/Solve.** **08**
- Derive the expression for Clapeyron-Clausius equation. Give its applications.
- Q.5 Attempt any Two of the following.** **16**
- a)** What are azeotropic mixtures? Discuss the distillation behaviour of typical azeotropic mixture.
 - b)** Derive an expression for Van't Hoff's isotherm by using Van't Hoff's equilibrium box.
 - c)** Discuss in detail the activated complex theory of chemical reaction.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (CBCS) : Examination March/April - 2025
Botany (Special Paper-XIII)
Plant Pathology (22221601)

Day & Date: Sunday, 18-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 60

- Instructions:** 1) All questions are compulsory.
 2) Draw neat and labeled diagram and give equations wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of logarithmic table and non-programmable calculator is allowed

Q.1 A) Multiple choice question.**08**

- 1) Red rot of sugarcane is caused by _____
 a) Phytophthora infestans
 b) Alternaria alternate
 c) Cercospora personata
 d) Colletotrichum falcatum

- 2) _____ Plant disease which affects the absorption and accumulation of water and minerals is _____ crop known Pulses.
 a) Root rot
 b) Wilts
 c) soft rot
 d) Damping off

- 3) Which of the given disease is related to wheat?
 a) Tikka
 b) Leaf rust
 c) Downy mildew
 d) Late light

- 4) Most fungal diseases spread out in _____
 a) Dry and cold weather
 b) Wet and cold weather
 c) Dry and hot weather
 d) Wet and hot weather

- 5) White rust of crucifer causes the infection _____
 a) Local type
 b) Systemic type
 c) Local and systemic type
 d) Seedling type

- 6) Viruses enter the plant through _____
 - a) Osmosis
 - b) Pinocytosis
 - c) Diffusion
 - d) Plasmolysis
- 7) Citrus canker disease occur on _____
 - a) Grapes
 - b) Ladies finger
 - c) Pomegranate
 - d) Lemon
- 8) Aerobiology is directly associated with other scientific branches like _____
 - a) Plant pathology
 - b) Animal
 - c) Palynology
 - d) All of these
- 9) _____ is dealing with the study of nature and structure of airborne biological materials,
 - a) Virology
 - b) Aerobiology
 - c) Geology
 - d) Phycology
- 10) The separation of pathogen from its host and its culture on a nutrient medium is called _____
 - a) Reproduction
 - b) Inoculation
 - c) Incubation
 - d) Isolation

B) Fill in the blanks.

06

- The late blight of _____ is caused by *Phytophthora infestans*.
- The physiological or morphological changes as a result of disease are known as _____
- Sulfur based fungicides are used for _____ types of disease.
- The word _____ has been derived from Greek word Pathos means suffering.
- Tikka disease is caused by _____
- The mode of nutrition in fungi is _____

Q.2 Solve any eight of the following

16

- Write the control measures of little leaf of brinjal.
- Write symptoms of red rot
- What is necrosis?
- Name any two seed borne
- Define host and pathogen
- Name any two bacterial diseases.
- Define disease.
- Write symptoms of grain smut of jowar.
- What is host range?
- What is infection?

- Q.3 Attempt any two of the following** **16**
- a) Describe the causal organism and control measures of Downy mildew of grapes.
 - b) Describe the seed treatment methods.
 - c) Describe the causal organism and symptoms of Oily spot of pomegranate.
 - d) Describe the scope and importance of Aerobiology.
- Q.4 Attempt any two of the following** **10**
- a) Describe the causal organism, symptoms and control measures of white rust of mustard.
 - b) Describe the causal organism, symptoms and control measures of red rot of sugarcane.
 - c) Describe the causal organism, symptoms and control measures of late blight of potato.
- Q.4 B) Describe the causal organism, symptoms and control measures of citrus canker** **06**
- Q.5 Attempt any two of the following** **16**
- a) Explain the importance of plant diseases.
 - b) Describe the causal organism, symptoms and control measures of tomato mosaic disease.
 - c) Classify the plant diseases based on severity of infection and spread of disease.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Zoology (Special Paper-XIII)
Animal Physiology: Life Sustaining Systems (22221625)

Day & Date: Sunday, 18-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) The breakdown of complex food into simpler form is called _____.
 a) Digestion b) Respiration
 c) Circulation d) Excretion
- 2) _____ is defined as gaseous exchange between the organism and environment.
 a) Digestion b) circulation
 c) Excretion d) Respiration
- 3) The respiratory pigment present in human blood is _____.
 a) Chlorocruorin b) Vanadium
 c) Haemoglobin d) Haemocyanin
- 4) _____ is the functional unit of the kidney.
 a) Hilum b) Nephron
 c) Neurons d) Medulla
- 5) _____ blood group is called as universal donar.
 a) A b) B
 c) O d) AB
- 6) The rhythmic contraction and relaxation of heart is known as _____.
 a) Heart valve b) Heart beat
 c) Heart attack d) Heart burn
- 7) HCL is produced in _____ part of body.
 a) Stomach b) Brain
 c) Liver d) Lung
- 8) The normal diastolic blood pressure in a normal healthy adult human is _____.
 a) 110 mm Hg b) 60 mm Hg
 c) 90 mm Hg d) 80 mm H

- 9) The artificial process of removing wastes, excess salts and water from the blood is _____.
a) Dialysis b) Circulation
c) Digestion d) Respiration
- 10) Major stress hormone is _____.
a) Adrenaline b) Glucagon
c) Epinephrine d) Cortisol

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc.

06

- 1) _____ is used to measure Blood pressure.
- 2) Define : Excretion
- 3) What is gastric digestion?
- 4) The production of red blood cells is called _____.
- 5) _____ is a powerful anticoagulant present in the blood.
- 6) What is the end product of protein digestion.

Q.2 Solve any Eight of the following.

16

- What is Peristalsis
- What is Tidal Volume?
- What are enzymes? Name any 2 gastric enzymes
- What is micturition?
- Name the hormones which regulate kidney functions
- Name 2 bile salts
- Give the different types WBC in blood
- Write the function of liver.
- What is Tachycardia?
- Name 2 hormones of pancreas

Q.3 A) Answer of the following (Any Two)

10

- 1) Describe origin and conduction of heart beat.
- 2) Mechanical digestion of food
- 3) Structure of Nephron

B) Short note/Solve

06

Describe functions of blood.

Q.4 A) Answer of the following (Any Two)

08

- 1) Describe cardiac cycle.
- 2) Bohr's effect
- 3) Functions of pancreas

B) Describe/Explain/Solve

08

Explain physiology of Yoga and stress.

Q.5 Answer of the following (Any Two)

16

- a)** Describe the process of blood clotting.
- b)** Describe process of intestinal digestion.
- c)** Describe the process of urine formation.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Mathematics (Special Paper-XIII)
Metric Spaces (22221633)

Day & Date: Sunday, 18-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 A) Choose the correct alternatives from the following. 10

- 1) Which of the following is not element of class l^2 ?
 - a) $\left\{\frac{1}{e^n}\right\}_{n=1}^{\infty}$
 - b) $\left\{\frac{1}{n}\right\}_{n=1}^{\infty}$
 - c) $\left\{\frac{1}{\sqrt{n}}\right\}_{n=1}^{\infty}$
 - d) All of these
- 2) If ϱ_1 and ϱ_2 are metric on M then $\varrho_1 + \varrho_2$ is _____ on M .
 - a) Metric
 - b) Not metric
 - c) Absolute metric
 - d) Usual metric
- 3) Norm is a function with domain l^2 and range _____.
 - a) $(-\infty, 0)$
 - b) $[0, \infty)$
 - c) $(-\infty, \infty)$
 - d) $(-\infty, 0)$
- 4) The subset $\{1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \dots\}$ of the real line has _____ as the limit point.
 - a) 1
 - b) $\frac{1}{2}$
 - c) ∞
 - d) 0
- 5) If any metric space M , both M and ϕ are _____.
 - a) Open
 - b) Closed
 - c) Both open and closed
 - d) Not open
- 6) A subset E of metric space M is closed subset of M if _____.
 - a) $E = \bar{E}$
 - b) $E \neq \bar{E}$
 - c) $E = \bar{\bar{E}}$
 - d) $\bar{E} = M$

- 7) Let (M_1, ρ_1) and (M_2, ρ_2) be metric spaces and let $f : M_1 \rightarrow M_2$ then f is continuous on M_1 iff _____
- $f^{-1}(G)$ open in M_1 whenever G is open in M_2
 - $f^{-1}(F)$ closed in M_1 whenever F is open in M_2
 - Both a and b
 - Neither a nor b
- 8) In a metric space $M = [0,1]$ with the absolute value metric,
 $B[\frac{1}{4}, \frac{1}{2}] =$ _____
- $(\frac{1}{4}, \frac{3}{4})$
 - $(\frac{3}{4}, \frac{1}{4})$
 - $(\frac{1}{2}, \frac{1}{4})$
 - $[0, \frac{3}{4})$
- 9) Every compact metric space is _____
- Complete and bounded
 - Complete and not bounded
 - Complete and totally bounded
 - Totally bounded and not complete.
- 10) For a metric (M, ρ) the map $T : M \rightarrow M$ is a contraction on M , if _____
- $\rho(T_x, T_y) = \alpha \rho(x, y)$ for $0 < \alpha \leq 1$
 - $\rho(T_x, T_y) \leq \alpha \rho(x, y)$ for $0 \leq \alpha < 1$
 - $\rho(T_x, T_y) \leq \alpha \rho(x, y)$ for $0 \leq \alpha \leq 1$
 - $\rho(T_x, T_y) \geq \alpha \rho(x, y)$ for $0 \leq \alpha < 1$

B) Fill in the blanks.**06**

- A metric space M has Heine-Borel property if M is _____
- The complement of open set is _____.
- If $T_x = x^2, 0 \leq x \leq \frac{1}{3}$, if T is contraction on $[0, \frac{1}{3}]$ then $\alpha =$ _____.
- The arbitrary union of open set is _____.
- For any $a \in \mathbb{R}, B[a; 1] =$ _____.
- For a class l^2 , let $s = \{s_n\}_{n=1}^{\infty} \in l^2$ then the norm of s is defined as $\|s\| =$ _____.

Q.2 Attempt any eight of the following**16**

- If $|x - 2| < 1$ then prove that $|x^2 - 4| < 5$
- Define Metric space.
- In set $\mathbb{R}$ define $d(x, y) = |x - y| \forall x, y \in \mathbb{R}$ then prove that it is a metric space.
- If the real valued function f and g are continuous at $x = a \in \mathbb{R}'$ then prove that (f, g) is continuous at $x = a \in \mathbb{R}'$
- Define open ball in metric space.
- If $|x - 3| < \frac{1}{10}$ then prove that $|x^2 - x - 6| < 0.5$

- 7) If f is continuous at $0 \in \mathbb{R}'$ then prove that $|f|$ is continuous at a .
- 8) Consider the usual metric $\varrho(x, y) = |x - y|$ for $\{0, 1\}$ then describe $B(0, 1/8)$
- 9) Define Totally bounded set.
- 10) Let $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ be a function defined by $T(x) = \frac{x}{2}$, prove that T is contraction.

Q.3 A) Attempt any two of the following. 10

- 1) If F_1 and F_2 are closed subsets of metric space (M, ϱ) then prove that $F_1 \cup F_2$ is closed
- 2) If the subset A of the metric space (M, ϱ) is totally bounded then A is bounded
- 3) If f and g are real valued functions, if f is continuous at a and if g is continuous at $f(a)$ then $(g \circ f)$ is continuous at a

B) State and prove Schwarz Inequality theorem. 06

Q.4 A) Attempt any Two of the following. 08

- 1) If G_1 and G_2 are open subsets of metric space M then $G_1 \cap G_2$ is also open.
- 2) Let (M, ϱ) be a metric space and let $a \in M$ are real valued functions whose domain are subset of M . If $\lim_{x \rightarrow a} f(x) = L$ and $\lim_{x \rightarrow a} g(x) = N$ then $\lim_{x \rightarrow a} (f(x) + g(x)) = L + N$
- 3) Prove that $\lim_{x \rightarrow 2} (x^2 + 3x) = -2$

B) Let (M, ϱ) be a complete metric space. If T is contraction on M , then there is one and only one point x in M such that $T_x = x$ 08

Q.5 Attempt Any Two of the following. 16

- a) Prove that $\mathbb{R}^2$ is complete metric space.
- b) If (M_1, ϱ_1) and (M_2, ϱ_2) in metric spaces and let $F: M_1 \rightarrow M_2$ then f is continuous on M_1 iff $f^{-1}(G)$ is open in M_1 whenever G is open in M_2
- c) Show that $d: \mathbb{R}^2 \times \mathbb{R}^2 \rightarrow \mathbb{R}^2$ such that $d(x, y) = \text{Max}\{|x_1 - y_1|, |x_2 - y_2|\}$
Where $x = (x_1, x_2), y = (y_1, y_2)$ are in $\mathbb{R}^2$ s metric on $\mathbb{R}^2$

Seat No.	

Set P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Statistics (Special Paper - XIII)
Statistical Inference – II (22221641)

Day & Date: Sunday, 18-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagrams wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of log table and calculators is allowed)

Q.1 A) Choose the correct alternatives from the following. 10

- 1) Test of $H_0: \mu = 40$ against $H_1: \mu > 40$ leads to
 - a) left tailed test
 - b) right tailed test
 - c) two tailed test
 - d) none of these
- 2) A sequence of symbols shows lack of randomness if there are
 - a) Too many runs
 - b) Too few runs
 - c) Both a) and b)
 - d) Neither a) nor b)
- 3) In Sequential Probability Ratio Test (SPRT) the sample size is
 - a) fixed
 - b) a random variable
 - c) fixed but small
 - d) fixed but large
- 4) The ratio of likelihood under H_0 and the entire parametric space is called
 - a) Probability ratio
 - b) Sequential probability ratio
 - c) Likelihood ratio
 - d) None of These
- 5) For finding the confidence interval for mean of two normal populations when σ^2 is known, then the distribution used is _____.
 - a) Chi-square
 - b) t
 - c) F
 - d) none of these
- 6) Neyman- Pearson lemma provides
 - a) Unbiased C. R.
 - b) Most powerful C. R.
 - c) Admissible C. R.
 - d) Minimal C. R.
- 7) Rejecting H_0 when H_0 is false is _____.
 - a) Type-II
 - b) Type-I
 - c) Power
 - d) none of these

- 8) Out of the two types of error in testing, the more severe error is ____.
- Type I error
 - Type II error
 - Both a) & b) are equally severe
 - No error is severe
- 9) Most frequently used method of breaking the ties is ____.
- midrank method
 - average statistics approach
 - to omit tied values
 - most favorable statistic approach
- 10) The decision criteria in SPRT depends on the functions of
- type I error
 - type II error
 - type I error and type II error
 - none of the two types of errors

B) Define the following.

06

- Hypothesis
- Type-1 error
- Power of test
- Type-II error
- Null and alternative hypothesis
- Pivotal quantity

Q.2 Answer any eight of the following.

16

- State confidence interval for population proportion P .
- M.P. test
- U.M.P. test
- ASN function
- Level of significance
- Define LRT
- State confidence interval for μ when σ^2 is known in case of $N(\mu, \sigma^2)$ distribution.
- ASN function
- State confidence interval for population variance σ^2 when μ is known.
- State confidence interval for population proportion $P_1 - P_2$.

Q.3 A) Solve any Two of the following.

10

- Obtain $100(1-\alpha)\%$ confidence interval for the parameter μ in case of $N(\mu, \sigma^2)$ distribution, when σ^2 is unknown.
- Describe the procedure of Run test.
- Describe the procedure of median test.

B) Describe the procedure of sign test.

06

Q.4 A) Attempt any Two of the following. 08

1) Derive the likelihood ratio test for testing $H_0: \mu = \mu_0$ against $H_1: \mu \neq \mu_0$ when a sample of size n is taken from $N(\mu, \sigma^2)$.

2) Describe the procedure of Mann-Whitney U-test.

3) Obtain M.P. critical region for the distribution

$$f(x) = \Theta e^{-\theta x}; x \geq 0 \\ = 0 \quad ; \text{otherwise}$$

for testing the hypothesis $H_0: \theta = 2$ against $H_1: \theta = 1$ based on a r. s. of size n drawn from distribution $f(x)$.

B) Derive the likelihood ratio test for testing $H_0: \mu = \mu_0$ against $H_1: \mu \neq \mu_0$ 08
when a sample of size n is taken from $N(\mu, \sigma^2)$.

Q.5 Solve any two of the following. 16

a) A coin is for which the probability of occurrence of head is P , thrown 7 times and null hypothesis is $H_0: P = \frac{1}{2}$ tested against $H_1: P = \frac{1}{4}$ is accepted more than one head appears, then compute

i) type-I error ii) type-II error iii) Power of test.

b) State the procedure of Kolmogorov - Smirnov test for two independent samples.

c) State and prove Neyman- Pearson lemma.

Seat No.	

Set P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Geology (Special Paper-XIII)
Photogeology & Remote Sensing (22221649)

Day & Date: Sunday, 18-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) Which of the following is an air based platform?

a) Balloons	b) Towers
c) Rocket	d) Unmanned spacecraft
- 2) The system that uses the sun as a source of electromagnetic energy and records the naturally radiated and reflected energy from the object is called _____.

a) Geographical Information System
b) Global Positioning System
c) Passive Remote Sensing
d) Active Remote Sensing
- 3) The point just vertically below the observers position, in celestial sphere is called _____.

a) Celestial point	b) Nadir
c) Zenith	d) Pole
- 4) LISS is an example of _____.

a) Active Sensor	b) Passive Sensor
c) Both Active and Passive Sensor	d) None
- 5) When EM radiation enters the atmosphere, it is subjected to _____.

a) Scattering	b) Absorption
c) Transmission	d) All the above
- 6) The fact that sky appears to be blue is due to _____.

a) Rayleigh scattering	b) Mie scattering
c) Non selective scattering	d) All of above

- 7) In healthy vegetation, there is _____ absorption of blue & red energy.
 - a) More
 - b) Less
 - c) Both a and b
 - d) None of the above
- 8) In case of soil, there is nearly _____ transmittance of energy.
 - a) More
 - b) Minimum
 - c) Zero
 - d) None of the above
- 9) _____ are the orbits having distance in between 2000 km to 36000 km from surface of the Earth.
 - a) Low Earth orbit
 - b) Medium Earth orbit
 - c) Geostationary orbit
 - d) None of the above
- 10) _____ is capacity with which the sensor can sense smallest possible object with reasonable accuracy.
 - a) Spatial resolution
 - b) Spectral resolution
 - c) Radiometric resolution
 - d) None

B) Answer the following questions in a One Sentence

06

- 1) What is the scale of large-scale aerial photographs?
- 2) GIS stores the non -spatial data in which format.
- 3) India falls in which zone of UTM.
- 4) What are the basic kinds of vector entities?
- 5) The spectrum that reaches the earth without absorption by atmosphere is known as.
- 6) What is platform?

Q.2 Solve any Eight of the following.

16

- a) Name five components of GIS.
- b) Major differences between vector and raster data models.
- c) What is trilateration?
- d) Define GIS.
- e) What is lineament?
- f) What is black body?
- g) What is the use of fiducial marks?
- h) What is vertical aerial photographs?
- i) What is strike and dip?
- j) What is the wavelength range of visible spectrum?

Q.3 A) Answer of the following (Any Two)

10

- 1) Explain Push-broom scanners.
- 2) Advantages of vector data model.
- 3) Describe various drainage patterns.

B) Short note/Solve

06

Write short note rectangular drainage pattern with their significance.

- Q.4 A) Answer of the following (Any Two) 08**
- 1) Describe types of aerial photographs depending on optical axis position.
 - 2) Describe any four elements of photointerpretation.
 - 3) Describe restoration.
- B) Describe/Explain/Solve 08**
- Describe scattering and their types.
- Q.5 Answer of the following (Any Two) 16**
- a) What is the linear and non -linear contrast stretch?
 - b) What is GIS? Write advantages and disadvantages.
 - c) Explain in detail digital image processing.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (CBCS) : Examination March/April - 2025
Microbiology (Special Paper-XIII)
Molecular Biology and Bioinformatics (22221657)

Day & Date: Sunday, 18-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagrams wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of log table and calculators is allowed.

Q.1 A) Multiple choice questions.**10**

- 1) Which of the following is the structural organization model of the *Escherichia coli* chromosome?
 - a) Supercoiled Model
 - b) Folded Fiber Model
 - c) Linear Model
 - d) Histone-wrapped Model
- 2) Which enzyme is responsible for transcription in prokaryotes?
 - a) DNA polymerase
 - b) RNA polymerase
 - c) Helicase
 - d) Ligase
- 3) The lacZ gene encodes which enzyme?
 - a) β -Galactosidase
 - b) Permease
 - c) Transacetylase
 - d) RNA polymerase
- 4) What is the effect of a nonsense mutation on translation?
 - a) Causes premature termination
 - b) Alters the amino acid sequence
 - c) Causes a frameshift
 - d) Has no effect
- 5) Which enzyme is primarily used to cut DNA at specific sequences in genetic engineering?
 - a) DNA polymerase
 - b) RNA polymerase
 - c) Restriction enzyme
 - d) Ligase
- 6) Which of the following methods is used for the detection of mutants?
 - a) Replica plating
 - b) Gram staining
 - c) Translation
 - d) Transformation

- 7) What is the main application of protein engineering?
 - a) Enhancing protein function
 - b) DNA sequencing
 - c) Cell division
 - d) Microbial growth
- 8) Which of the following is the primary purpose of gel electrophoresis in DNA analysis?
 - a) To isolate DNA
 - b) To separate DNA fragments based on size
 - c) To sequence DNA
 - d) To amplify DNA
- 9) The Protein Data Bank (PDB) is a database that stores:
 - a) Nucleic acid sequences
 - b) Three-dimensional structures of proteins
 - c) Genetic information on organisms
 - d) Information on metabolic pathways
- 10) Which of the following is a common application of DNA fingerprinting?
 - a) Gene cloning
 - b) Paternity testing and forensic analysis
 - c) DNA sequencing
 - d) Gene therapy

B) One sentence answer:**06**

- 1) What is the shape of the *Escherichia coli* chromosome?
- 2) Which molecule acts as the inducer in the Lac operon system?
- 3) Give the full form of NCBI.
- 4) Which enzyme catalyzes transcription?
- 5) Enlist the nonsense codons involved in translation termination.
- 6) What is a point mutation?

Q.2 Answer Any Eight of the following.**16**

- 1) What is an operon?
- 2) Enlist the major bioinformatics resources on the Internet.
- 3) What is a silent mutation?
- 4) Write any two names of vectors used in Genetic engineering.
- 5) Define protein engineering.
- 6) What is the role of DNA ligase in molecular biology?
- 7) Enlist the different variants of BLAST.
- 8) Give the two applications of genetic engineering in the agricultural sector.
- 9) What is intragenic mutation?
- 10) Enlist the all tools of genetic engineering used for rDNA Technology.

- Q.3 A) Attempt any Two of the following. 10**
- 1) Explain the regulation of the tryptophan operon.
 - 2) Discuss the effects of mutations on phenotypes.
 - 3) Describe the process of DNA fingerprinting and its applications in forensic science.
- B) Write a short note on Protein Engineering. 06**
- Q.4 A) Attempt any Two of the following. 08**
- 1) Explain the regulation of the lac operon in the presence and absence of lactose.
 - 2) Explain the time course of phenotypic expression in mutation.
 - 3) Discuss the principle and applications of BLAST.
- B) Explain in detail the process of Bacterial Transcription. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Explain in detail the Agarose Gel Electrophoresis for the separation of DNA.
 - b) Describe the process of translation, including activation of amino acids, initiation, elongation, and termination.
 - c) Explain in detail the DNA sequencing by the Sanger Dideoxy method.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Electronics (Special Paper-XIII)
Power Electronics (22221673)

Day & Date: Sunday, 18-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figure to right indicate full marks.

Q.1 A) Multiple choice questions.**10**

- 1) Collector, Emitter and Gate are the terminals of _____.
 a) Power BJT b) IGBT
 c) Power MOSFET d) GTO
- 2) UPS means _____.
 a) Uninterrupted Power SCR
 b) Unijunction Power Supply
 c) Uninterrupted Power Supply
 d) Under Performance SCR
- 3) If gate current of the SCR is increased then the magnitude of the forward break over voltage is _____.
 a) increased
 b) remains as it
 c) does not depend on gate current
 d) decreased
- 4) In SCR based parallel inverter _____ type of commutation is used.
 a) Class A b) Class C
 c) Class B d) Class F
- 5) The buried gate is fabricated in _____ device.
 a) GTO b) SCR
 c) PUT d) SIT
- 6) _____ is used as a DC to DC converter.
 a) Rectifier b) Inverter
 c) Chopper d) Cyclo-converter
- 7) A PUT is generally used in _____.
 a) a rectifier circuit b) power amplifier
 c) Filter d) saw-tooth oscillator

- 8)** _____ exhibits negative resistance property like UJT.
- a) GTO b) PUT
c) SIT d) IGBT
- 9)** The series inverter uses _____ type of commutation.
- a) Class A b) Class B
c) Class C d) Class D
- 10)** The SCR is turn off if the anode current is reduced below the _____.
b) Gate current b) Latching current
c) Resonating current d) Holding current

B) Fill in the blanks.

06

- 1) Power MOSFET is a _____ controlled device.
- 2) Heat sink is used for the purpose of _____.
- 3) SMPS means _____.
- 4) The GTO is turn off by using _____.
- 5) A power circuit that converts DC into variable DC is called as _____.
- 6) Another name for Class C commutation is _____.

Q.2 Solve any Eight of following.

16

- 1) State difference between inverter and chopper.
- 2) State the four applications of SCR.
- 3) Draw the construction diagram and symbol of PUT.
- 4) Define firing angle of SCR.
- 5) State the principle of Speed control of DC motor.
- 6) Why power devices are not operated with higher frequency?
- 7) Draw the Symbol of Power MOSFET & GTO.
- 8) State any two advantages of IGBT.
- 9) Define reverse recovery time of power diode.
- 10) What are the applications of power diode?

Q.3 A) Attempt any Two of the following.

10

- 1) Explain the construction of power diode.
- 2) Explain working of flasher circuit.
- 3) Explain Principle of Single phase half wave inverter.

B) Explain with suitable diagram emergency lighting system.

06

Q.4 A) Attempt any Two of the following.

08

- 1) Explain the construction of power MOSFET.
- 2) Explain working of SCR firing by UJT.
- 3) With the help of neat circuit diagram explain operation of step-down chopper using SCR.

B) Draw the two-transistor model of SCR and explain it.

08

Q.5 Attempt any Two of the following.

16

- a)** Explain construction and working of IGBT with suitable diagram.
- b)** Explain working of single-phase full wave controlled rectifier with inductive load and effect of free wheel diode.
- c)** Explain Class D commutation technique of SCR.

Seat No.	

Set P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Computer Science (Paper-XIII)
Network Security(22221665)

Day & Date: Sunday, 18-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figure to right indicate full marks.

Q.1 A) Multiple choice questions. 10

- 1) _____ encryption algorithm is used in SSL/TLS.
 - a) DES
 - b) RSA
 - c) Blowfish
 - d) Triple-DES
- 2) Which one of the following is not a cryptographic algorithm.
 - a) IDEA
 - b) Blowfish
 - c) Jupiter
 - d) AES
- 3) _____ is a type of substitution cipher.
 - a) Caesar cipher
 - b) Playfair cipher
 - c) Rail fence cipher
 - d) None of These
- 4) AES uses a _____ bit block size and a key size of _____ bits.
 - a) 128; 128 or 256
 - b) 64; 128 or 192
 - c) 256; 128, 192, or 256
 - d) 128; 128, 192, or 256
- 5) The information that gets transformed in encryption is _____.
 - a) Plain text
 - b) Parallel text
 - c) Encrypted text
 - d) Decrypted text
- 6) A digital signature is a mathematical technique which validates _____.
 - a) Authenticity
 - b) Integrity
 - c) Non-repudiation
 - d) All of the above
- 7) _____ is a process which verifies the identity of a user who wants to access the system.
 - a) Authentication
 - b) Non-repudiation
 - c) Integrity
 - d) None of the above
- 8) _____ is a symmetric block cipher that is intended to replace DES as the approved standard for a wide range of applications.
 - a) AES
 - b) RSA
 - c) MD5
 - d) RC5

- 9) _____ is the first step in DES.
- | | |
|-----------------------|--------------------------|
| a) Key transformation | b) Expansion permutation |
| c) S-box substitution | d) P-box substitution |
- 10) DES consists of _____ rounds to perform the substitution and transposition.
- | | |
|-------|-------|
| b) 21 | b) 18 |
| c) 16 | d) 25 |

B) Fill in the blank.**06**

- 1) In Cryptography, the original message, before being transformed, is called _____.
- 2) The processed S/MIME along with security related data is called as _____.
- 3) The keys used in cryptography are _____.
- 4) _____ encryption algorithm is used in PGP (Pretty Good Privacy) for symmetric Encryption.
- 5) MAC stands for _____.
- 6) The full form of SSL is _____.

Q.2 Answer any eight of the following.**16**

- 1) What is Network Security?
- 2) Define the term attacks?
- 3) What is Cryptography?
- 4) What is plain text?
- 5) Define the term steganography.
- 6) Define Message digests?
- 7) What is Passwords?
- 8) What is Encryption?
- 9) What is Ciphertex?
- 10) What is Internet Security Protocols?

Q.3 A) Attempt any Two of the following.**10**

- 1) Explain the different Security services.
- 2) Explain RSA algorithm in detail with an example.
- 3) Explain Message Authentication Code in detail.

B) Short note on.**06**

- 1) Symmetric key cryptography
- 2) Blowfish Algorithms

Q.4 A) Attempt any Two of following.**08**

- 1) What are attacks? Explain types of Attacks.
- 2) Explain Biometrics in details.
- 3) Explain need for security.

B) What is asymmetric key cryptography? Explain advantages and disadvantages.**08**

Q.5 Attempt any Two of the following.

16

- a)** Explain Advanced Encryption Standard (AES) symmetric algorithms in details.
- b)** Explain User Authentication with use of smart cards.
- c)** What is E-mail Security? Explain S/MIME in details.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Physics (Special Paper-XIV)
Materials Science (22221618)

Day & Date: Sunday, 25-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. **10**

- 1) _____ is time dependent permanent deformation.

a) Creep	b) Elasticity
c) Plasticity	d) Fatigue
- 2) Reciprocal of conductivity is _____.

a) inductance	b) resistivity
c) susceptibility	d) capacitance
- 3) Bakelite is example of _____ polymer.

a) thermosetting	b) thermoplastic
c) synthetic rubber	d) conducting
- 4) Low density polymers have _____ structure.

a) linear	b) branched
c) cross linked	d) synthetic
- 5) Tensile strength of ceramics is practically _____.

a) low	b) high
c) very high	d) zero
- 6) Cermet's are example of _____.

a) large particle composites	b) micro composites
c) fiber composites	d) short composites
- 7) Properties of materials are highly anisotropic when they are in the form of _____.

a) polycrystalline	b) single crystalline
c) liquid	d) amorphous
- 8) _____ structure can be studied by naked eye.

a) Atomic	b) Grain
c) Micro	d) Macro

- 9) Size of nanomaterial is _____.
a) 10-50 nm b) 10-50 μm
c) 10-50 mm d) 10-50 cm
- 10) Nanoscience can be studied with the help of _____.
a) Newtonian mechanics b) Quantum mechanics
c) Nuclear physics d) Geo physics

B) State True or False.

06

- 1) The dielectric strength of material is a function of length.
- 2) Saturated monomer undergoes addition polymerization.
- 3) Oxide ceramic is generally good conductor in their normal oxidation states.
- 4) Fiber reinforced polymer is a composite material.
- 5) Selection of materials mainly depends upon cost of a material.
- 6) Sol gel is the chemical method for synthesis of nanomaterial.

Q.2 Solve any Eight of the following.

16

- What is ductility?
- Write in short thermal conductivity of material.
- What are polymers?
- Write any two applications of ceramic materials.
- Draw Cesium Chloride structure.
- What is composite?
- What are 'biomechanics'?
- Define the term biocompatibility.
- Write names of any two chemical method for synthesis of nanomaterials.
- What is Top-Down approach for synthesis of nanomaterials?

Q.3 A) Answer of the following (Any Two)

10

- 1) Explain the difference between elasticity and plasticity.
- 2) Write a note on fiber reinforced composites.
- 3) What is copolymer. Explain classification of copolymer.

B) What are the properties of biomaterials?

06

Q.4 A) Answer of the following (Any Two)

10

- 1) Write a note on thermosetting & thermoplastic polymers.
- 2) Explain mechanical, electrical and magnetic properties of materials.
- 3) What are biomaterials? Explain biocomposite materials

B) Explain in details classification of nano-structured materials.

06

Q.5 Answer of the following (Any Two)

16

- Discuss classification of materials.
- Write any four applications of polymer.
- Explain any two physical methods for the synthesis of nanomaterials.

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat diagrams and give equations wherever necessary.
4) Use of log table and calculators is allowed.
(At. Wts.: H=1, C=12, O=16, N=14, Na=23, Cl=35.5)

Q.1 A) Select the correct alternative. 10

- 1) Trialkyl aluminum is in the form of _____.
a) monomer
b) dimer
c) trimer
d) tetramer
- 2) The reagent which induces passivity is called _____.
a) Promoter
b) Passivator
c) Activator
d) all of these
- 3) Pure metal corrodes _____.
a) Hardly
b) Evan's rule
c) Faraday's rule
d) Keir's principle
- 4) $\text{Ni}(\text{CO})_4$ has _____ structure.
a) tetrahedral
b) square planer
c) TBP
d) metallic
- 5) In SO_3 angle O-S-O is _____.
a) 45°
b) 180°
c) 90°
d) 120°
- 6) Borazine is isoelectronic with _____.
a) Ethane
b) Hexane
c) Diborane
d) Benzene
- 7) Metallic solids are _____.
a) bad conductors
b) insulators
c) good conductors
d) superconductors
- 8) Metals are lustrous because of _____.
a) protons
b) free neutrons
c) free electrons
d) free protons

- 9) Among lanthanons _____ element do not occur in nature.
a) Sm b) Pm
c) Tm d) Nd
- 10) Transuranic elements are also known as _____elements.
a) post lanthanons b) manmade
c) outer d d) none of these

B) Fill in the blank.

06

- 1) In actinide elements the successive electron is added in _____ orbital.
- 2) Bonding in metals is best explained by _____ theory.
- 3) XeF_2 , molecule has _____ geometry.
- 4) Seviour corrosion occurs when % of humidity is more than _____.
- 5) The term 'organometallic' was first introduced by _____.
- 6) Oxide film theory of passivity was experimentally proved by _____.

Q.2 Solve any Eight of the following.

16

- a) Define lanthanides?
- b) What is the common oxidation state of actinides?
- c) What is metallic solid?
- d) What is immersed corrosion?
- e) Give any two applications of passivity
- f) What is mean by galvanizing?
- g) Which is the common solvent used in preparation of organometallic compound?
- h) What are metal carbonyls?
- i) How many hydrogens are present in diborane?
- j) Write the geometry XeO_4 .

Q.3 A) Answer of the following. (Any Two)

10

- 1) Write a note on electronic configuration of lanthanides.
- 2) Discuss the structure of $\text{YBa}_2\text{Cu}_3\text{O}_7$.
- 3) Discuss the structure of SO_2 .

B) Explain the electrochemical theory of corrosion.

06

Q.4 A) Answer of the following. (Any Two)

08

- 1) Write a note on nomenclature of organometallic compounds.
- 2) Discuss the classification of solids on the basis of Band theory.
- 3) Discuss the effect of purity of metal on corrosion.

B) What are the methods of lanthanide separation? Explain ion exchange method for separation of lanthanides.

08

Q.5 Answer of the following. (Any Two)**16**

- a)** Discuss the various methods used in protection metals from corrosion.
- b)** Discuss the synthesis and structures of organometallic compounds of lithium.
- c)** What are the various methods used in preparation of transuranic elements? Discuss in detail, heavy ion bombardment method.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Botany (Special Paper-XIV)
Plant Biotechnology (22221602)

Day & Date: Sunday, 25-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Select the correct alternative. 10

- 1) _____ is the first step for protoplast culture.
 - a) Selection of Explant
 - b) Viability testing for protoplast
 - c) Isolation of protoplast
 - d) Preparation of culture media
- 2) To express eukaryotic genes in prokaryotic library used is _____.
 - a) cDNA library
 - b) bDNA library
 - c) aDNA library
 - d) zDNA library
- 3) Transgenic plants developed by _____.
 - a) Introducing foreign genes
 - b) Introducing gene mutations
 - c) Deleting certain chromosome parts
 - d) Stopping spindle formation
- 4) Chemicals used for gene transfer methods include _____.
 - a) poly ethylene glycol
 - b) CaCl₂
 - c) dextran
 - d) all of the above
- 5) PCR technique was first devised by _____.
 - a) E.M. Southern
 - b) Al wine
 - c) Alec Jeffreys
 - d) Kary Mullis
- 6) In genome southern blotting can be used to identify _____.
 - a) sequences
 - b) a specific DNA sequences
 - c) DNA fragments
 - d) RNA sequence
- 7) _____ is used as a explants for the embryo culture.
 - a) Embryo
 - b) Anther
 - c) Callus
 - d) Pollen
- 8) Golden rice is a transgenic crop of the future with the following _____.
 - a) insect resistance
 - b) carbohydrates
 - c) high vitamin A content
 - d) high lysine content

- 9) _____ biological agent used for gene transfer methods.
- | | |
|-------------------------|----------------------|
| a) Poly ethylene glycol | b) CaCl ₂ |
| c) Dextran | d) Agrobacterium |

- 10) Callus is _____.
- tissue that forms embryo
 - stem
 - leaf
 - unorganised actively dividing mass of cells

B) Fill in the blank/Definition/One sentence answer/ One word answer/ **06**
Give the name/Predict the product etc.

- A collection of total genomic DNA from a single organism is called _____.
- Introduction of DNA into cells by exposing to high voltage electric pulse is called _____.
- _____ technique is used for DNA.
- The transgenic plant 'Flavr Savr' tomato carries an artificial gene for _____.
- Protoplasts are _____.
- The polymerase chain reaction can be understood as _____.

Q.2 Solve any Eight of the following. 16

- What is totipotency?
- Any to applications of biotechnology.
- Define the term 'clone'.
- What are vectors?
- Define reporter genes.
- Define transgenic plants.
- Roll of biotechnological institute.
- Give the uses of DNA libraries.
- What is callus?
- Enlist enzymes involved in recombinant DNA technology.

Q.3 A) Answer of the following. (Any Two) 10

- Explain the roll of biotechnology in agriculture.
- Explain in brief DNA figure printing.
- Describe somatic hybridization.

B) Write a note on Micro propagation. **06**

Q.4 A) Answer of the following. (Any Two) 08

- Basic requirements for PCR technique.
- Write a note on vectors.
- Explain the any two physical methods of gene delivery.

B) Describe the isolation of protoplast and its culture. **08**

Q.5 Answer of the following. (Any Two)

16

- a)** Explain Agrobacterium mediated gene transfer.
- b)** Describe the techniques of tissue culture.
- c)** What is PCR? Describe the different steps of PCR technique.

Max. Marks: 80

Q.1 A) Select the correct alternative. 10

- Page 1 of 3

- 8) Peppered Moth is a good example of _____.
 a) Industrial melanism b) Connecting link
 c) Adaptive radiation d) Macroevolution
- 9) Limulus is a good example of _____.
 a) Industrial melanism b) Connecting link
 c) Adaptive radiation d) Living Fossil
- 10) Adaptive radiation in mammals due to habitat is because of _____.
 a) brain b) heart
 c) limbs d) lungs

B) Fill in the blank. 06

- 1) _____ is type of RNA which carry the message of protein synthesis.
- 2) _____ is the modern synthesis of Darwin's theory of evolution and Mendel's principles of heredity.
- 3) _____ speciation happens when populations are geographically separated.
- 4) _____ is a three nucleotide sequence which codes for one amino acid.
- 5) _____ occurs when new species evolve from a single population without geographic isolation.
- 6) _____ is a mechanism of evolution that involves random changes in allele frequencies in a population.

Q.2 Solve any Eight of the following. 16

- a) Gene pool
- b) Heritable variation
- c) RNA world
- d) What does K-T extinction stand for?
- e) What is speciation?
- f) Define evolution.
- g) What is a fossil?
- h) Chemogeny
- i) Mass extinction
- j) Natural selection

Q.3 A) Answer of the following. (Any Two) 10

- 1) What are the two main sources of variation?
- 2) Genetic drift
- 3) Geological time scale

B) What are the key unique hominin characters that are different from that of primate characters? 06

Q.4 A) Answer of the following. (Any Two) 08

- 1) What is speciation? What are the different types of speciation?
- 2) What are the facts and deductions from Darwinism?
- 3) What are the prepositions of Lamarckism? Discuss each preposition with the help of examples.

B) Explain Socio-cultural evolution of man. **08**

Q.5 Answer of the following. (Any Two) **16**

- a)** Describe different types of sources of variation.
- b)** Explain the disturbing factors of Hardy-Weinberg law of equilibrium with suitable examples.
- c)** Describe in detail Darwinism.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Mathematics (Special Paper-XIV)
Numerical Analysis (22221634)

Day & Date: Sunday, 25-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Select the correct alternative. 10

- 1) The value of $\Delta^n(e^x) = \underline{\hspace{2cm}}$ the interval of differencing being 1.
 a) $(e + 1)^n e^x$ b) $(e - 1)^n e^x$
 c) e^x d) ne^x
- 2) $\left(E^{\frac{1}{2}} + E^{-\frac{1}{2}}\right)(1 + \Delta)^{\frac{1}{2}} = \underline{\hspace{2cm}}$.
 a) $\Delta + 1$ b) $\Delta - 1$
 c) $\Delta + 2$ d) $\Delta - 2$
- 3) If $\Delta^2 y_0 = \underline{\hspace{2cm}}$.
 a) $y_2 - 2y_1 + y_0$ b) $y_2 + 2y_1 + y_0$
 c) $y_2 - 2y_1 - y_0$ d) $y_2 - 2y_1 - y_0$
- 4) If $\lambda_1, \lambda_1, \lambda_1$ are real and equal roots then c.f. = $\underline{\hspace{2cm}}$.
 a) $c_1(\lambda_1)^n + c_2(\lambda_1)^n + c_3(\lambda_1)^n$
 b) $(c_1 + c_2n + c_3n^2)(\lambda_1)^n$
 c) $(c_1 - c_2n - c_3n^2)(\lambda_1)^n$
 d) $(c_1 + c_2n + c_3n)(\lambda_1)^n$
- 5) The solution of $(E - 1)^3 u_n = 0$ is $\underline{\hspace{2cm}}$.
 a) $u_n = c_1 + c_2n + c_3n^2$ b) $(c_1 + c_2n + c_3n^2)(2)^n$
 c) $u_n = c_1 + c_2n + c_3n^3$ d) $(c_1 + c_2n + c_3n^2)(3)^n$
- 6) In trapezoidal rule, the function $y = f(x)$ is taken to be $\underline{\hspace{2cm}}$.
 a) Ellipse b) Straight line
 c) Circle d) Parabola
- 7) Gauss backward interpolation formula is used to interpolate values of y for $\underline{\hspace{2cm}}$.
 a) $0 < P < 1$ b) $-1 < P < 0$
 c) $\alpha < P < 0$ d) $0 < P < -\alpha$

- 8) The value of $\int_0^1 \frac{dx}{1+x} =$ _____.
- a) 0.69351 b) 0.69915
c) 0.96315 d) 0.69315
- 9) To find the value of 1st order derivative at tabulated point the value of P is _____.
- a) 0 b) 1
c) -1 d) 2
- 10) The Lagrange's interpolation formula for unequal intervals for 'n' points is a polynomial of degree _____.
- a) $n + 1$ b) n
c) $n - 1$ d) $n + 2$

B) Fill in the blank.

06

- 1) The order of difference between equation $y_{n+2} - 2y_n + y_{n-1} = 1$ is _____.
- 2) The particular integral of $y_{n+2} - 5y_{n+1} - 6y_n = 4^n$ is _____.
- 3) $\Delta \tan^{-1} x =$ _____.
- 4) The value of $\left(\frac{\Delta^2}{E}\right) e^x =$ _____.
- 5) Simpson's $\left(\frac{3}{8}\right)^{\text{th}}$ rule is _____.
- 6) The expression for $\left(\frac{dy}{dx}\right)_{x=x_n}$ using backward differences is _____.

Q.2 Solve any Eight of the following.

16

- Evaluate $\Delta^2 \left(\frac{x^2}{\cos 2x} \right)$
- With usual notation, prove that $\Delta - \nabla = \Delta \nabla = \delta^2$
- Evaluate $\Delta^2(ab^x)$
- Solve $u_{n+2} - 2u_{n+1} + u_n = 0$
- Solve $y_{n+2} - 4y_{n+1} + 3y_n = 5^n$
- From $y_n = A2^n + B(-3)^n$, derive a difference equation by eliminating the constant.
- State the Trapezoidal rule for integration.
- State Newton's backward interpolation formula.
- State Gauss's forward interpolation formula.
- With usual notation, prove that $E = e^{hD}$.

Q.3 A) Answer of the following. (Any Two)

10

- 1) Given that

x :	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y :	7.989	8.403	8.781	9.129	9.451	9.750	10.031

Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.1$

2) Prove that

$$M = \frac{2+\Delta}{2\sqrt{(1+\Delta)}} = \sqrt{\left(1 + \frac{1}{4}\delta^2\right)}$$

3) Solve

i) $u_{n+2} - 4u_{n+1} + 4u_n = 2^n$

ii) $y_{x+1} - y_x + xy_{x+1}y_x = 0$ given $y_1 = 2$

B) State and prove Lagrange's interpolation formula for unequal intervals. **06**

Q.4 A) Answer of the following. (Any Two) **08**

1) Use Trapezoidal rule to estimate the integral.

$$\int_0^2 e^{x^2} dx \quad \text{taking the number 10 intervals.}$$

2) Evaluate

i) $\Delta^2 \left(\frac{5x + 12}{x^2 + 5x + 6} \right)$

ii) $\Delta(e^x \log 2x)$

3) Solve $y_{n+2} - 2 \cos \alpha \cdot y_{n+1} + y_n = \cos \alpha n$

B) State and prove Newton's forward interpolation formula. **08**

Q.5 Answer of the following. (Any Two) **16**

a) State and prove Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule and hence evaluate

$$\int_0^1 \frac{x^2}{1+x^3} dx$$

b) Using Gauss backward difference formula, find $y(8)$ from the following table.

$x:$	0	5	10	15	20	25
$y:$	7	11	14	18	24	32

c) Solve

1) $y_{x+1}y_x + (x+2)y_{x+1} + xy_x + x^2 + 2x + 2 = 0$

2) $y_{n+2} - 2y_{n+1} + y_n = n^2 2^n$

Seat No.	

Set P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Statistics (Special Paper-XIV)
Probability Theory (22221642)

Day & Date: Sunday, 25-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- Which one of the correct postulates for Poisson process _____
 a) Independence b) Homogeneity in time
 c) Regularity d) All the above
- A sequence $\{X_n\}$ is said to be converges in distribution to a r.v. X if _____.
 a) $F_n(x) \rightarrow F(x)$ as $n \rightarrow \infty$
 b) $F_n(x) \rightarrow f(x)$ as $n \rightarrow \infty$ $f(x)$ is p.d.f
 c) $F_n \rightarrow 0$ as $n \rightarrow \infty$
 d) $F_n(x) \rightarrow 1$ as $n \rightarrow \infty$
- For Markov chain with 4 states, n^{th} step TPM will be of order ____
 a) $4 \times n$ b) $n \times 4$
 c) 4×4 d) $n \times n$
- If $X_n \xrightarrow{P} X$ then _____.
 a) $KX_n \xrightarrow{P} KX$ b) $KX_n \xrightarrow{P} K$
 c) $KX_n \xrightarrow{P} X$ d) None of these
- In stochastic process the parameter space may be _____.
 a) Discrete b) Continuous
 c) Both a & b d) Neither a nor b
- Which one of the following is an order statistic?
 a) sample mode b) sample median
 c) sample mean d) none of these
- A state of Markov chain is said to be Ergodic if it is _____.
 a) null persistent and aperiodic
 b) non-null persistent and aperiodic
 c) null persistent and periodic
 d) non-null persistent and periodic

8) For a random sample of size 5 pdf of first order statistic is given by $f(y_1) = \underline{\hspace{2cm}}$.

- a) $n! f(y_1)[1 - F(y_1)]^{(n-1)}$ b) $5f(y_1)[1 - F(y_1)]^4$
 c) $nf(y_1)[1 - F(y_1)]^{(n-1)}$ d) $5! f(y_1)[1 - F(y_1)]^4$

Let $\{X_n, n \geq 1\}$ be a sequence of iid r.v.s. each with mean μ and

9) variance σ^2 . Let $S_n = \sum_{i=1}^n X_i$. Then the limiting distribution of Z is normal if $Z = \underline{\hspace{2cm}}$.

- a) $\frac{S_n - \mu}{(\sigma/\sqrt{n})}$ b) $\frac{S_n - n\mu}{(\sigma/\sqrt{n})}$
 c) $\frac{S_n - n\mu}{n\sigma^2}$ d) $\frac{S_n - n\mu}{\sigma\sqrt{n}}$

10) A stochastic process $\{X_n, n \geq 1\}$ where random variable X_n is the number of sixes in the first n throws of a die is $\underline{\hspace{2cm}}$.

- a) continuous time, continuous state space
 b) discrete time, continuous state space
 c) continuous time, discrete state space
 d) discrete time, discrete state space

B) Answer the following.

06

- 1) If a one-step TPM is a unit matrix of order 3 then a 3-step TPM would be $\underline{\hspace{2cm}}$.
- 2) In M/M/1 : ∞ /FCFS model the queue discipline is $\underline{\hspace{2cm}}$.
- 3) If P is one step TPM of Markov chain $\{X_n, n \geq 0\}$ whose state space is $\{0,1\}$ then $P = [X_{20} = 1/X_{16} = 1]$ is an element of $\underline{\hspace{2cm}}$.
- 4) Distribution function of $X(n)$ is $\underline{\hspace{2cm}}$.
- 5) Transient state is also called as $\underline{\hspace{2cm}}$.
- 6) Convergence in law is also called as $\underline{\hspace{2cm}}$.

Q.2 Solve any Eight of the following.

16

- a) State the joint p.d.f of i^{th} and j^{th} order statistics.
- b) Define queue with example.
- c) Define first return probabilities of TPM.
- d) State two queue discipline.
- e) Define Order statistic.
- f) State Weak Law of Large Number. (WLLN).
- g) Define convergence in quadratic mean.
- h) State any two assumptions made while deriving probability distribution in queuing system.
- i) Define irreducible Markov chain.
- j) Define convergence in probability

Q.3 A) Answer of the following. (Any Two) 10

- 1) Let $\{X_n, n \geq 1\}$ be a Markov chain with state space $S = \{0,1\}$ and initial probability distribution is $\{0.4, 0.6\}$ with one step transition probability matrix

$$P = \begin{bmatrix} 0.7 & 0.3 \\ 0.4 & 0.6 \end{bmatrix} \text{ compute } P(X_3 = 0)$$

- 2) Write a short note on queue discipline and service mechanism.
 3) Define convergence in distribution. If $P = \left[X_n = \frac{3-2n}{n} \right] = \frac{4n-3}{12n}$ and $P = \left[X_n = \frac{3n+1}{n} \right] = \frac{8n+3}{12n}$ examine the convergence in distribution.

B) Define Stochastic process and explain the classification of stochastic process. 06**Q.4 A) Answer of the following. (Any Two) 08**

- 1) Let X_i be i.i.d. $P(\lambda)$ then test whether WLLN holds good for this sequence.

- 2) Obtain a stationary distribution of a M.C. if one step TPM is

$$P = \begin{bmatrix} 2/3 & 1/3 \\ 1/2 & 2/2 \end{bmatrix}$$

- 3) Find the distribution of sample median if a random sample of odd size is taken from a distribution with p.d.f. $f(x)$ and c.d.f. $F(x)$.

B) State and prove the theorem of WLLN for i.i.d. random variables. 08**Q.5 Answer of the following. (Any Two) 16**

- a) Discuss the Solution of queuing Model: M/M/1, using FCFS queue discipline.

- b) Let $\{X_n, n \geq 1\}$ be a Markov chain with state space $S = \{1,2,3,4\}$ and TPM is

$$P = \begin{bmatrix} 1/3 & 2/3 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 1/2 & 0 & 1/2 & 0 \\ 0 & 0 & 1/2 & 1/2 \end{bmatrix}$$

Then classify the all states.

- c) Examine whether WLLN holds for sequence $\{X_n\}$ of a random variable defined as

$$P[X_k = \pm\sqrt{K}] = \frac{1}{2\sqrt{k}}, P[X_k = 1] = \frac{1}{\sqrt{k}}$$

Max. Marks: 80

10

- Page 1 of 3

- 7) The removal of particles of dust and sand by strong winds is called _____.
 - a) Abrasion
 - b) Depletion
 - c) Deflation
 - d) Aeration
- 8) The variously shaped depressions of different dimensions that are developed in the riverbed are called _____.
 - a) Potholes
 - b) Cavities
 - c) Dents
 - d) Craters
- 9) _____ refers to the lowering of a fluvial surface, such as a stream bed or floodplain, through erosional processes.
 - a) Aggradation
 - b) degradation
 - c) weathering
 - d) None of the above
- 10) Landforms of cuesta and hogback are formed on _____ structure.
 - a) Granitic batholiths
 - b) inclined sedimentary beds
 - c) Folded and faulted region
 - d) Limestone region

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc.

06

- 1) _____ erosion is a fluvial process of erosion that lengthens a stream, a valley or a gully at its head.
- 2) _____ is the study of the record of the Earth's magnetic field in rocks or sediments.
- 3) _____ type of plate boundary of the Indian plate along the Himalayan mountains?
- 4) The concept “The present is the key to the past” is given by _____.
- 5) Alluvial deposits of roughly triangular shape that are deposited by major rivers at their mouths are called _____.
- 6) The composition of the mantle is equivalent to _____ rock type.

Q.2 Solve any Eight of the following.

16

- a) What is peneplain?
- b) Name the erosional features of oceans.
- c) Give two examples of exogenous processes.
- d) Define Asthenosphere
- e) List the types of physical weathering.
- f) Name the geological features related to divergent plate boundaries.
- g) Give two examples of diastrophism.
- h) Name the any two types of drainage pattern.
- i) List the depositional features of Karst topography.
- j) Define polycyclic landform.

Q.3 A) Attempt any Two of the following.

10

- Describe Paleomagnetism and its application.
- Discuss in detail the depositional features of Wind.
- Explain the types and causes of rejuvenation.

B) Explain in brief exogenic and endogenic processes with suitable examples. **06**

Q.4 A) Attempt any Two of the following. 08

- 1) Explain in short the Mid oceanic ridge with neat labeled diagram.
- 2) Discuss in brief the Karst topography and its features.
- 3) Describe the any two processes of physical weathering with neat diagram.

B) Define Continental drift. Explain the continental drifting with its evidences. **08**

Q.5 Attempt any Two of the following. 16

- a)** Define plate tectonic. Explain the types of plate boundaries with suitable examples.
- b)** Explain in detail the three stages of river with its suitable features.
- c)** Describe the topographic expressions of rejuvenation and poly (multi) cyclic reliefs.

Seat No.	

Set	P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Microbiology (Special Paper-XIV)
Microbial Biochemistry (22221658)

Day & Date: Sunday, 25-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) The regulatory enzymes for which substrate and modulator is identical is known as _____ cooperativity.
 - a) Heterotropic b) Homotropic
 - c) Amphitropic d) Psychotropic
- 2) _____ organelle is primarily involved in β oxidation of long chain of fatty acid.
 - a) Golgi body b) Mitochondria
 - c) Endoplasmic reticulum d) Peroxisomes
- 3) The purification of enzyme on the basis of their size carried out by _____ chromatography method.
 - a) ion exchange b) affinity
 - c) gel exclusion d) adsorption
- 4) The breakdown of microbial cell by the phenomenon called as cavitation involves _____.
 - a) Ultrasonication b) Thawing
 - c) Impingement d) Osmotic Shock
- 5) _____ is the major products in the pentose phosphate pathway.
 - a) Ribulose and ATP b) Glucose and NADH
 - c) Ribulose and NADPH d) FAD and NAD⁺
- 6) The purity of an enzyme at various stages of purification is best measured by _____.
 - a) total protein b) specific activity
 - c) total coenzyme d) total enzyme
- 7) In the arabinose operon _____ acts as regulator.
 - a) ara A b) ara D
 - c) ara B d) ara C

- 8) In phosphoketolase pathway _____ enzyme play important role.
- Phosphoketolase
 - Orotase
 - Glucose 6 phosphate dehydrogenase
 - Lactate dehydrogenase
- 9) Purple and green sulfur bacteria use _____ as the electron donor to reduce carbon dioxide.
- S^{2-}
 - SO_4^{2-}
 - H_2S
 - Organic acids
- 10) The substrate binds to active site of enzyme of _____ bond during catalysis.
- Covalent
 - Disulphide
 - Hydrogen
 - Hydrophobic

B) Answer the following.**06**

- What is enzyme unit?
- What is homogenization?
- Define cofactor
- What is feedback inhibition?
- Enlist the names of purines and pyrimidine's.
- What is V_{max} ?

Q.2 Solve any Eight of the following.**16**

- What is GOGAT?
- What is active site?
- What is salting out?
- What is isoenzyme? Explain with suitable example
- What is the coenzyme?
- Enlist the two examples of unsaturated fatty acid.
- Enlist the applications of immobilized enzyme.
- Define Ribozymes.
- What is enzyme activity?
- What is K_m ?

Q.3 A) Answer of the following. (Any Two)**10**

- Give a brief account on pyruvate as a key metabolite.
- What is enzyme regulation? Give a brief account on Arabinose operon as example of positive enzyme regulation.
- Discuss in detail purification of enzyme on the basis of size and biological affinity.

B) Explain in detail as lock and key and induced fit hypothesis to prove mechanism of enzyme action.**06**

- Q.4 A) Answer of the following. (Any Two) 08**
- 1) Give a brief account on methods of cell disruption for the extraction of intracellular enzymes.
 - 2) Give a detail account on peptidoglycan biosynthesis.
 - 3) Give a brief account on assimilation of carbon.
- B) What is enzyme immobilization? Describe in detail methods of enzyme immobilization. 08**
- Q.5 Answer of the following. (Any Two) 16**
- a) Discuss in detail Bioluminescence.
 - b) What is allosteric enzyme? Explain in detail models of allosteric enzymes.
 - c) Give a detailed account on TCA cycle.

Day & Date: Sunday, 25-May-2025
Time: 03:00 PM To 06:00 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.
4) Use of log table and calculators is allowed.

1) In C programming, collective group of 'similar quantities' called as

- a) Constant b) Array
c) Variable d) Data

2) For the development of an embedded system it requires at least a device.

- a) I/O b) input
c) output d) computing

3) State the invalid keyword in an embedded C programming.

- a) Equal b) Int
c) For d) char

4) For developing the firmware for 8051 based embedded system IDE is needed.

- a) Pony Prog b) Flash Magic
c) Keil micro vision d) Micro C.

5) To configure 'Port 1' in Input mode, which of following C programming statement must be necessary?

- a) P1 = 0x55; b) P1 = 0x00;
c) P1 = 0xFF; d) P1 = 0xAA;

6) In smart LCD 16x2 device, the number of columns and row are respectively.

- a) 16 & 2 b) 2 & 16
c) 32 & 2 d) 2 & 32

7) In embedded C programming, the Superloop is constructed using `do-while` statement.

- a) `for(;;)` b) `while(1)`
c) Either a) or b) d) both a) and b)

- 8) For the development of an embedded system, time delay generation technique in C programming is _____.
 a) Software delay b) Hardware delay
 c) Either a) or b) d) both a) and b)
- 9) In C programming, the 'format specifier' of float variable is _____.
 a) %lf b) %f
 c) %F d) %Lf
- 10) Across which device freewheeling diode is needed while interface relay with 8051?
 a) switch b) relay
 c) driver transistor d) resistor

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. 06

- 1) Give the name of header file must be needed while developing C program for 8051 based system.
- 2) Give the definition of embedded system
- 3) Give the sample of output statement in C programming.
- 4) How many numbers of keywords are utilized for 8051 using C programming.
- 5) In Timer programming using C, who reflect the completion or overflow of counting?
- 6) After execution of the statement $X = Y \% Z$, where $Y = 11$ and $Z = 4$, what is the value returned to X, if X variable is integer type?

Q.2 Solve any Eight of the following. 16

- a) Give the advantages and disadvantages of embedded system.
- b) Mention the logical operators of C programming.
- c) What is character sets in C programming?
- d) State any four applications of embedded system.
- e) Is 16x2 smart LCD has control signals? If yes, write.
- f) Write the syntax of 'if.. else' statement in C programming.
- g) Define constants and state it's type in C programming.
- h) Sketch structure of embedded system.
- i) State the eight keyword of C programming.
- j) Give the features of C programming

Q.3 A) Answer of the following. (Any Two) 10

- 1) Why Operating System not utilized in embedded system development? Hence explain Superloop or Endlessloop.
- 2) Explain the local & global variable declaration in C programming.
- 3) With suitable diagram describe an interfacing of DAC to microcontroller 8051.

B) Classify the operators in C programme? Explain any two operators with suitable C program. 06

- Q.4 A) Answer of the following. (Any Two) 08**
- 1) Sketch the interfacing of 16x2 LCD to microcontroller.
 - 2) What is software delay? Write embedded C program for generation of square wave at port P1 using software delay.
 - 3) With suitable diagram explain minimum hardware requirement for embedded system.
- B) What is 'if' control statement in C programming? Describe in detail 'if' control statements with suitable example. 08**
- Q.5 Answer of the following. (Any Two) 16**
- a) What is 'loop' control statement in C programming? Discuss in detail 'loop' with suitable example.
 - b) Describe in detail the designing of an embedded system for temperature of environment.
 - c) With suitable diagram & C programming, describe interfacing of thumb wheel switch to 8051.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Computer Science Special Paper-XIV
Linux and Shell Programming (22221666)

Day & Date: Sunday, 25-May-2025
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Select the correct alternative. 10

- 1) In Linux, what is the purpose of the 'root' user?
 - a) A standard user with limited permissions
 - b) A service account
 - c) The system administrator with full privileges
 - d) A guest user
- 2) What is the significance of the Linux kernel?
 - a) It provides a graphical user interface
 - b) It manages system resources and hardware communication
 - c) It stores user data
 - d) It compiles software programs
- 3) Which of the following commands is used to change the current directory?
 - a) cd
 - b) change
 - c) goto
 - d) setdir
- 4) What is Linux primarily known as?
 - a) A web server
 - b) An operating system
 - c) A programming language
 - d) A hardware platform
- 5) Which command is used to change the ownership of a file in Linux?
 - a) chown
 - b) chmod
 - c) chgrp
 - d) mv
- 6) Which command shows the current processes running in the system?
 - a) list
 - b) ps
 - c) top
 - d) run
- 7) What is the purpose of the 'sudo' command?
 - a) To switch users
 - b) To execute a command as a superuser
 - c) To shut down the system
 - d) To display disk usage

- 8) Which of the following statements is true about Linux?
- It is a proprietary operating system
 - It is only used on servers
 - It is an open-source operating system
 - It does not support multitasking
- 9) What is the purpose of the 'kill' command?
- To terminate processes
 - To restart services
 - To delete files
 - To change user permissions
- 10) Directory is a type of file.
- True
 - false

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. 06

- _____ is the core of Linux Operating System?
- _____ command is used to list all files and directories in a Linux system?
- _____ command can be used to display the last lines of a file.
- _____ is the creator of the Linux kernel.
- The _____ command is used to search for specific text patterns within files.
- _____ is the default shell for most Linux distributions.

Q.2 Solve any Eight of the following. 16

- What is Super Block?
- Define Kernel?
- Explain chmod command.
- What is the use of text editor in linux?
- Explain uniq command.
- What is the use of nice command?
- Long form of DHCP, DNS.
- What is mean by scripts in linux.
- What is the use of Piping?
- What is inode Block?

Q.3 A) Attempt any Two of the following. 10

- Explain I/O Redirection.
- Explain Archive and File compression commands.
- Explain Boot Loaders in detail.

B) Explain Linux Distributions. 06

Q.4 A) Attempt any Two of the following. 08

- Explain File and Directory permissions.
- Explain Shell and its types.
- Explain Linux Architecture .

B) Explain Role of system administrator. **08**

Q.5 Attempt any Two of the following. **16**

- a)** Differentiate between Windows and Linux.
- b)** Explain Linux commands (mkdir, rm, cat, cd, pwd, ls) syntaxes with output.
- c)** Explain Shell Control and Loop structure in detail.

Seat No.	

Set	P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Physics (Special Paper - XV)
Atomic, Molecular Physics and Quantum Mechanics (22221619)

Day & Date: Monday, 05-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Multiple choice questions.

10

- 1) _____ is the valid range of principle quantum number (n).
 a) $n = 0, 1, 2, 3, ..$ b) $n = -1, 1, 2, ..$
 c) $n = 0, 1, 2, 3, .. \infty..$ d) $n = 1, 2, 3, 4..$
- 2) The splitting of the sodium D-line into two components (D1 and D2) is due to _____.
 a) The fine structure b) The Stark effect
 c) The Zeeman effect d) The Doppler effect
- 3) The series of the hydrogen emission spectrum is known as the _____ series.
 a) Paschen-back b) Pfund
 c) Balmer d) Lyman
- 4) In a strong electric field, the Stark effect for $n = 2$ removes the degeneracy in the structure, leading to the separation of _____ energy levels.
 a) 1 b) 2
 c) 3 d) 4
- 5) An electronic transition occurs due to a change in the _____ energy.
 a) thermal b) electronic
 c) mechanical d) magnetic
- 6) The Raman shift for the Stokes line has a _____ value.
 a) positive b) maximum
 c) negative d) extremum
- 7) The total probability of the wave function Ψ is always normalized to _____.
 a) zero b) minus one
 c) plus one d) Infinity

- 8) The minimum energy of a particle in a one-dimensional rigid box is found by setting n equal to _____.
a) $1/2$
b) 1
c) 2
d) 0
- 9) The maximum number of electrons in a shell with principal quantum number n is given by _____.
a) $2n^2$
b) $2n$
c) n^2
d) $2(2n + 1)$
- 10) For any value of (m_l), there are _____ possible values for the spin quantum (m_s).
a) one
b) two
c) three
d) four

B) Solve the following questions.

06

- 1) Zero-point energy can be expressed as _____.
- 2) The eigenvalue equation asserts that when an operator is applied to a function, it produces the same function scaled by a _____ factor.
- 3) Write the boundary conditions for a particle in one-dimensional rigid box.
- 4) The Frank-Condon principle is most applicable in the study of _____.
- 5) Which quantum numbers are involved in determining the Zeeman Effect?
- 6) The Stark Effect is most commonly observed in atoms with _____ states.

Q.2 Solve any Eight of the following.

16

- State Heisenberg's uncertainty principle.
- What is an operator?
- Define Raman effect.
- What is Stark effect?
- Give two properties of Raman line.
- What is commutation rule?
- Define sharp and principal line.
- What is probability density?
- What is tunnel effect?
- Define de Broglie wavelength and explain its significance in quantum mechanics.

Q.3 A) Answer of the following. (Any Two)

10

- 1) Write a note on Frank-Condon principle.
- 2) Write a note on selection rules for alkali spectra.
- 3) An electron initially at rest is accelerated by a potential difference of 5000 V, Find the de Broglie wavelength.
(Given: Mass of an electron: 9.1×10^{-31} Kg)

B) Show that $[L_z, L_x] = i\hbar L_y$

06

Q.4 A) Attempt any Two of the following. 08

- 1) Obtain Eigen values for L_z .
- 2) Write a note on vibrational electronic spectra.
- 3) Explain Paschen back effect in principal series.

B) Explain strong field Stark effect in hydrogen atom. 08

Q.5 Attempt any Two of the following. 16

- a) Derive Schrödinger's time dependent wave equation in three dimensions.
- b) Obtain an expression for linear momentum operator.
- c) Explain zero point energy. Calculate the lowest energy of an electron confined to move in one dimensional potential box of length $1 \text{ \AA}$.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Chemistry (Special Paper - XV)
Organic Chemistry (22221611)

Day & Date: Monday, 05-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams and given equation wherever necessary.

Q.1 A) Select the correct alternative. 10

- 1) Indole 3-acetic acid is used as _____.
 a) herbicide
 b) plant growth regulating substance
 c) miticide
 d) insecticide
- 2) Pyrrole undergo electrophilic substitution reactions preferentially at position _____.
 a) 1
 b) 2
 c) 3
 d) 4
- 3) Ozonolysis of vitamin A gives _____.
 a) isoprene unit
 b) β -ionone
 c) geronic acid
 d) biotene
- 4) Natural dye is _____.
 a) picric acid
 b) indigo
 c) thioindigo
 d) none of these
- 5) Skraup's synthesis is used to prepare _____.
 a) Indole
 b) Pyrrole
 c) Quinoline
 d) Pyridine
- 6) The colour of compound is due to the presence of _____ group.
 a) chromophore
 b) auxochrome
 c) bathochrome
 d) hypsochrome
- 7) Mutarotation is catalyzed by _____.
 a) acid
 b) base
 c) acid and base
 d) metal
- 8) _____ is used as an anti-inflammatory agent.
 a) Tolbutamide
 b) Chloromycetin
 c) Phenobarbitone
 d) Ibuprofen

- 9) Starch is a _____.
 a) trisaccharide b) amylose
 c) amylopectin d) amylose and amylopectin
- 10) Among the following _____ is an antitubercular agent.
 a) Paludrine b) Phenobarbitone
 c) Tolbutamide d) Isoniazid

B) Fill in the blank.**06**

- 1) Alizarin belong to the class of _____ dye.
- 2) Paludrine is used as _____ agent.
- 3) In Skraup's synthesis, _____ is used as an oxidizing agent.
- 4) Adrenaline contains _____ hydroxyl groups.
- 5) Polysaccharides are also known as _____.
- 6) Pyrethroids are the natural _____ insecticides.

Q.2 Answer the following questions. (Any Eight)**16**

- a) How will you synthesize pyridine from piperidine?
- b) What are carbohydrates? Draw the open chain structure of D-glucose.
- c) Give the classification of Vitamins.
- d) What is the action of p-nitrobenzoic acid and manganese dioxide on Vitamin-A?
- e) Define the terms:
 - 1) Anaesthetics
 - 2) Antineoplastic agents
- f) What are disaccharides? Write the structure of Sucrose.
- g) Define the terms with one suitable example:
 - 1) Herbicides
 - 2) Plant growth regulators
- h) How will you prepare 2-butyl pyridine and pyridine-3-sulphonic acid from pyridine?
- i) Explain the qualities of good dye.
- j) Give the synthesis and uses of Methoxychlor.

Q.3 A) Answer of the following questions. (Any Two)**10**

- 1) Discuss the analytical evidences put forth in the support of structure of adrenaline.
- 2) Write the classification of dyes based on the chemical composition.
- 3) Give the synthesis and uses of Indole 3-acetic acid.

B) Write a short note on.**06**

- 1) Acidic character of pyrrole
- 2) Baygon

Q.4 A) Answer of the following questions. (Any Two) 08

- 1) What are heterocyclic compounds? Give the methods of synthesis of pyrrole.
- 2) Discuss the analytical evidences put forth in support of structure of Vitamin-A.
- 3) Explain the Witt's theory for chromophore and auxochrome.

B) Answer the following questions. 08

- 1) What happens when glucose is treated with,
 - i) Red P/HI
 - ii) Acetic anhydride
 - iii) Conc. HNO_3
 - iv) NH_2OH
- 2) Give the synthesis and uses of Tolbutamide.

Q.5 Answer of the following questions. (Any Two) 16

- a) What are antibiotics? Explain Penicillin-G with respect to,
 - 1) Structure
 - 2) Types
 - 3) Acidic hydrolysis
 - 4) Alkaline hydrolysis
- b) Explain the different methods for the determination of ring size of D-glucose.
- c) What is the action of following on quinolone?
 - 1) $\text{Conc. HNO}_3 + \text{Conc. H}_2\text{SO}_4$
 - 2) $\text{SO}_3 - \text{H}_2\text{SO}_4/220^\circ\text{C}$
 - 3) NaNH_2/Δ
 - 4) $\text{C}_4\text{H}_9\text{Li}$
 - 5) $\text{C}_6\text{H}_5\text{Li}$
 - 6) Na in liquid NH_3
 - 7) $\text{H}_2/\text{Ni}, 150^\circ\text{C}, 160 \text{ atm}$
 - 8) $\text{H}_2 - \text{Pt}/\text{CH}_3\text{COOH}$

Seat No.	

Set P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Botany (Special Paper - XV)
Cell Biology (22221603)

Day & Date: Monday, 05-May-2025
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw neat labelled diagrams and given equation wherever necessary.
- 4) Use of log table and calculators is allowed.

(At. Wts.: H=1, C=12, O=16, N= 14, Na =23, Cl = 35.5)

Q.1 A) Select the correct alternative. 10

- 1) The instrument used for visualizing fine detail of an object is _____.
 - a) stage
 - b) diaphragm
 - c) centrifuge
 - d) light microscope
- 2) The phase contrast microscopy is most often used to visualize _____.
 - a) microbes
 - b) living cells
 - c) dead cells
 - d) None of these
- 3) The components of prokaryotic cells are _____.
 - a) plasma membrane
 - b) DNA
 - c) cytoplasm
 - d) All of these
- 4) The three scientists that contributed to the cell theory are _____.
 - a) M. Schleiden, T. Schwann, R. Virchow
 - b) M. Schleiden, T. Schwann, Alberts
 - c) M. Schleiden, W. Sutton, R. Virchow
 - d) Preuss, T. Schwann, R. Virchow
- 5) The cell organelle that traps the sunlight is _____.
 - a) Chloroplast
 - b) Ribosomes
 - c) Lysosomes
 - d) Mitochondria
- 6) The spindle apparatus is formed during the _____ of mitosis.
 - a) telophase
 - b) metaphase
 - c) prophase
 - d) anaphase
- 7) The term chromosome was first coined by _____.
 - a) Sutton
 - b) Boveri
 - c) Waldeyer
 - d) Hoffmeister

- 8) Cyclin is associated with _____.
a) Mitosis b) Cylosis
c) Glycolysis d) Leptospirosis
- 9) _____ is longest stage in the cell cycle.
a) Interphase b) Anaphase
c) Metaphase d) None of the above
- 10) Chromosome structure can be observed best during _____.
a) Anaphase b) Metaphase
c) Telophase d) none of the above

B) Fill in the blank.

06

- 1) The _____ is regulated by cyclins and Cdk.
- 2) In _____ stage of meiosis, synapsis takes place.
- 3) The sex chromosomes are known as _____.
- 4) The _____ microscope is used to study the ultra-structure of cell organelles.
- 5) The stages occur during Interphase are _____.
- 6) The power house of cell is _____.

Q.2 Solve any Eight of the following.

16

- a) Define Magnification.
- b) What is mean by prokaryotic cell?
- c) Define Telocentric chromosome.
- d) Give any two functions of Lysosome.
- e) Sketch and label the Endoplasmic reticulum.
- f) Give any two significances of Mitosis.
- g) Define electron microscopy.
- h) What is mean by cell cycle?
- i) Enlist the components of Eukaryotic cell.
- j) What is mean by autosomes?

Q.3 A) Write short notes on any Two of the following.

10

- 1) Sample preparation in electron microscopy
- 2) Functions of ribosomes
- 3) Metaphase of mitosis

B) State the difference between prokaryotic and eukaryotic cell.

06

Q.4 A) Answer any Two of the following questions.

08

- 1) Give significance of meiosis.
- 2) Define mitochondria and explain its ultrastructure with suitable diagram.
- 3) State the functions of cytoskeleton.

B) Explain types of Endoplasmic reticulum with suitable diagram.

08

Q.5 Attempt any Two of the following.

16

- a)** Explain 4 types of chromosomes according to centromere position.
- b)** Explain the ultrastructure and functions of chloroplast.
- c)** Give an account of Phase Contrast Microscope.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Zoology (Special Paper - XV)
Animal Behavior and Chronobiology (22221627)

Day & Date: Monday, 05-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Multiple choice questions.**10**

- 1) Konrad Lorenz was the father of _____.
 a) Ecology b) Ethology
 c) Entomology d) Ecosystem
- 2) Taxis and Kinesis are examples of _____ behavior.
 a) Stereotyped b) Learning
 c) Complex d) Acquired
- 3) Foraging dance is the process by which _____ find food, gather it, and bring it back to their hive.
 a) Housefly b) House sparrow
 c) Honeybee d) Herring
- 4) Classical conditioning was first studied in _____ by the Russian physiologist Ivan Pavlov.
 a) Dog b) Cat
 c) Monkey d) Bat
- 5) Intrasexual selection is also called _____.
 a) Food competition b) Mate competition
 c) Habitat competition d) Water competition
- 6) The daily changes in sleep and wakefulness, annual bird migration, and the tidal variations in behavior of coastal animals are examples of _____.
 a) Animal behavior b) Biological rhythms
 c) Altruism d) Orientation
- 7) _____ is the study of biological rhythms.
 a) Animal Behavior b) Ethology
 c) Chronobiology d) Chronopharmacology

- 8) _____ hormone plays a crucial role in regulating the sleep-wake cycle and circadian rhythms.
- | | |
|--------------|--------------|
| a) Melatonin | b) Melanin |
| c) Insulin | d) Thyroxine |
- 9) Tidal rhythms are often seen in _____.
- | | |
|----------------|----------------|
| a) Forest life | b) Marine life |
| c) Space life | d) Desert life |
- 10) _____ is the science of optimizing drug effects concerning the biological rhythm.
- | | |
|---------------------|-----------------------|
| a) Chronobiology | b) Chronopharmacology |
| c) Biological clock | d) Chronotherapy |

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. 06

- 1) Ivan Pavlov's theory is called _____.
- 2) A person becoming less responsive to a bad smell over time is an example of which behavior.
- 3) Who discovered the bee dance?
- 4) Define sexual dimorphism.
- 5) Define chronobiology.
- 6) Give any one example of Circadian rhythm.

Q.2 Solve any Eight of the following. 16

- a) Who are the three fathers of Ethology?
- b) What is an example of a Proximate cause of behavior?
- c) Give examples of instinct behavior.
- d) What is the concept of society?
- e) What is asymmetry of sex in animal behavior?
- f) What is society of honey bee?
- g) What is Biological Oscillation?
- h) What is Lunar rhythm?
- i) What is the role of Melatonin?
- j) What is importance of chronotherapy?

Q.3 A) Attempt any Two of the following. 10

- 1) Give brief profile of I. Pavlov and K. Lorenz.
- 2) Explain Ivan Pavlov's Dog experiment.
- 3) Describe characteristics of Biological rhythm.

B) Describe advantages of dance languages in Honey bee. 06

Q.4 A) Attempt any Two of the following. 08

- 1) Give an account on habituation and imprinting patterns of behavior.
- 2) Describe an intra sexual and inter sexual selection behavior.
- 3) Explain historical developments in chronobiology.

B) Explain Biological clock. 08

Q.5 Attempt any Two of the following. 16

- a) Describe foraging and dance language in honey bee.
- b) Explain types of biological rhythms.
- c) Give an account on chronopharmacology and its role in various diseases.

Seat No.	

Set	P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Mathematics (Special Paper-XV)
Integral Calculus (22221635)

Day & Date: Monday, 05-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative for each of the following. **10**

- 1) The integral $\int_0^{\infty} \frac{dx}{(1-x)^3}$ is _____.
 a) improper integral of first kind
 b) improper integral of second kind
 c) improper integral of mixed kind
 d) none of these

- 2) $\int_a^b \frac{dx}{(x-a)^m}$ is convergent if _____.
 a) $m > 1$
 b) $m = 1$
 c) $m \geq 1$
 d) $m < 1$

- 3) The μ test states that, if a is the only point of infinite discontinuity of f on $[a, b]$ and $\lim_{x \rightarrow a} (x-a)^\mu f(x)$ exist and _____ then $\int_a^b f(x)dx$ converges if and only if $\mu < 1$.
 a) is zero
 b) if any non zero
 c) is non zero finite
 d) is any value

- 4) $\int_0^{\infty} e^{-ax} x^{n-1} dx =$ _____.
 a) $\frac{\sqrt{n}}{a^n}$
 b) $\frac{\sqrt{n}}{a}$
 c) $\sqrt{n}$
 d) $\frac{\sqrt{n}}{a^{n-1}}$

- 5) The value of $\int_0^{\infty} x^4 e^{-x} dx$ is _____.
 a) 24
 b) 12
 c) 48
 d) 6

- 6) The value of $\int_0^{\pi/2} \sin^3 \theta \cos^5 \theta d\theta =$ _____.
 a) $\frac{1}{12}$
 b) $\frac{1}{10}$
 c) $\frac{1}{24}$
 d) $\frac{1}{16}$
- 7) The value of $\int_0^{\pi/2} \sqrt{\tan \theta} d\theta =$ _____.
 a) $\frac{\pi}{\sqrt{2}}$
 b) π
 c) $\frac{\pi}{2}$
 d) $\sqrt{\pi}$
- 8) Area laying between the parabola $y = 4x - x^2$ and the line $y = k$ is _____.
 a) $\frac{1}{2}$ units
 b) 3 units
 c) $\frac{3}{2}$ units
 d) $\frac{9}{2}$ units
- 9) $\int_1^2 \int_0^{3y} y dy dx =$ _____.
 a) 3
 b) 5
 c) 7
 d) 9
- 10) To change a given double integral from cartesian to polar co-ordinates we use the formula _____.
 a) $dxdy = d\theta dr$
 b) $dxdy = rd\theta dr$
 c) $dxdy = r^2 dr d\theta$
 d) $r dxdy = d\theta dr$

B) Fill in the blanks.

06

- 1) The integral is said to be proper integral if _____.
- 2) The integral $\int_1^{\infty} \frac{dx}{x^{2/5}(1+x)^{3/5}}$ is _____.
- 3) The Area of circle $x^2 + y^2 = a^2$ is _____.
- 4) The value of $\left| \frac{1}{2} \right| =$ _____.
- 5) If $0 < P < 1$ then $\sqrt[p]{p} \sqrt[p]{1-p} =$ _____.
- 6) Another form of $\beta(m, n)$ is _____.

Q.2 Solve any Eight of the following.

16

- Test the convergence of $\int_0^1 \frac{dx}{\sqrt{1-x^2}}$
- Test the convergence of $\int_0^\infty \frac{dx}{1+x^2}$
- Test the convergence of $\int_0^1 \frac{1}{x^3(1+x^2)} dx$

- d) Show that $\sqrt{2} = 1$
- e) Show that $\beta(m, n) = \beta(n, m)$
- f) Evaluate $\int_0^{\infty} e^{-x^4} dx$
- g) Define Beta and Gamma function.
- h) Evaluate $\int_0^1 \int_0^1 \frac{dx dy}{\sqrt{1-x^2} \sqrt{1-y^2}}$
- i) Solve $\int_1^{\log 8} \int_0^{\log y} e^{x+y} dx dy$
- j) Solve $\int_0^{\pi} \int_0^{a \sin \theta} r dr d\theta$

Q.3 A) Answer the following questions. (Any Two)

10

- 1) Show that the improper integral $\int_a^{\infty} \frac{dx}{x^P}$ converges if and only if $P > 1$ and divergent if $P \leq 1$.
- 2) Prove that $\beta(m, n) = 2 \int_0^{\pi/2} \sin^{2m-1} \theta \cos^{2n-1} \theta d\theta$
- 3) Change the order of the double integration.
- $$\int_0^{4a} \int_{x^2/4a}^{2\sqrt{ax}} f(x, y) dx dy$$

B) Prove that $2^{2m-1} \sqrt{m} \sqrt{m+1/2} = \sqrt{\pi} \sqrt{2m}$

06

Q.4 A) Answer the following questions. (Any Two)

08

- 1) State and prove relation between Beta and Gamma function.
- 2) Evaluate $\iint_R X(x^2 + y^2) dy dx$ where R is region banded by $y = 0, x = 2$, and $y = x^2$
- 3) Show that every absolutely convergent integral is convergent.

B) If $f(x)$ and $g(x)$ are positive and $\lim_{x \rightarrow \infty} \frac{f(x)}{g(x)} = L$ where L is non zero

08

finite number then show that two integral $\int_a^{\infty} f(x) dx$ and $\int_a^{\infty} g(x) dx$ behave alike.

Q.5 Answer the following questions. (Any Two)**16**

a) State and prove Abel's test for the improper integral of a product of two function.

b) Using the transformation $u = \frac{x^2+y^2}{x}, v = \frac{x^2+y^2}{y}$

Evaluate $\iint \frac{(x^2+y^2)^2}{x^2y^2} dx dy$ over the area.

Common to the circles $x^2 + y^2 - ax = 0, x^2 + y^2 - by = 0$

c) 1) Compute $\sqrt{-3/2} \sqrt{-5/2}$

2) Show that $\beta(m, n) = \beta(m, n+1) + \beta(m+1, n)$

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Statistics (Special Paper - XV)
Designs of Experiments (22221643)

Day & Date: Monday, 05-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to right indicate full marks.
 3) Use of Statistical table and calculators is allowed.

Q.1 A) Multiple choice questions. 10

- 1) Local control in the field is maintained through:
 - a) Uniformity trials
 - b) randomization
 - c) natural factors
 - d) all of the above
- 2) Errors in a statistical model are always taken to be:
 - a) Independent
 - b) distributed as $N(0, \sigma_e^2)$
 - c) both (a) and (b)
 - d) none of these
- 3) The formula for obtaining a missing value in RBD by minimizing the error mean square was given by:
 - a) W. G. Cochran
 - b) T. Wishart
 - c) F. Yates
 - d) J. W. Tukey
- 4) If σ_1^2 is the error variance of design-1 and σ_2^2 of design-2, utilizing the same experiment material, the efficiency of design-1 over 2 is:
 - a) $\frac{1/\sigma_1^2}{1/\sigma_2^2}$
 - b) $\frac{1/\sigma_2^2}{1/\sigma_1^2}$
 - c) σ_1^2/σ_2^2
 - d) none of these
- 5) In a fixed effect model, the hypothesis about the treatment under test is:
 - a) $\sigma_t^2 = 0$
 - b) $\tau_i = 0$
 - c) $\sum \tau_i = 0$
 - d) none of these
- 6) The formula for estimating one missing value in a LSD with 'k' treatments with usual notations is:
 - a) $\frac{(R' + C' + T' - G')}{(k-1)(k-2)}$
 - b) $\frac{[k(R' + C' + T') - 2G']}{(k-1)(k-2)}$
 - c) $\frac{k(R' + C' + T' - 2G')}{(k-1)(k-1)}$
 - d) $\frac{k(R' + C' + T' - 2G')}{(k-2)(k-2)}$

- 7) A missing value in an experiment is estimated by the method of:
 - a) minimizing the error mean square
 - b) analysis of covariance
 - c) Both a) and b)
 - d) Neither a) nor b)
- 8) In a 2^3 factorial experiment, all effects and their sum of squares can be obtained by:
 - a) Yates' method
 - b) Modulo technique
 - c) Both a) and b)
 - d) Neither a) nor b)
- 9) Experimental error is due to:
 - a) Experimenter's mistakes
 - b) extraneous factors
 - c) Variation in treatment effects
 - d) none of these
- 10) In a LSD, number of rows, columns and treatments are
 - a) All different
 - b) always equal
 - c) Not necessarily equal
 - d) None of these

B) Define the following.**06**

- 1) State any one principle of design of experiments.
- 2) Write full form of d.f. in DOE.
- 3) Compute M.S.S., if S.S.= 120 and d.f.= 6.
- 4) Write full form of ANOVA in DOE.
- 5) State types of confounding.
- 6) Write full form of RBD in DOE.

Q.2 Solve any Eight of the following.**16**

- a) Define replication.
- b) Define experimental unit.
- c) Explain the term Treatment.
- d) State the formula to find a missing observation in LSD.
- e) Define block.
- f) Define yield.
- g) Define Efficiency of design.
- h) State the headings of columns in ANOVA table.
- i) State main effects in 2^2 factorial experiment.
- j) Define layout of an experiment.

Q.3 A) Attempt any Two of the following.**10**

- 1) Explain Randomization and local control in design of experiments.
- 2) Estimate parameters in CRD.
- 3) State mathematical model and assumptions in case of LSD.

B) What is LSD? Give its layout.**06**

Q.4 A) Attempt any Two of the following. 08

- 1) State analysis of variance table in case of CRD.
- 2) Explain Yate's procedure to obtain factorial effect totals in 2^2 factorial experiment.
- 3) State main effects and interaction effects in 2^2 factorial experiment.

B) Derive the formula for efficiency of LSD over CRD. 08

Q.5 Attempt any Two of the following. 16

- a) State mathematical model, assumptions and analysis of variance table in case of RBD.
- b) Derive the formula for one missing observation in RBD.
- c) Explain total and partial confounding.

Set **P**

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Geology (Special Paper - XV)
Environmental Geology (22221651)

Day & Date: Monday, 05-May-2025
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.

Q.1 A) Multiple choice questions.

10

- In common scientific terms, surroundings of an individual is called _____.
 - Climate
 - Atmosphere
 - View
 - Environment
- Some amount of moisture in the sediments on the slope _____ the landslide due to cohesion.
 - Prevents
 - Causes
 - Triggers
 - does not affect
- Death of microorganisms from the ponds & lakes may be indicator of upcoming _____.
 - Landslide
 - volcanic eruption
 - Flood
 - Avalanche
- Deforestation in the hilly catchment of a basin may trigger _____ in future.
 - flood & landslide
 - Landslide
 - Flood
 - Subsidence
- Thermal energy is type of _____ energy source.
 - non-conventional
 - conventional
 - Alternative
 - Renewable
- Tatapani location is suitable for _____ energy source.
 - Conventional
 - Thermal
 - Hydropower
 - Geothermal
- Ideally speaking, in earth energy balance, tally should be _____ in % terms.
 - 1
 - Zero
 - 50
 - 100

- 8) Two reasons for subsidence may be _____.
 a) illegal underground mining & tsunami
 b) Tsunami & flood
 c) flood & volcano
 d) illegal underground mining & overexploitation of groundwater.
- 9) Low intensity but prolonged duration of rain may cause _____.
 a) Flood
 b) Landslide
 c) flood & landslide
 d) Tsunami
- 10) Diversion channel & spreading network solution is adapted in _____ hazard.
 a) landslide
 b) flood
 c) avalanche
 d) coastal

B) Fill in the blanks.**06**

- 1) Interaction of a species with the surrounding is called _____.
 2) Wall built along the banks of the river to control the impact of flood is called _____.
 3) Main parameter constantly active in case of landslide hazard is _____.
 4) Recent disaster experienced by Myanmar is _____.
 5) Multi-impacting natural factor for disasters like flood, landslides is _____.
 6) Flash floods are caused due to _____.

Q.2 Solve any Eight of the following.**16**

- 1) What is hazard?
 2) What is disaster?
 3) What is Environmental Geology?
 4) What main natural source of energy for the life on the earth?
 5) What is geothermal power?
 6) What type of power source is geothermal power?
 7) Which is probable locations for geothermal power in Maharashtra?
 8) Which type of energy plant Solapur City has?
 9) What could be the two major environmental impacts of thermal power plants?
 10) Which type of disaster the cities like Mumbai & Chennai frequently face?

Q.3 A) Answer any two of the following.**10**

- 1) Describe the role of duration & intensity impacts of rain in landslide.
 2) Describe the role of duration & intensity impacts of rain in flood.
 3) Describe the remedies for volcanic hazard.

B) Write short note on preparedness for volcanic hazard.**06**

- Q.4 A) Attempt any two of the following. 08**
- 1)** Describe the disaster management plan.
 - 2)** Describe the disaster management plan for earthquake hazard.
 - 3)** Describe the anthropogenic reasons of flood.
- B) Describe the mitigation parameters for volcanic hazard. 08**
- Q.5 Answer the following questions . 16**
- a)** Describe the merits & demerits of Dams with respect to Flood, Landslide & energy resources. Give examples if necessary.
 - b)** Describe the control measures of landslides & relates phenomenon like avalanche.

Seat No.	

Set	P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Microbiology (Special Paper - XV)
Environmental Microbiology (22221659)

Day & Date: Monday, 05-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 A) Rewrite the following sentence by selecting correct answer from the given alternatives. 10

- 1) The process of removal of pollutants with the use of microorganisms is called _____.
 a) eutrophication b) bioremediation
 c) oxidation d) pollution
- 2) _____ elements act as key elements in eutrophication.
 a) N & C b) N & P
 c) N & K d) P & C
- 3) One carbon credit corresponds to 1 metric ton of _____ prevented from entering the atmosphere.
 a) sulfur oxide b) carbon dioxide
 c) nitrogen d) oxygen
- 4) In B.O.D test liberated _____ is titrated against sodium thiosulphate.
 a) I₂ b) Cl₂
 c) Alkali iodide d) MnSO₄
- 5) Activated sludge process is an example of _____ waste water treatment process.
 a) primary b) preliminary
 c) secondary d) tertiary
- 6) Xanthan gum produced by microorganisms is used for _____.
 a) metal recovery b) oil recovery
 c) sewage treatment d) pollution control
- 7) _____ is an important organism used in bioleaching.
 a) *Bacillus* b) *Thiobacillus ferrooxidans*
 c) *Pseudomonas* d) *Brevibacterium*
- 8) The process of dissolving metals from ore bearing rocks using microorganisms is called _____.
 a) Bioleaching b) Bioremediation
 c) Bioaccumulation d) Biodegradation

- 9) Biodegradable organic matter in sewage is measured by _____ test.
- | | |
|--------|----------|
| a) COD | b) MPN |
| c) BOD | d) IMViC |

- 10) Sludge digester produces _____ as one of the product.
- | | |
|------------------|------------------|
| a) NH_3 | b) CH_4 |
| c) press mud | d) spent wash |

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. 06

- 1) List two important organisms involved in bioleaching process.
- 2) The strong oxidising agent used for C.O.D. is _____.
- 3) Examples of thermophiles.
- 4) The incubation period for BOD test is _____ days.
- 5) Heap leaching is the method of _____.
- 6) _____ organism grows at high atmospheric pressure.

Q.2 Solve any Eight of the following. 16

- a) Define bioremediation.
- b) Significance of bioaerosol.
- c) What is carbon sequestration. Give any two methods of it.
- d) Give significance of microorganisms in air.
- e) Recombinant DNA advisory committee (RDAC).
- f) Define BOD and COD.
- g) Classification of lakes on the basis of nutrient level.
- h) Define acidophiles and give examples of acidophiles.
- i) Define carbon credit.
- j) Define psychrophiles with examples.

Q.3 A) Attempt any Two of the following. 10

- 1) Write different parameters used for characterization of industrial waste water.
- 2) Give an account of characteristic and treatment of dairy industry waste.
- 3) Write a note on regulatory frame work of biosafety in India.

B) Short note/Solve. 06

Describe various methods of sampling of air.

Q.4 A) Attempt any Two of the following. 08

- 1) Define bioleaching. Explain in detail copper leaching.
- 2) Write a note on Thermophiles.
- 3) Describe characteristics of marine bacteria.

B) Describe/Explain/Solve. 08

What is eutrophication? Describe sources, effects and control of eutrophication.

Q.5 Attempt any Two of the following.

16

- a)** Write an essay on Biological safety.
- b)** Describe various methods of biological treatment of waste water.
- c)** Write in details on various methods of oil recovery.

Seat No.	

Set	P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Electronics (Special Paper - XV)
Electronics Instrumentation (22221675)

Day & Date: Monday, 05-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) Which of the following is NOT a type of amplifier used in signal conditioning?
 - a) Bridge amplifier
 - b) Isolation amplifier
 - c) Operational amplifier
 - d) Chopper amplifier
- 2) The main purpose of signal conditioning is to: _____.
 - a) Store data
 - b) Convert digital signals to analog
 - c) Prepare signals for display and processing
 - d) Generate signals
- 3) A chopper amplifier is primarily used to: _____.
 - a) Increase frequency
 - b) Amplify dc signal & Reduce noise and offset
 - c) Generate power
 - d) as a comparator
- 4) The gain equation for AD620 is: _____.
 - a) $G = 1 + (49.4k\Omega/RG)$
 - b) $G = 100 / RG$
 - c) $G = 1 / RG$
 - d) $G = RG \times 10$
- 5) Which amplifier is designed for temperature sensor interfacing?
 - a) AD620
 - b) AD594/595
 - c) LM741
 - d) NE555
- 6) Ratiometric conversion is often used with: _____.
 - a) Analog displays
 - b) Transducers powered by reference voltage
 - c) Heating elements
 - d) Relay switching
- 7) A single channel DAS is used for: _____.
 - a) Multiple sensors
 - b) Single input measurement
 - c) Network control
 - d) Power conversion

- 8) The function generator is used to produce: _____.
 a) Logic levels
 b) Power pulses
 c) Sine, square, triangle waveforms
 d) Thermal signals
- 9) CRO is mainly used to measure: _____.
 a) Static temperature
 b) Voltage waveform
 c) Current only
 d) Resistance only
- 10) A digital data recorder is used for: _____.
 a) Visual display
 b) Audio signals only
 c) Long-term digital data storage
 d) Voltage control

B) Give one sentence answer.**06**

- 1) Draw the symbol of a bridge amplifier.
- 2) What is the purpose of excitation in signal conditioning?
- 3) What is offset compensation?
- 4) Define data acquisition system (DAS).
- 5) What is a preamplifier used for?
- 6) What is the range of 4-20mA transmission?

Q.2 Solve any Eight of the following.**16**

- a) What is a signal conditioner?
- b) What is 4-20mA current transmission used for?
- c) What is the function of electromagnetic shielding?
- d) What is an XT recorder?
- e) List any two features of AD620.
- f) What is logarithmic signal conversion?
- g) List two differences between AD594 and AD595.
- h) What is an LCR Q meter?
- i) What is the importance of grounding in instrumentation?
- j) List any two applications of DAS.

Q.3 A) Attempt any Two of the following.**10**

- 1) Explain the importance of shielding in noisy environments.
- 2) Write a short note on the salient features and block diagram of AD620.
- 3) Compare single and multi-channel DAS.

B) Discuss in detail case study of Temperature Meter.**06****Q.4 A) Attempt any Two of the following.****08**

- 1) Explain the operation and application of AD595.
- 2) Draw the complete block diagram of an electronic instrument and explain.
- 3) Compare and explain DSO and CRO with suitable examples.

B) Discuss in detail case study of pH Meter. **08**

Q.5 Attempt any Two of the following. **16**

- a)** Draw the block diagram of a Digital Multimeter (DMM) and explain it.
How is it used to measure different electrical parameters?
- b)** Write a short note on the working of a magnetic recorder.
- c)** Case study of Conductivity Meter.

Seat No.	

Set	P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Computer Science (Special Paper - XV)
ASP.Net Core MVC (22221667)

Day & Date: Monday, 05-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Select the correct alternative. 10

- 1) In ASP.NET Core MVC, _____ is the main purpose of the Model.
 - a) Handle user interface
 - b) Act as middleware
 - c) Represent business data and logic
 - d) Store routing rules
- 2) The file that typically stores global configuration like connection strings and logging settings is in _____ file.
 - a) Startup.cs
 - b) launchSettings.json
 - c) web.config
 - d) appsettings.json
- 3) In Out-of-Process hosting, HTTP requests are handled by _____ in ASP.NET Core.
 - a) IIS Express handles requests directly
 - b) Kestrel acts as reverse proxy
 - c) Kestrel serves the app directly
 - d) Application runs on Apache server
- 4) The default entity state when a new entity is added to the DbSet is _____.
 - a) Unchanged
 - b) Modified
 - c) Added
 - d) Detached
- 5) The default routing pattern used in ASP.NET Core MVC is _____.
 - a) {controller}/{action}/{id?}
 - b) /home/controller/action/id
 - c) /api/controller/action
 - d) /mvc/controller/id
- 6) The _____ EF Core class is used to build a model during OnModelCreating().
 - a) DbContextOptions
 - b) ModelBuilder
 - c) DbInitializer
 - d) DbDesigner

- 7) To delete a record from DbContext, the _____ method is used.
 - a) Delete
 - b) Del
 - c) Remove
 - d) Pop
- 8) If you want to create a form using HTML Helpers in ASP.NET Core MVC, _____ is used.
 - a) @using (Html.BeginForm())
 - b) <form> tag
 - c) Html.BeginForm()
 - d) Html.RenderForm()
- 9) The Razor syntax that correctly renders a model property in a view using _____.
 - a) @Model.PropertyName
 - b) #Model.PropertyName
 - c) \$Model.PropertyName
 - d) @model.PropertyName
- 10) You can render a partial view in Razor syntax by using _____.
 - a) @RenderPartial("viewName")
 - b) @PartialView("viewName")
 - c) @Html. PartialRender("viewName")
 - d) @Html.Partial("viewName")

B) Fill in the blank.**06**

- 1) HTML and Razor code for the UI should be written in the _____ folder of an MVC project.
- 2) The file extension of Razor Views in MVC is _____
- 3) You can define a section in a layout view using _____
- 4) The _____ binding source is used for query string parameters.
- 5) The default return type for an action method rendering a Razor view is _____.
- 6) The default storage mechanism for session in ASP.NET Core is _____

Q.2 Solve any Eight of the following.**16**

- a) What is ViewBag? Give example.
- b) Explain Many-to-Many Relationships with example.
- c) Explain Routing using Tokens with example.
- d) List out Entity States in Entity Framework Core.
- e) Which files are created after migration?
- f) What is database first approach? When to use this approach?
- g) What is use of AppSettings .json file?
- h) What are different action methods used in ASP.Net Core?
- i) Explain FromQuery with example.
- j) Explain Display attribute with example.

Q.3 A) Attempt any Two of the following.**10**

- a) Explain different type of hosting used in ASP.Net Core MVC with example.
- b) What is cookie? Explain with example how to Encrypt Cookies.
- c) Explain with example to Upload File, Restrict Uploaded File Size, Restrict Uploaded File Type.

B) Write program checking given number is prime or Armstrong. **06**

Q.4 A) Attempt any Two of the following. **08**

- 1) Explain TempData with example.
- 2) Explain ASP.Net Core MVC Project File Structure.
- 3) Explain different Microsoft Web Technologies in detail.

B) What is EF core? Explain in detail DB providers used in EF Core. **08**

Q.5 Attempt any Two of the following. **16**

- a)** What is html helper and tag helper? Explain custom html helper and custom tag helper with example.
- b)** What is middleware component? Explain different middleware component used in ASP.Net Core MVC.
- c)** What is seeding? Why it is important? Explain with example how to seed data.

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Physics (Special Paper - XVI)
Electronics (22221620)

Day & Date: Tuesday, 06-May-2025
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions:

- 1) All questions are compulsory.
- 2) Draw neat labelled diagrams whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic table and calculator is allowed.

Q.1 A) Choose any one of the following and rewrite the sentence below. 10

- 1) An Op-Amp can be classified as _____ amplifier.
a) Linear
b) Low- r_{in}
c) positive feedback
d) R-C coupled
- 2) An inverting amplifier has $R_2 = 2M\Omega$ and $R_1 = 2K\Omega$, its gain is _____.
a) 1000
b) -1000
c) 10^3
d) -10^{-3}
- 3) The IC 555 is built in _____ circuit.
a) Differential amplifier
b) Timer
c) Schmitt trigger
d) Adder
- 4) The control element of an SCR is _____.
a) Cathode
b) Anode
c) Anode supply
d) Gate
- 5) An SCR is sometimes called _____.
a) Triac
b) Diac
c) UJT
d) Thyristor
- 6) A triac can pass portion of _____ half cycle through the load.
a) Only positive
b) Only negative
c) Both
d) None
- 7) The normal way to turn ON the Diac is by _____.
a) Gate current
b) gate voltage
c) breakover voltage
d) None
- 8) The liquid used in LCDs are _____.
a) Nematic
b) Tantalum
c) Oil
d) Electrolytic

9) MOSFET has ____ terminals.

- a) Two
- b) Five
- c) Four
- d) Three

10) The input impedance of MOSFET is of the order of ____.

- a) Ω
- b) A few hundred Ω
- c) $K\Omega$
- d) Several $M\Omega$

B) Solve the following:

06

- 1) The output of non-inverting Op-Amp is ____ with input.
- 2) What are the three terminals of SCR?
- 3) The Triac is a ____ switch.
- 4) LCD stands for what?
- 5) Which color is given by GaAs material used for doping?
- 6) Draw the symbol of n-channel D-MOSFET.

Q.2 Solve the following: (Any Eight)

16

- a) What are the characteristics of Op-Amp?
- b) Define duty cycle in Astable multivibrator.
- c) Define the terms: Breakover voltage and Holding current.
- d) Draw the symbol of DIAC and TRIAC.
- e) What do you understand by Nixie.
- f) What was need to develop MOSFET?
- g) Explain the concept of Comparator.
- h) What are the two applications of DIAC?
- i) What are the advantages of LED?
- j) Write trans conductance and input impedance of D- MOSFET.

Q.3 A) Solve the following: (Any Two)

10

- 1) Draw and explain block diagram of IC 555 timer.
- 2) Explain the I-V Characteristics of SCR.
- 3) Explain the construction and working of DIAC.

Q.3 B) Short notes.

06

- 1) Write a short note on the application of IC 555 timer as a square wave generator.

Q.4 A) Attempt the following. (Any Two)

08

- 1) Explain Op-Amp as inverting amplifier.
- 2) What are the characteristics of LCD and Give its important features.
- 3) Explain the types of D-MOSFET.

B) Explain.

08

- a) Explain the construction and working of SCR.

Q.5 Attempt the following. (Any Two)**16**

- a)** Explain Op-Amp as Differentiator and Integrator.
- b)** Explain LCD and state different types of liquid crystal used for LCD display and give important features of LCD's.
- c)** Explain circuit operation of E-MOSFET.
For a certain D-MOSFET, $I_{DSS} = 8\text{mA}$ and $V_{GS} = -6\text{V}$
 - 1) Is this n-channel or p-channel?
 - 2) Calculate I_D at $V_{GS} = -2\text{V}$.

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and give equation whenever necessary.
3) Figures to the right indicate full marks.
4) Use of logarithmic table and calculator is allowed.
(At. Wts : H = 1, C = 12, O = 16, N = 14, Na = 23, Cl = 35.5)

Q.1 A) Fill in the blanks by choosing correct alternatives given below. 10

- Page 1 of 3

- 9)** _____ is added during vulcanization of rubber,
a) Sulphur b) Ethane
c) Urea d) Phenol
- 10)** Ethyl alcohol is denatured by adding _____.
a) methanol and pyridine b) glycerol
c) Aniline d) ether and methanol

B) Define the following:

06

- 1) Ionic Liquids
- 2) Micelles
- 3) Elastomers
- 4) Power alcohol
- 5) Rate of flow (Rf value)
- 6) Umpolung

Q.2 Solve the following: (Any Eight)

16

- a) Write any two principles of green chemistry.
- b) Give any two applications of paper chromatography.
- c) Give synthesis and uses of polystyrene.
- d) Mention the names of any two by-products of sugar industry.
- e) Define the terms absolute alcohol and denatured spirit.
- f) Give any two synthetic applications of SeO_2 .
- g) Mention names of any two raw materials used for preparation of detergents.
- h) Give synthesis and uses of polyurethane.
- i) Draw a neat and labeled diagram for cleansing action of soap.
- j) Define the terms
 - 1) Thermoplastic
 - 2) Thermosetting

Q.3 A) Solve the following: (Any Two)

10

- 1) Explain hot process for manufacturing of soap.
- 2) Give synthesis and uses of phenol-formaldehyde resin.
- 3) Explain the byproducts of alcohol industry.

B) Write a short note on Ziegler-Natta polymerization.

06

Q.4 A) Attempt the following. (Any Two)

08

- 1) Give any four synthetic applications of NaBH_4 .
- 2) Give the reactions involved in preparation of teepol and deriphat.
- 3) Explain with a neat labeled diagram of multiple effect evaporation process.

B) Explain paper chromatography with reference to principle, methodology and applications.

08

Q.5 Attempt the following. (Any Two)

16

- a)** Give synthesis and uses of Buna-S and Buna-N rubbers.
- b)** What are phase transfer catalysts? Explain their advantages and applications.
- c)** Write a note on comparison between soaps and detergents

Seat No.	

Set

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B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Chemistry (Special Paper - XVI)
Applied Organic Chemistry (22221616-B)

Day & Date: Tuesday, 06-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Draw neat labelled diagrams whenever necessary.
 3) Figures to the right indicate full marks.

Q.1 A) Choose the most correct alternative for each of the following. 10

- 1) Which of the following is not a principle of Green Chemistry?
 - a) Green solvents and auxiliaries
 - b) Use of renewable feedback
 - c) Hazardous chemical synthesis
 - d) Design for energy efficiency
- 2) Identify the non-toxic and green solvent.
 - a) Liquified carbondioxide
 - b) Benzene
 - c) Carbon tetrachloride
 - d) Toluene
- 3) Identify the element that cannot be detected by Lassaigne's test.
 - a) Nitrogen
 - b) Fluorine
 - c) Sulfur
 - d) Phosphorous
- 4) An Antidandruff shampoo is a _____.
 - a) Cosmetic
 - b) Drug
 - c) Both
 - d) None of the above
- 5) The cosmetic preparation used to prevent dandruff and itching is _____.
 - a) shampoo
 - b) rinse
 - c) both
 - d) none of these
- 6) The purpose of conditioning agent on shampoo is _____.
 - a) To bring moisture to nail
 - b) To bring moisture to hair
 - c) To bring moisture to skin
 - d) To bring greasiness to hair
- 7) Most of the perfumes, dyes, drugs and oils are obtained from _____.
 - a) wild herbs
 - b) coal tar
 - c) acasia bark
 - d) various kinds of poisons

- 8) Which of the following is not a product of fermentation?
 - a) Oxygen
 - b) Carbon dioxide
 - c) Ethanol
 - d) Lactate
- 9) Which of the following is not a probiotic?
 - a) Fungi
 - b) *Saccharomyces cerevisiae*
 - b) *Escherichia coli*
 - d) *Lactobacillus*
- 10) Which is the final product of anaerobic digestion in the production of biogas?
 - a) Ethane and CO₂
 - b) Methane and CO₂
 - c) Ethane and hydrogen
 - d) Ethane and oxygen

B) Fill in the blanks.

06

- 1) After the use of chemicals, we must _____ them properly.
- 2) Titanium dioxide commonly used in _____ cream.
- 3) The source of ethanol fermentation is _____.
- 4) Cotton, silk, wool and linen are examples of _____ fibres.
- 5) _____ fibres are most difficult to dye.
- 6) Green chemistry is also called as _____.

Q.2 Answer the following questions. (Any Eight)

16

- a) What are some of the common techniques used in separating mixtures?
- b) Write the ingredients of face powder.
- c) Write uses of rose oil.
- d) Write general idea of dyeing.
- e) Give classifications of fibres.
- f) Define zeolites with suitable example.
- g) Write the reactions for the presence of acid and base in the binary mixture.
- h) Write the ingredients of shaving cream.
- i) What are vitamins? Give examples of Vit-B12.
- j) Define solvent free reactions with example.

Q.3 A) Answer the following questions. (Any Two)

10

- 1) Discuss the determination of types of mixtures.
- 2) Discuss the preparation and importance of geraniol.
- 3) Explain the reparation and uses of hair dye.

B) Write a short note on twelve principles of Green Chemistry.

06

Q.4 A) Answer the following questions. (Any Two)

08

- 1) Discuss object of sizing ingredients and their functions.
- 2) Discuss Aerobic and anaerobic fermentation process.
- 3) Illustrate the reactions in ionic liquids.

B) Outline of the process of bleaching cotton and synthetic material in detail.

08

Q.5 Answer the following questions. (Any Two)

16

- a)** Discuss the preparations and uses of lipsticks and cold creams.
- b)** Discuss the preparation and importance of Eugenol and sandalwood oil.
- c)** Explain the singeing, desizing processes in detail.

Max. Marks: 80

4) Use of logarithmic table and non-programmable calculator is allowed.

10

- Page 1 of 3

- 9)** IIVR (Indian Institute of Vegetable Research) is located at _____.
a) New Delhi b) Lucknow
c) Varanasi d) Karnal
- 10)** The art of making animal shapes in plants is _____.
a) Topiary b) Pinching off
c) Edging d) Hardening

B) Fill in the blanks:

06

- 1) Method of breaking dormancy of light sensitive ____.
- 2) ____ treatment is also an effective method of breaking hard-seed.
- 3) The ____ characteristics of a seed are laid down during the course of its development.
- 4) Any ____ treatment that weakens the seed coat is known as scarification.
- 5) There are ____ methods to break the dormancy of chilling requiring seeds.
- 6) The hard seed coat is impermeable to water and ____.

Q.2 Solve the following: (Any Eight)

16

- a) What is scion?
- b) What is mean by Horticulture?
- c) What is seed?
- d) Define cut flowers.
- e) Define budding.
- f) What are biopesticides?
- g) Give the definition of gardening.
- h) What is bonsai?
- i) Define Park.
- j) Define vegetative propagation.

Q.3 A) Solve the following: (Any Two)

10

- 1) Define Horticulture and explain the use of CAD in Landscape gardening.
- 2) Define and explain Seed bank and its importance.
- 3) Describe the role of computer application in landscaping.

B) Role of exhibitions in floriculture.

06

Q.4 A) Attempt the following. (Any Two)

08

- 1) Describe the types of seeds studied by you.
- 2) Explain the types of layering studied by you.
- 3) Describe the seed production technology studied by you.

B) Give the methods of weed control studied by you.

08

Q.5 Attempt the following. (Any Two)

16

- a)** Describe biopesticides.
- b)** Explain the importance of flower shows and exhibition studied by you.
- c)** What is seed viability? Explain the factors affecting seed viability.

Seat No.	

Set | P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Botany (Special Paper - XVI)
Biostatistics (22221608-B)

Day & Date: Tuesday, 06-May-2025
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams whenever necessary.
3) Figures to the right indicate full marks.

Q.1 A) Multiple choice questions

10

- 1) The collection or the group of all items about which information is collected is called ____.

a) Population	b) Sample
c) Variate	d) Attribute
- 2) Pie diagram is a ____.

a) One dimensional	b) Two dimensional
c) Three dimensional	d) Circular diagram
- 3) Primary data means ____.

a) Already collected by other agency
b) Processed data
c) Finished data
d) Original data
- 4) ____ is used to test goodness of fit.

a) student t test	b) Standard deviation
c) Probability	d) chi square test
- 5) The set of all possible outcome of an experiment is called ____.

a) Sample space	b) Trial
c) Null event	d) Mutually exclusive event
- 6) ____ is a collection of data which can be measured in well-defined units.

a) Sample	b) Population
c) Variate	d) Attribute
- 7) The value of probability lies between ____.

a) 0 and 1	b) 0 and 10
c) 0 and 100	d) 1 and 100

- 8) Student t test was proposed by ____.
- a) Karl Pearson b) R.A Fischer
c) William Gosset d) Laplace

- 9) Arithmetic mean is denoted by ____.
- a) Mdn b) $\bar{Z}$
c) $\bar{x}$ d) σ

- 10) A variable taking only particular values is called ____.
- a) Continuous b) Nominal
c) Ordinal d) Discrete variable

B) Fill in the blanks:

06

- 1) The particular value in a series which appears again and again with highest frequency is called ____.
- 2) ____ is the difference between largest value and smallest value of the series.
- 3) The null hypothesis for the independent sample test t test is ____.
- 4) Median is denoted by ____.
- 5) The values of probability do not exceed ____.
- 6) In columns charts, bars are arranged in ____.

Q.2 Solve the following: (Any Eight)

16

- a) What is attribute?
- b) Enlist the methods of primary data collection
- c) Define Histogram
- d) Define Probability
- e) What is interpretation of data?
- f) What is secondary data?
- g) Give merits and demerits of mode.
- h) What is paired t test?
- i) Give the characteristics of chi square test.
- j) What is chronological classification of data?

Q.3 A) Solve the following: (Any Two)

10

- 1) Explain student t test and give its significance
- 2) Differentiate between primary and secondary data.
- 3) Explain Arithmetic Mean and give its merits and demerits.

B) Short notes.

06

Give the significance of Biostatistics

Q.4 A) Attempt the following. (Any Two)

08

- 1) Explain the methods of collecting secondary data.
- 2) Describe the kinds of probability.
- 3) Describe the standard deviation and give its merits and demerits.

B) Describe the different types of sampling methods. **08**

Q.5 Solve the following: **16**

- a)** Describe tabulation and explain the parts of table.
- b)** Explain the stages of statistical investigation.

Seat No.	

Set

P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Zoology (Special Paper - XVI)
Applied Zoology (22221628)

Day & Date: Tuesday, 06-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagrams whenever necessary.
 3) Figures to the right indicate full marks.
 4) Use of log table and calculators is allowed.

Q.1 A) Multiple choice questions

10

- 1) Inland fisheries includes _____.
 a) Fishes only from fresh water
 b) Fishes both from brackish water and fresh water
 c) Fishes only from sea water
 d) Fishes only from brackish water
- 2) _____ is the edible freshwater teleost
 a) Catla catla b) Hilsa ilisha
 c) Rays and skates d) Sharks
- 3) If more than single species of fish is cultured at a time, then it is called as _____.
 a) Monoculture b) Aquaculture
 c) Polyculture d) Mori
- 4) _____ of the following is not a method of fish preservation.
 a) Chilling b) Baking
 c) Canning d) Salting
- 5) Smoking is a technique used for _____.
 a) Cocoon harvesting b) Crop harvesting
 c) Fish Preservation d) Mushroom Preservation
- 6) Sericulture is _____.
 a) Rearing of fishes b) Rearing of silkworm
 c) Rearing of birds d) Rearing of cockroach
- 7) _____ of the following varieties of silk is not produced in India.
 a) Muga Silk b) Mulberry Silk
 c) Tassar Silk d) American Silk

- 8)** _____ is the purpose of the lac secreted by the lac insect.
- a) For food b) For protection
- c) For mating d) For camouflage
- 9)** _____ of the following is not typically included in Poultry farming
- a) Cow b) Chicken
- c) Duck d) Turkey
- 10)** Poultry birds which are exclusively grown for meat are called _____.
- a) Layers b) Cockerel
- c) Rooster d) Broilers

B) Fill in the blank / definition / one sentence answer / one word answer:

- 1) What is Apiculture?
- 2) What is Mari culture?
- 3) Define Moulting.
- 4) Role of Mulberry in sericulture.
- 5) Write any four names of Marine fishes.
- 6) Enlist any four Indigenous cow breeds.

Q.2 Solve the following: (Any Eight)

- a) Define Induced breeding.
- b) Importance of honey bees in nature.
- c) Write any four milk products.
- d) Enlist the Fish by-products.
- e) What are the Properties of honey?
- f) Enlist the types of silk in India.
- g) Define aquaculture.
- h) Define Breeding pond.
- i) Write lac Products.
- j) Types of honey bees

Q.3 A) Solve the following: (Any Two)

- 1) What is remote sensing? Give applications of GIS in fishery
- 2) What is the role of egg and meat in diet?
- 3) What is the significance of transgenic animals?

B) Write short note on fish diseases

Q.4 A) Attempt the following. (Any Two)

- 1) Describe current position of fresh Water resources in India.
- 2) Describe techniques of dairy managements and write common dairy animals.
- 3) Write about indigenous and exotic breeds of cow?

B) Define prawn culture? Comment on fresh water prawn culture? **08**

Q.5 Attempt the following. (Any Two) **16**

- a)** What is apiculture? Comment on life cycle of honey bees
- b)** Comment on harvesting and preservation of fish techniques
- c)** Describe in detailed fishing gears and crafts.

Seat No.	

Set P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Mathematics (Special Paper-XVI)
Graph Theory (22221640-A)

Day & Date: Tuesday, 06-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Use of calculators is allowed.

Q.1 A) Select correct alternative for each of the following. 10

- 1) Convert $10110.010_{(2)}$ to decimal number = _____.
 a) 22.5 b) 2.25
 c) 225 d) 0.225
- 2) Convert $0.327_{(8)}$ to decimal number = _____.
 a) 0.4919 b) 0.4199
 c) 0.4991 d) 0.4199
- 3) A multigraph consists _____ between vertices.
 a) Both loops and parallel edges
 b) No loops but parallel edges
 c) Loops but no parallel edges
 d) No loops and no parallel edges
- 4) A vertex with zero out degree is called as _____.
 a) Source b) Initial vertex
 c) Both a and b d) Sink
- 5) A directed graph is called strongly connected if for any pair of vertices of the graph _____ of the pair are reachable from one another.
 a) Both the vertices b) At least one vertex
 c) No vertices d) None of these
- 6) A tree T with n vertices has _____ edges.
 a) n b) $n + 1$
 c) $n - 1$ d) $2n$
- 7) Repeated edges are allowed in _____.
 a) Trail b) Path
 c) Walk d) Cycle

8) The maximum number of edges in a simple graph with n vertices is ____.

- a) $\frac{n(n+1)}{2}$ b) $\frac{n-1}{2}$
 c) $\frac{n(n-1)}{2}$ d) $\frac{n(2n+1)}{2}$

9) The complete graph K_n is a regular of degree ____.

- a) $n - 1$ b) $n + 1$
 c) $n + 2$ d) n

10) A subgraph H of G is called a spanning subgraph of G if and only if ____.

- a) $V(H) = V(G)$ b) $V(H) \neq V(G)$
 c) $V(H) < V(G)$ d) $V(H) > V(G)$

B) Fill in the blanks:

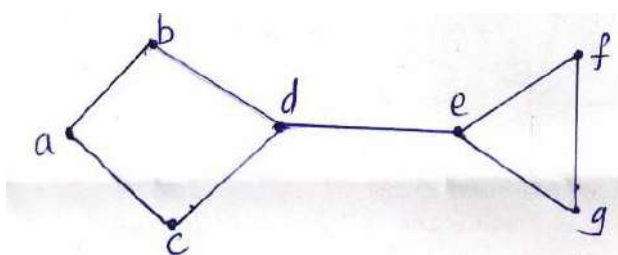
06

- a) Convert $109_{(10)}$ to binary number ____.
 b) Convert $62.24_{(8)}$ to decimal ____.
 c) Any graph $K_{1,n}$ is called ____ graph.
 d) Every non trivial tree T has at least two vertices of degree ____.
 e) A tree with ____ vertex is called a trivial tree.
 f) If $e=(u, v)$ is a directed edge in diagram then V is called ____ vertex.

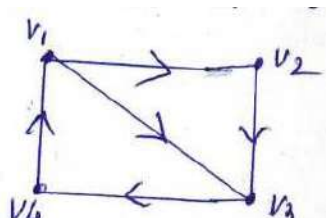
Q.2 Solve the following: (Any Eight)

16

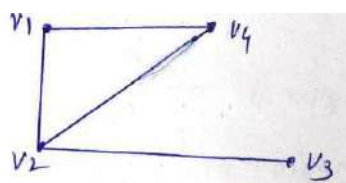
- a) Define complete and regular graph.
 b) Draw a graph of chemical molecules of propane.
 c) Draw a wheel W_3 .
 d) Find diameter of the following graph



e) Write Adjacency matrix of diagram.



f) Find spanning tree of the following graph

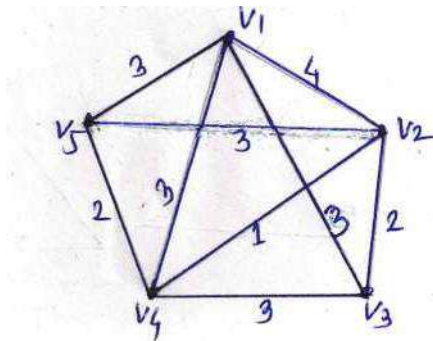


- g) Draw binary tree representation $(a+b)/c$.
- h) Convert $FA8.2_{(16)}$ to decimal.
- i) Convert $127.03125_{(10)}$ to octal.
- j) Define path with one suitable example.

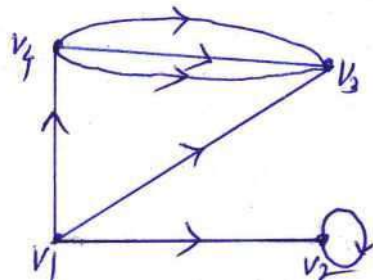
Q.3 A) Solve the following: (Any Two)

10

- a) Find the minimal spanning tree of weighted graph using Prim's algorithm.



- b) Find the in degree and out degree and total degree of each vertex of the following graph.



- c) In nondirected graph show that the total number of odd degree vertices is even.

B) Convert

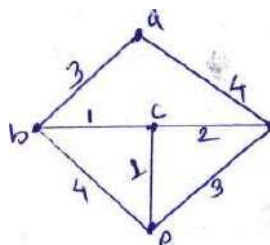
06

- a) $21.673_{(8)}$ to binary
- b) $AFCG.BE_{(16)}$ to binary

Q.4 A) Attempt the following. (Any Two)

08

- a) Show that a simple graph with n vertices and k components can not have more than $\frac{(n-k)(n-k+1)}{2}$ edges.
- b) Write short note on polish prefix and post fix notation.
- c) By using Kruskal's algorithm find minimal spanning tree of the graph

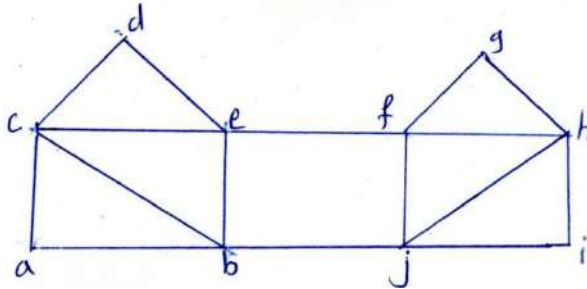


B) Convert**08**

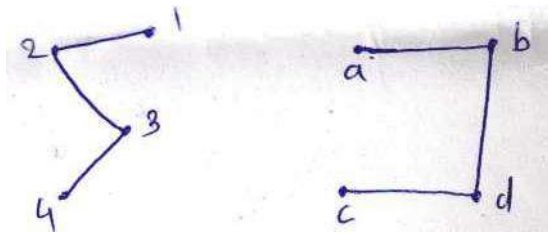
- a) $24.76_{(8)}$ to binary
- b) $110010101.1011100_{(2)}$ to hexadecimal
- c) $0.350_{(10)}$ to hexadecimal
- d) $3D59_{(16)}$ to octal

Q.5 Attempt the following. (Any Two)**16**

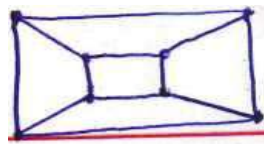
- a) Using Fleury's algorithm find Euler circuit in the graph



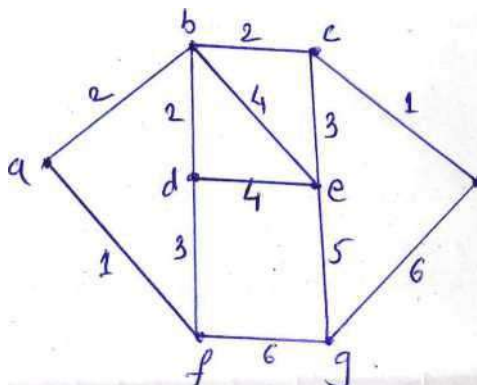
- b) 1) Show that the given pair of graphs are isomorphic



- 2) Verify Euler's formula for the graph



- c) Apply Dijkstra's algorithm to find the shortest path between the indicated vertices in the given weighted graph from a to h.



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Set P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Statistics (Special Paper - XVI)
Quality Management (22221648 - A)

Day & Date: Tuesday, 06-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagrams whenever necessary.
 3) Figures to the right indicate full marks.
 4) Use of log table and calculators is allowed.

Q.1 A) Multiple choice questions 10

- 1) Which charts are particularly more effective for sample size One?
 - a) P-charts
 - b) C-charts
 - c) $\bar{X}$ & S chart
 - d) CUSUM Chart
- 2) Which of the following is correct for λ in EWMA expression?
 - a) $\lambda > 0$
 - b) $0 < \lambda < 1$
 - c) $1 < \lambda$
 - d) $\lambda > 1$
- 3) TQM stands for _____.
 - a) Total Qualitative Management
 - b) Total Quantity Management
 - c) Total Quality Management
 - d) None of these
- 4) DMAIC is often associated with _____.
 - a) Six -Sigma
 - b) Kaizen board
 - c) Five- Sigma
 - d) Acceptance sampling
- 5) When we accept the lot in single sampling plan, _____.
 - a) $d < c$
 - b) $d \leq c$
 - c) $d > c$
 - d) None of these
- 6) Average Total Inspection for single sampling plan _____.
 - a) $n^* P + N^*(1-P)$
 - b) $n^* P_a + N^*(1-P_a)$
 - c) $N^* P + n^*(1-P)$
 - d) $N^* P_a + n^*(1-P_a)$
- 7) In double sampling plan, if the numbers of defects is in between the two cut off numbers C_1 & C_2 then _____.
 - a) Accept lot
 - b) Reject lot
 - c) Take another sample
 - d) none of these

- 8) Consumer's risk is probability of _____
 - a) Accepting lot of bad quality
 - b) Accepting lot of good quality
 - c) Rejecting lot of good quality
 - d) Rejecting lot of bad quality
- 9) Which of the following is not a Dimension of quality?
 - a) Performance
 - b) Aesthetics
 - c) check sheet
 - d) Features
- 10) Which of the following is not a component of Total Quality Management (TQM)?
 - a) Continuous improvement
 - b) Customer focus
 - c) Employee empowerment
 - d) Inspection

B) Fill in the blanks:

06

- 1) PDCA cycle stands for ____.
- 2) Control Chart is a ____.
- 3) A set of components whose functioning ensures the functioning of the system is known as ____.
- 4) Average Sample number for single sampling plan is ____.
- 5) In acceptance sampling, when there is a finite probability that the lot may be rejected even if quality is actually good is called ____.
- 6) Full form of E in the EWMA chart is ____.

Q.2 Solve the following: (Any Eight)

16

- a) Define Series System.
- b) What is histogram?
- c) Define LTPD.
- d) Differentiate between producer's risk & consumer's risk?
- e) What is the meaning of quality?
- f) State magnificent tools of statistical Process Control (SPC).
- g) Explain scatter plot or diagram in short.
- h) Define TQM?
- i) Define a Structure function of a system of n components.
- j) Define sample inspection.

Q.3 A) Solve the following: (Any Two)

10

- 1) Write note on DMAIC cycle.
- 2) Find the Relationship between Survival function and hazard function.
- 3) Derive an expression for Average Total Inspection (ATI) for a Double Sampling Plan (DSP).

B) Short notes.

06

Write a note on magnificent tool of quality- Pareto diagram.

- Q.4 A) Attempt the following. (Any Two)** **08**
- a) Find the structure function of a Series system of n components
 - b) Write a short note on OC curve.
 - c) Write the procedure of Double Sampling Plan.
- B) Explain.** **08**
- Explain Total Quality Management (TQM)
- Q.5 Solve the following:** **16**
- a) Explain Eight dimensions of quality.
 - b) Find the failure rate function (hazard rate) for a 2-out-of-3 system, where components are independent and life time T_1 of i th component is exponentially distributed with mean 100 hrs., for $i = 1, 2, 3$.
 - c) Explain the Tabular CUSUM for monitoring the process mean.

Seat No.	

Set	P

B.Sc. (Semester – VI) (New) (CBCS) Examination: March/April – 2025
Statistics (Special Paper – XVI)
Time Series Analysis and Reliability Theory (22221648-B)

Day & Date: Tuesday, 06-05-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labeled diagrams whenever necessary.
 4) Use of log table and calculator is allowed.

Q.1 A) Choose the correct alternatives from the following. 10

- 1) Seasonal variations are _____.
 a) short term variation b) long term variation
 c) sudden variation d) none of the above
- 2) Linear trend means _____.
 a) no change
 b) constant change
 c) changes are in geometric progression
 d) none of the above
- 3) Least square method _____.
 a) reduces the calculations
 b) does not give estimate of future
 c) reduces the sum of squares of errors
 d) is subjective
- 4) In time series values are arranged in _____ order.
 a) increasing b) chronological
 c) decreasing d) both a) and c)
- 5) In time series analysis the method of moving averages, is used to estimate _____.
 a) seasonal variations b) Trend
 c) cyclical variations d) irregular variations
- 6) Prosperity. Recession. Depression and Recovery in a business is an example of _____.
 a) Irregular trend b) Secular trend
 c) Cyclical trend d) Seasonal trend
- 7) A fire in a factory delaying production for some weeks is _____.
 a) Irregular trend b) Secular trend
 c) Cyclical trend d) Seasonal trend

- 8)** In moving average method, we cannot find trend values of some _____.
a) end points b) middle points
c) starting and end periods d) starting periods
- 9)** In time series analysis, method of ratio to trend is used to estimate _____.
a) Trend b) seasonal variations
c) cyclical variations d) irregular variations
- 10)** In autoregressive model we assume that _____.
a) the successive values in time series to be dependent
b) the successive values in time series to be independent
c) the regression analysis is better than time series analysis
d) the values in time series are non-normal

B) Fill in the blanks.

06

- 1) The link relative is defined as _____.
- 2) In time series additive model gives $Y =$ _____.
- 3) In time series multiplicative model gives $Y =$ _____.
- 4) Increase sales due to Diwali is due to _____ component time series.
- 5) Increasing population is _____ component of time series.
- 6) For testing of randomness _____ test is used.

Q.2 Define the following terms. (Any Eight)

16

- 1) Trend
- 2) Write note on irregular variations.
- 3) What do you mean by stationarity?
- 4) Define autocorrelation function.
- 5) Explain the term 'season'.
- 6) Describe the term 'Business cycle'.
- 7) State the four components of time series.
- 8) Write the difference between seasonal variations and cyclical variations.
- 9) Write first order moving average MA (1) model.
- 10) Write first order autoregressive model AR (1) model.

Q.3 A) Attempt any Two of the following.

10

- 1) Describe the progressive average method.
- 2) Discuss the importance and utility of time series analysis in various fields.
- 3) Describe the procedure of method of simple average.

B) Describe the procedure of single exponential smoothing.

06

Q.4 A) Solve any Two of the following.

08

- 1) Describe the procedure of double exponential smoothing.
- 2) Explain how to fit AR (1) model.
- 3) Explain moving average method.

B) Illustrate with examples of the following term.

08

- i) Secular trend
- ii) Seasonal variations
- iii) Cyclical variations
- iv) Irregular variations

Q.5 Attempt any Two of the following.

16

a) Obtain the seasonal indices for the quarters by ratio to moving average method.

Year	Quarters No.			
	I	II	III	IV
2017	37	41	33	35
2018	37	39	36	36
2019	40	41	33	31
2020	33	44	40	40

- b)** Describe the procedure of link relative method.
- c)** Describe the procedure of curve fitting least square method.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Geology (Special Paper-XVI)
Geochemistry (22221652)

Day & Date: Tuesday, 06-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) Which of the following method is used for dating relatively recent geological event?

a) K - Ar method	b) U - Pb method
c) Carbon - 14 methods	d) Rb - Sr method
- 2) The metal phase is discontinuous and the silicates are mainly plagioclase feldspar and pyroxene sometimes with accessory olivine.

a) Pallasites	b) Mesosiderites
c) Octahedrites	d) Chondrites
- 3) Which of the following mineral is most abundant in average mineralogical composition of Igneous rock.

a) Felspar	b) Pyroxene & Hornblende
c) Quartz	d) Biotite
- 4) The time that it takes a given amount of a radioactive isotope to be reduced by one-half is called the isotopes _____.

a) Radioactivity	b) Half life
c) Geochronology	d) None of the above

The small rounded bodies of chondrules consisting of hydrated iron magnesium silicate and containing up to 10% of complex organic compounds.

- 5)

a) Chondrites	b) Carbonaceous chondrites
c) Achondrite	d) None of the above
- 6) In cosmic abundance of elements, pronounced abundance peak is at atomic number _____ and smaller peaks at several other heavier atomic number.

a) 25	b) 26
c) 27	d) 28

- 7) Chalcophile elements have an affinity for a _____ phase.
 - a) Silicate
 - b) metallic liquid
 - c) sulphide liquid
 - d) Volatile
- 8) The water loving colloids are called as:
 - a) Hydrophobic
 - b) Hydrophilic
 - c) Dispersion
 - d) Emulsions
- 9) _____ elements are those which occur in very low concentrations in common rocks (usually < 0.1 % by weight).
 - a) Trace
 - b) Major
 - c) Minor
 - d) Rare earth
- 10) An alpha particle is same as?
 - a) A helium nucleus
 - b) A hydrogen nucleus
 - c) A proton
 - d) A positron

B) Fill in the blank.**06**

- 1) Different element with same neutron number but with different values of atomic weight and protons are known as _____.
- 2) Which of the following stable isotopes of hydrogen having atomic number 3:
- 3) Long -term changes in the geochemical cycle are known as _____.
- 4) The most abundant chemical element in the earth's crust is _____.
- 5) Elements which readily-form ions with an outermost 8-electron shell are:
- 6) When a minor element has small charge and ionic radius similar to a major element it is as being _____ in the crystal lattices containing the major element.

Q.2 Solve any Eight of the following.**16**

- a) Give any two examples of covalent bond.
- b) Which of the two planets rotate in retrograde rotation?
- c) Name the eight elements make up nearly 99% of the total Earth's crust.
- d) Which is the major mineral in average mineralogical composition of Igneous rocks.
- e) Write the applications of colloids.
- f) Name the types of Aerolites.
- g) Define Isomorphism.
- h) List the dating method of radiogenic isotopes.
- i) Name the elements of LILE.
- j) Define Half life period.

- Q.3 A) Answer of the following. (Any Two) 10**
- 1) Describe Ur-Th-Pb method of dating the geologic event.
 - 2) Write short note on Polymorphism with suitable example.
 - 3) Discuss in short the average chemical composition of igneous rocks.
- B) Write a note on iron meteorites. Add note on its structure. 06**
- Q.4 A) Answer of the following. (Any Two) 08**
- 1) Explain the difference between compatible and incompatible trace elements.
 - 2) Discuss the difference between ionic bonding and covalent bonding.
 - 3) Explain the carbon dating method in detail.
- B) Write short note on Geochemical cycle. 08**
- Q.5 Answer of the following. (Any Two) 16**
- a) Explain in details the composition of Meteorites.
 - b) Discuss the different types of chemical bonding. Add note on Coordination number.
 - c) Define Colloids. Explain the types of colloids and its significance.

Seat No.	

Set

P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
MICROBIOLOGY (Special Paper - XVI)
Medical Microbiology (22221664-A)

Day & Date: Tuesday, 06-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Draw neat labelled diagrams whenever necessary.
 3) Figures to the right indicate full marks.

Q.1 A) Rewrite the following sentences by selecting correct answers from given alternatives. 10

- 1) _____ antibiotic inhibits cell wall synthesis.

a) Streptomycin	b) Penicillin
c) Chloramphenicol	d) Chloroquine
- 2) Plasmodium reproduces sexually in the _____.

a) Human	b) Water
c) Mosquito	d) Stagnant water
- 3) Tuberculosis is _____ borne disease.

a) Air	b) Water
c) Food	d) Insect
- 4) Disease causing ability of organism is _____.

a) Immunity	b) Adherence
c) Pathogenicity	d) Productivity
- 5) Pyocin pigment is produced by _____.

a) Mycobacterium leprae
b) Pseudomonas aeruginosa
c) Micrococcus luteus
d) Staphylococcus aureus
- 6) Sulphonamides are inhibitor of _____.

a) Folic acid	b) Protein
c) Vitamin B12	d) Glycolipids
- 7) _____ is protozoal disease.

a) Tuberculosis	b) Prostate
c) Corona	d) Malaria
- 8) _____ bacteria is used as biological warfare agent.

a) Escherichia coli	b) Bacillus subtilis
c) Bacillus anthracis	d) Pseudomonas putida

- 9) The term vaccine was introduced by ____.
- a) Von Behring b) Louis Pasteur
b) Edward Jenner d) Robert Koch
- 10) Streptomycin inhibits ____ synthesis.
- a) Cell wall b) Protein
c) Nucleic acid d) Cell membrane

B) Answer the following:

06

- 1) Give two examples of killed vaccines.
- 2) Give the two example of antifungal agents.
- 3) What is microbial adhesion?
- 4) What is chemotherapy?
- 5) Which is causative agent of malaria.
- 6) What is meaning of Toxoids.

Q.2 Solve the following: (Any Eight)

16

- a) Define Antibiotics.
- b) What is invasion?
- c) What is prophylaxis?
- d) What is meaning of drug resistance?
- e) What is broad spectrum antibiotic?
- f) What is virulence?
- g) What is etiological agent?
- h) What is Bioweapon?
- i) Give the examples of B-lactam antibiotic.?
- j) What is attenuated vaccines?

Q.3 A) Describe in brief: (Any Two)

10

- 1) Ideal characteristics of chemotherapeutic agent.
- 2) Mechanism of bacterial invasion.
- 3) Disease caused by *Pseudomonas aeruginosa*.

B) Describe in detail action of AZT and Remdesivir.

06

Q.4 A) Write short Note. (Any Two)

08

- 1) Describe in brief bacterial toxins.
- 2) Describe in brief staphylococcal wound infections.
- 3) Describe in brief Recombinant DNA vaccines.

B) Describe in detail antifungal agents.

08

Q.5 Attempt the following. (Any Two)

16

- Describe in detail mechanism of antibiotic resistance.
- Write an essay on “Bioweapons”.
- Describe in detail disease caused by *Mycobacterium tuberculosis*.

Seat No.	

Set

P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Microbiology (Special Paper-XVI)
Clinical Microbiology (22221664-B)

Day & Date: Tuesday, 06-May-2025
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat labelled diagrams whenever necessary.
3) Figures to the right indicate full marks.

Q.1 A) Rewrite the following sentences by selecting correct answers from given alternatives. 10

- 1) Antibiotic acting on cell wall is _____.
a) Streptomycin b) Penicillin
c) Chloramphenicol d) Tetracycline
- 2) _____ is serodiagnostic test.
a) IMVIC b) MPN
c) MBRT d) VDRL
- 3) _____ is clinical sample for diagnosis of throat infections.
a) Sputum b) Urine
c) Stool d) Blood
- 4) _____ is airborne disease.
a) Malaria b) Typhoid
c) Tetanus d) Tuberculosis
- 5) Malaria is _____ disease.
a) Viral b) Bacterial
c) Fungal d) Protozoal
- 6) Pyocin pigment is produced by _____.
a) Pseudomonas aeruginosa b) Bacillus anthracis
c) Clostridium perfringens d) Mycobacterium spp
- 7) Staphylococcus aureus produces _____ enzyme useful for increasing virulence.
a) Amylase b) Coagulase
c) Protease d) Lipase
- 8) _____ drug inhibit folic acid synthesis.
a) Streptomycin b) Penicillin
c) Sulphonamide d) Chloramphenicol

- 9) Streptomycin antibiotic inhibits ____ synthesis.
a) Cell wall b) Cell membrane
c) Nucleic acid d) Protein
- 10) Mycobacterium tuberculosis is cultivated on ____ medium.
a) Blood agar b) Cetrimide agar
c) MacConkey's agar d) Levinson- Jonson

B) Answer in short:

06

- 1) Give the name of causative agent of Malaria.
- 2) What is clinical specimen?
- 3) What is Pathogenesis?
- 4) Define broad spectrum antibiotic.
- 5) What is serology?
- 6) Which specimen is used for diagnosis of urinary tract infections?

Q.2 Answer the following: (Any Eight)

16

- What is biomedical waste?
- Give the two names of drugs acting on nucleic acid.
- Which is causative agent of mucormycosis?
- How the pus is collected for diagnosis?
- What is bacterial invasion?
- What is antibiotic resistance?
- Define chemotherapeutic agent.
- Which toxins are produced by *Clostridium perfringens*?
- What are mycotic infections?
- Which is causative agent of yellow fever?

Q.3 A) Attempt the following: (Any Two)

10

- 1) Describe in brief yellow fever.
- 2) Describe the basis principles of Microbial adhesion.
- 3) Describe the ideal characteristics of chemotherapeutic agents.

B) Describe in short Antibiotic sensitivity test.

06

Q.4 A) Attempt the following. (Any Two)

08

- 1) Explain the staphylococcal wound infections.
- 2) Comment on disposal of biomedical waste.
- 3) Describe in brief Mechanism and pathogenecity of viral infections.

B) Describe in detail Tuberculosis.

08

Q.5 Attempt the following. (Any Two)

16

- Describe in brief various diagnostic methods.
- Describe in detail Malaria.
- Describe in detail mechanism of action of different chemotherapeutic agents.

Seat No.	

Set

P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Microbiology (Special Paper - XVI)
Health Microbiology (22221664-C)

Day & Date: Tuesday, 06-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat diagrams and give equations whenever necessary.
 3) Figures to the right indicate full marks.

Q.1 A) Multiple choice questions. 10

- 1) Which bacterial structure is primarily involved in adhesion to host cells?
 - a) Ribosome
 - b) Flagella
 - c) Pili and fimbriae
 - d) Nucleus
- 2) Penicillin is Drug acting on _____.
 - a) Cell Wall
 - b) Cell Membrane
 - c) Nucleic acid synthesis
 - d) None of the above
- 3) Bactericidal agents _____.
 - a) Kill bacteria
 - b) Prevent bacterial multiplication
 - c) Both a & b
 - d) None of the above
- 4) Which of the following is an example of the live vaccine?
 - a) pertusis
 - b) cholera
 - c) mumps
 - d) rabies
- 5) Chloramphenicol does not affect the eukaryotic cells because _____.
 - a) They have 30 S ribosomes
 - b) They have mitochondria
 - c) They have 80 S ribosomes
 - d) None of the above
- 6) Antibiotics used for the treatment of cholera is _____.
 - a) Tetracycline
 - b) Penicillin
 - c) Streptomycines
 - d) None of these
- 7) *Bacilli Calmette Guerin* (BCG) contains the avirulent strains of _____.
 - a) Human tubercle bacilli
 - b) Avian tubercle bacilli
 - c) Bovine tubercle bacilli
 - d) A typical mycobacteria
- 8) *Pseudomonas aeruginosa* Causes _____.
 - a) blue pus
 - b) black pus
 - c) yellow pus
 - d) orange pus

- 9) Causative agent of Tineanigra
 a) *Malassezia furfur* b) *Exophialawerenekii*
 c) *Candida albicans* d) *Aspergillusflavus*
- 10) The main causative organism of gas gangrene is _____.
 a) *B. anthrax* b) *Clostridium tetani*
 c) *Cl.deficile* d) *Cl.perfringens*

B) Give short answers of the following: 06

- 1) Give example of endotoxin.
- 2) What are the symptoms of tuberculosis?
- 3) Which test is used to determine antibiotic susceptibility?
- 4) Give example of antifungal agent.
- 5) What is a common mechanism of viral pathogenicity?
- 6) What is the primary purpose of a vaccine?

Q.2 Answer the following: (Any Eight) 16

- a) Define Pathogenicity
- b) Give Examples of Bacterial Exotoxin.
- c) What is the mode of transmission of Cholera.
- d) Name the causative agent of Mucormycosis.
- e) Define vaccine.
- f) Give two examples of bioweapons.
- g) Give two examples of drugs acting on protein synthesis.
- h) Give two examples of drugs acting on cell wall.
- i) What are the advantages of Bioweapons?
- j) Define MIC.

Q.3 A) Write Short Notes: (Any Two) 10

- 1) Differentiate between Endotoxin and Exotoxin.
- 2) Write a note on the transmission mechanism of Rocky Mountain spotted fever.
- 3) Describe in detail staphylococcal wound infections.

B) Write a note on Ideal characteristics of Chemotherapeutic agents. 06

Q.4 A) Attempt the following. (Any Two) 08

- 1) Differentiate between Attenuated and killed vaccines.
- 2) Write a note on the Basic principles of Microbial adhesion.
- 3) Write a note on Drugs acting on Nucleic acid Synthesis.

B) Write a note on antibiotic susceptibility testing. 08

Q.5 Attempt the following. (Any Two) 16

- a) Write an essay on Malaria.
- b) Describe in detail Antibiotic Resistance with special emphasis on Mechanism and impact.
- c) Write a note on drugs acting on folic acid metabolism.

Seat No.	

Set P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
ELECTRONICS (Special Paper - XVI)
Virtual Instrumentation (22221680-A)

Day & Date: Tuesday, 06-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Draw neat labelled diagrams whenever necessary.
 3) Figures to the right indicate full marks.

Q.1 A) Multiple choice questions: 10

- 1) LabVIEW can command plug-in data acquisition devices to generate ____ signals.
 - a) analog
 - b) digital
 - c) both a) and b)
 - d) none of these
- 2) Software Layer Diagram consists _____.
 - a) Application software
 - b) Test and Data management software
 - c) Measurement and control software
 - d) all of these
- 3) Data structure that groups data together is called as _____.
 - a) Loop
 - b) Charts
 - c) Cluster
 - d) None of these
- 4) Quad unsigned integer numbers have ____ bits of storage.
 - a) 16
 - b) 32
 - c) 64
 - d) 128
- 5) ____ programs are called virtual instruments.
 - a) C
 - b) LabVIEW
 - c) C++
 - d) None of these
- 6) ____ adjustments is usually adjusted first in an instrument requiring calibration.
 - a) Dead band
 - b) Span
 - c) Hysteresis
 - d) Zero
- 7) ____ is the default format for numeric objects.
 - a) Double precision
 - b) Single precision
 - c) Virtual precision
 - d) External precision

- 8) LabVIEW is essentially a ____ language.
 - a) java
 - b) C++
 - c) G
 - d) Python
- 9) A sensor module principally consists of _____.
 - a) input
 - b) signal conditioning part
 - c) A/D convertor
 - d) all of these
- 10) Tradition instruments are _____.
 - a) user defined
 - b) vendor defined
 - c) low cost
 - d) application oriented

B) State True or false:

06

- 1) Floating point is a numeric data type that represents a set of rational numbers using binary digits or bits.
- 2) A bridge circuit uses comparison method of measurement.
- 3) An actuator is a device that activates process control equipment by using hydraulic power.
- 4) Decreasing application software development time cost is disadvantage of VI.
- 5) In LabVIEW green colour represents Boolean data.
- 6) Error clusters contain all error conditions.

Q.2 Solve the following: (Any Eight)

16

- a) What is the importance of VI?
- b) Draw the block diagram of DAS.
- c) State the full form of IDE and DAS.
- d) Explain the role of tunnel in a loop.
- e) Name the three parts of LabVIEW.
- f) What are the features of signal conditioning?
- g) State Layers of Virtual Instrumentation.
- h) What is module or Sub VI?
- i) Explain PSPICE.
- j) Write a note on case structure.

Q.3 A) Solve the following: (Any Two)

10

- 1) Explain in detail Feedback node and Formula node with suitable examples.
- 2) Explain advantages of LabVIEW.
- 3) Explain the advantages of Virtual Instruments versus Traditional Instruments.

B) Explain Importance of VI.

06

- Q.4 A) Attempt the following. (Any Two) 08**
- 1) Explain the steps to create Sub-VI in LabVIEW.
 - 2) Discuss in detail about While and For Loops with Examples.
 - 3) Explain formula nodes for virtual instrumentation.
- B) Explain designing of virtual instrumentation using LabVIEW for temperature controlling. 08**
- Q.5 Attempt the following. (Any Two) 16**
- a) Give the detailed explanation of tools palette, functions palette, and control palette with diagrams.
 - b) Explain virtual instrumentation programming techniques of labview.
 - c) Write a note on data- flow techniques. Explain graphical programming in data flow.

Max. Marks: 80

Q.1 A) Choose the correct alternative and rewrite the sentence: 10

- Page 1 of 3

- 8) In mobile phones SIM stands for _____.
 a) system identity module b) source identity module
 c) subscriber identity module d) substitute identity module
- 9) A specialized cable designed to transmit alternating current of radio frequency is known as _____.
 a) transmission line b) coaxial cable
 c) shield coax d) twisted pair
- 10) _____ wireless technology is used to exchange data between devices over short distances.
 a) Wi-Fi b) Bluetooth
 c) NFC d) Zigbee

B) Give the Answer in one word.**06**

- 1) The term WWW is the abbreviation for _____.
- 2) _____ is a Transferred Electron Device.
- 3) The term LASER is the abbreviation for _____.
- 4) The refractive index of cladding is _____ the refractive index of core.
- 5) The working principle of the microwave tube is based on _____ modulation.
- 6) The term Wi-Fi is the abbreviation for _____.

Q.2 Solve the following: (Any Eight)**16**

- a) Define Bit rate and Baud rate.
- b) State the condition for total internal reflection.
- c) State the function of intrinsic layer in pin diode.
- d) What is transponder?
- e) Define uplink and downlink frequency in satellite communication.
- f) What is cavity resonator?
- g) What do you mean by computer networking? What are its types?
- h) What is Network topology? What are its types?
- i) What is roll of control unit in cell phone?
- j) Define cell in the mobile communication.

Q.3 A) Attempt any two of the following questions.**10**

- 1) With constructional diagram explain working of p-i-n diode.
- 2) With the help of block diagram explain earth station in satellite communication.
- 3) Explain strip line and micro strip line.

B) Give the construction and working of the LASER diode.**06**

- Q.4 A) Attempt any two of the following questions. 08**
- 1) Compare Laser and LED optical sources.
 - 2) Explain cell phone with necessary block diagram.
 - 3) Discuss the application of satellite communication.
- B) With concept of velocity modulation explain construction and working of Klystron tube. 08**
- Q.5 Attempt any two of the following questions. 16**
- a) With suitable diagram explain Bus and Star topologies.
 - b) Explain pulsed radar system with the help of block diagram.
 - c) What is optical fiber? What are its types? Explain in brief Graded Index fiber.

Seat No.	

Set	P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Computer Science (Special Paper - XVI)
Advanced Python (22221672- A)

Day & Date: Tuesday, 06-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Choose correct alternatives. 10

- 1) Which widget in Tkinter is used as a container to organize other widgets?
 - a) Canvas
 - b) Label
 - c) Frame
 - d) Entry
- 2) _____ SQL command is used to delete records from a table in MySQL.
 - a) delete
 - b) insert
 - c) select
 - d) drop
- 3) _____ command is used to install NumPy.
 - a) pip install matplotlib
 - b) pip install NumPy
 - c) pip matplotlib
 - d) none of these
- 4) from _____ you can create a DataFrame in Pandas Python.
 - a) python list
 - b) Excel file
 - c) CSV file
 - d) all of these
- 5) Which function is used to create a line plot in Matplotlib?
 - a) plt.bar()
 - b) plt.scatter()
 - c) plt.plot()
 - d) plt.pie()
- 6) What is the purpose of the groupby() function in Pandas?
 - a) To filter data
 - b) To aggregate data
 - c) To sort data
 - d) To merge data
- 7) _____ Python module is commonly used to connect to a MySQL database.
 - a) sqlite3
 - b) psycopg2
 - c) cx_Oracle
 - d) None of these
- 8) _____ SQL command is used to update records from a table in MySQL
 - a) delete
 - b) insert
 - c) select
 - d) update

- 9)** _____ method is used to fetch one row from the result of an executed query.
- a) cursor.fetchall() b) cursor.fetchrows()
c) cursor.fetchone() d) cursor.fetchallrows()
- 10)** Which of the following cannot be used to create a DataFrame in Pandas?
- a) Python dictionary b) JSON file
c) Excel file d) none of the above

B) Fill in the blank.

06

- 1) bind is used to bind an event to a widget in Tkinter.
- 2) Tkinter is the standard GUI library for Python.
- 3) In Django, urls.py file contains the URL configurations.
- 4) In Matplotlib, plot function is used to plot a graph.
- 5) What is the output of `np.zeros(5)` in NumPy?
- 6) read_csv function is used to read a CSV file in Pandas.

Q.2 Solve any Eight of the following.

16

- a) Write a list of methods in NumPy.
- b) What is Django?
- c) Define a Series in Pandas.
- d) What is Seaborn?
- e) What is the difference between a NumPy array and a Python list?
- f) What is a cursor?
- g) Write a note on place layout.
- h) What are Django form fields?
- i) Write a note on Line plots in Matplotlib.
- j) How can you create a DataFrame from a list of dictionaries?

Q.3 A) Attempt any Two of the following.

10

- 1) Write a GUI program for the addition of two numbers.
- 2) Write a short note on Button.
- 3) Explain the features of matplotlib. Write Different Types of Plots in Matplotlib.

B) Explain the process of executing SQL queries in Python and MySQL.

06

Q.4 A) Attempt any Two of the following.

08

- 1) Explain the different functions used in the Pandas Series.
- 2) Explain histogram with an example.
- 3) Write a GUI program for insert record in student table.

B) Explain pack Layout Management in Tkinter with example.

08

Q.5 Attempt any Two of the following.**16**

- a)** Explain the key features of Tkinter in detail. Write process for bind event.
- b)** Explain Features of Pandas. Write a program to create DataFrame and series.
- c)** Create a Django application for login page.
(Write urls.py, views.py and template.)

Seat No.	

Set

P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
COMPUTER SCIENCE (Special Paper - XVI)
Mobile Application Development Using Kotlin (22221672-B)

Day & Date: Tuesday, 06-May-2025
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat labelled diagrams whenever necessary.
3) Figures to the right indicate full marks.

Q.1 A) Chose correct alternative: 10

- 1) ____ Tool in Android Studio allows you to test and debug Android applications.
a) Android Emulator b) Virtual Machine
c) Xcode d) Eclipse
- 2) Which Android widget is used to display a single piece of text on the screen?
a) TextView b) Button
c) EditText d) CheckBox
- 3) Which file is used to define the UI layout?
a) MainActivity.java b) AndroidManifest.xml
c) activity_main.xml d) build.gradle
- 4) ____ is used in android as a virtual machine.
a) Dalvik virtual machine b) PVM
c) Virtual Box d) None of these
- 5) ____ is a UI component in Android.
a) Button b) Window
c) Database d) Toast
- 6) Which of the following is not an example of an Android view?
a) Button b) TextView
c) ImageView d) Service
- 7) ____ is used for background tasks in Android.
a) Activity b) Service
c) Content Provider d) Intent

- 8) What is the primary purpose of the AndroidManifest.xml file?
 - a) To store app data
 - b) To define app components and permissions
 - c) To design the UI
 - d) To handle user interactions
- 9) Which method is used to retrieve data from a database in Android?
 - a) insert()
 - b) update()
 - c) query()
 - d) delete()
- 10) Which format is used to generate a signed APK?
 - a) ZIP
 - b) APK
 - c) JAR
 - d) PDF

B) Fill in the blanks:**06**

- 1) _____ is the default layout for a new Android project.
- 2) _____ is the purpose of the setOnClickListener() method in Android?
- 3) _____ is the purpose of the onCreate() method in SQLiteOpenHelper?
- 4) The _____ file contains essential information about your app like permissions and activities.
- 5) To pass data between two activities, we use the _____ method of Intent.
- 6) A helper class called _____ is used to manage SQLite databases in Android.

Q.2 Solve the following: (Any Eight)**16**

- a) What is android?
- b) What is service in android?
- c) Define use of intent in android.
- d) What is view?
- e) What is android application?
- f) What is Shared Preferences?
- g) What is context?
- h) What is the role of the AndroidManifest.xml file in an Android project?
- i) What is the role of SQLiteOpenHelper in database operations?
- j) Write a list of service lifecycle methods.

Q.3 A) Solve the following: (Any Two)**10**

- 1) Explain Android Project Structure (project and app directory)
- 2) Explain SharedPreferences in Android. How is it used for storing simple data?
- 3) Explain Android app components with examples.

B) Explain ConstraintLayout in detail.**06**

- Q.4 A) Attempt the following. (Any Two) 08**
- 1) Explain -Buttons, text fields, labels and checkbox.
 - 2) Explain App optimization and performance.
 - 3) Explain broadcast receiver.
- B) Explain classes used in connectivity? Explain use of SQLite Database. 08**
- Q.5 Attempt the following. (Any Two) 16**
- a) Write an android application for the addition of two numbers.
 - b) Describe the lifecycle of an Android Activity.
 - c) What is a Fragment in Android? How is it different from an Activity?

Set	P

B.Sc. (Semester - VI) (New) (CBCS) Examination: March/April - 2025
Computer Science (Special Paper - XVI)
Data Visualization using Power BI (22221672-C)

Day & Date: Tuesday, 06-May-2025
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Multiple choice questions **10**

- 1) You are creating a report to help the sales team analyze its performance and understand the key factors motivating sales. The team requires a single visualization that clearly highlights the elements influencing success.

Which type of visualization would best?

 - a) Key Influencers
 - b) Funnel Chart
 - c) Q&A
 - d) Line Chart
- 2) You import a large dataset to Power Query Editor. You need to identify whether a column contains only unique values. _____ data preview option used.

 - a) Show unique
 - b) Column distribution
 - c) Column profile
 - d) Both b and c
- 3) What is the purpose of the “Detect Data Type” feature in Power Query?

 - a) To automatically detect the correct data type for each column.
 - b) To automatically clean up the data
 - c) To categorize data
 - d) None of the above
- 4) What file extension is used for Power BI Desktop files?

 - a) .pbi
 - b) .pbx
 - c) .pbix
 - d) .pbd
- 5) _____ feature gives you quality indicators (Empty/Error/Valid) for each column?

 - a) Column profile
 - b) Column stats
 - c) Column quality
 - d) Value Distribution
- 6) _____ function counts non-empty values in a column?

 - a) COUNTA()
 - b) COUNT()
 - c) COUNTROWS()
 - d) DISTINCTCOUNT()

- 7) _____ visual uses slices of a circle to show proportions?
 - a) Donut chart
 - b) Table
 - c) Line chart
 - d) Card
- 8) Conditional formatting is used to _____.
 - a) Create charts
 - b) Highlight data based on rules
 - c) Build relationships
 - d) Hide columns
- 9) _____ visualization is best for comparing numerical values across categories?
 - a) Pie chart
 - b) Line chart
 - c) Bar chart
 - d) Scatter chart
- 10) What is the purpose of the SUMX function in DAX?
 - a) Calculates the average of a column
 - b) Returns the maximum value
 - c) Creates a running total
 - d) Performs a row-by-row calculation before aggregation

B) Fill in the blank.

06

- 1) A _____ table is used in Power BI to create relationships between different tables.
- 2) _____ is used in Power BI to transform and clean data.
- 3) _____ charts are used to show proportions in Power BI.
- 4) _____ relationships filter data in both directions.
- 5) _____ visuals can show hierarchical data like drill-downs.
- 6) A KPI visual compares current value with a _____.

Q.2 Solve any Eight of the following.

16

- a) What are the different views in Power BI Desktop?
- b) List out some drawbacks/limitations of using Power BI.
- c) What are the various types of users in Power BI?
- d) What is Power BI Q&A?
- e) Define left anti join.
- f) Define use of clustered column chart.
- g) What are the different types of filters in Power BI reports?
- h) What are the three Edit interactions options of a visual tile in Power BI Desktop?
- i) What is the difference between ALL and ALLEXCEPT in DAX?
- j) What are the available views in power BI desktop?

Q.3 A) Write a short note on any Two of the following. 10

- 1) What is the use of the "Get Data"? Explain type of data sources can you connect to the Power BI?
- 2) What are the different types of relationships? How do you create relationships in Power BI?
- 3) Difference between calculated Measure and calculated column?

B) What is role of the join? Explain different types of joins in Power BI? 06

Q.4 A) Attempt any Two of the following. 08

- 1) What is DAX? What are the three fundamental components of DAX?
- 2) How is the FILTER function used? Explain with example.
- 3) Difference between Append and Merge queries?

B) Explain the major components of Power BI? 08

Q.5 Attempt any Two of the following. 16

- a) What is a KPI visual in Power BI? Explain its components and use cases with an example.
- b) Describe the purpose and limitations of pie and donut charts with an example.
- c) Consider following employee dataset and write a DAX queries for the following question.

Stud_ID	Name	Gender	Enrollment Date	Department	Marks	City
1	Anjali Verma	F	2019-07-10	Science	85	Mumbai
2	Rahul Singh	M	2018-08-01	Commerce	73	Delhi
3	Sneha Sharma	F	2020-09-15	Arts	92	Mumbai
4	Karan Patel	M	2017-07-18	Science	68	Ahmedabad
5	Meena Choudhury	F	2021-01-10	Commerce	77	Delhi
6	Deepak Yadav	M	2019-07-20	Arts	80	Lucknow
7	Priya Kulkarni	F	2018-06-15	Science	90	Pune
8	Arjun Deshmukh	M	2020-08-25	Commerce	88	Pune
9	Ritu Sharma	F	2022-01-05	Arts	95	Jaipur
10	Nikhil Khanna	M	2019-09-10	Science	70	Lucknow

- a) Calculate the total students by city.
- b) Calculate the average marks of male and female students.
- c) List all students from the city of Pune.
- d) Calculate how many students have scored more than 80 marks.
- e) Create a new calculated column to find the month of enrollment.
- f) Show the average marks of students by department.
- g) To count students whose names, start with 'A'.

Seat No.	

Set	P

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
English (Compulsory)
Literary Mindscapes-I (19201600)

Day & Date: Wednesday, 30-April-2025
 Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 Answer the following question by choosing the correct option. 08

- 1) The members of _____ were coming to afternoon tea at Quick Family.
 - a) Welfare committee
 - b) Warfare committee
 - c) Children committee
 - d) Old age committee
- 2) Aksionov was fond of _____ when he young.
 - a) dancing
 - b) singing
 - c) reading
 - d) wrestling
- 3) _____ children were listening the story narrated by their mother.
 - a) One
 - b) Three
 - c) Four
 - d) Five
- 4) _____ was the painter of the Duchess's portrait.
 - a) Aphra Pandolf
 - b) Fra Pangol
 - c) Aphra Behn
 - d) Fra Pandolf
- 5) The poet refers to the grandeur of _____ in the poem 'Ode to Beauty'.
 - a) dooms of mighty dead
 - b) tombs of our ancestors
 - c) grand palaces
 - d) grand towers
- 6) She hurt her shoulder _____ riding the bicycle.
 (Choose the correct adverb) - **(before / while)**
- 7) Rani said, "I must complete the assignment."
 (Choose the correct indirect speech)
 - a) Rani said that she had to complete the assignment.
 - b) Rani was saying she should complete the assignment.
 - c) Assignment was to be completed by Rani.
 - d) None
- 8) Complete the following line
 'A thing of beauty is a _____ forever'.
 - a) cheerful
 - b) unhappiness
 - c) joy
 - d) truth

- Q.2 Answer the following questions in short. (Any Four) 12**
- a) What did Robert Quick expect from his children?
 - b) What is the significance of Aksionov's wife's dream?
 - c) What is the tragic story told by the narrator in the poem 'Sita'?
 - d) Describe the personality of the duchess.
 - e) What are the things of beauty mentioned in the poem, 'Ode to Beauty'?
 - f) What is 'Life' according to the poetess Charlotte Bronte?
- Q.3 Answer the following questions. (Any One) 10**
- a) How can literary skills help the learners in the future?
 - b) Why is life skill needed to become a good leader?
- Q.4 Mention four habits which show that you are conscious of the environment and understand the need to conserve it. 10**

Set	P

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Physics (Paper-XIV)
Electrodynamics (19201619)

Day & Date: Sunday, 18-May-2025
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Draw neat labelled diagrams wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log table and calculators is allowed.

Q.1 A) Multiple choice questions.

10

- 1) Intensity of radiation along the axis of electric dipole is _____.
a) Zero b) Maximum
c) Infinity d) Minimum
- 2) The EM energy crossing per unit area in unit time is called _____.
a) Poynting's vector b) Energy density
c) Polarisation vector d) Propagation vector
- 3) The Cyclotron frequency of a charged particle in magnetic field 'B' depends upon _____.
a) specific charge (q/m) b) magnetic field strength
c) none of the above d) both a & b
- 4) Maxwell's equations verify _____ nature of light.
a) Longitudinal b) Transverse
c) Elliptical d) Circular
- 5) Light is an _____ wave.
a) Magnetic b) Electric
c) Electromagnetic d) Monochromatic
- 6) The trajectory of a charged particle moving in crossed uniform, constant electric & magnetic fields are _____.
a) Ellipse b) Cycloid
c) Parabola d) Circle
- 7) The equation for critical angle of incidence is given by
 $\theta_c = \sin^{-1}(n_2/n_1)$ where _____.
a) $2 n_2 = n_1$ b) $n_2 > n_1$
c) $n_1 < n_2$ d) $n_2 = n_1$

- 8) Propagation constant is given by _____
 a) $k = 2\pi\lambda$ b) $k = 2\pi/\lambda$
 c) $k = \lambda/2\pi$ d) $k = 1 / 2 \pi \lambda$
- 9) Self-inductance per unit length of long solenoid with n turns per unit length and cross section area A is _____
 a) μ_0 / nA b) $A\mu_0 n$
 c) $\mu_0 n^2 A$ d) $A n/\mu_0$
- 10) Equation of Continuity is _____
 a) $\nabla \cdot J = - \frac{\delta \rho}{\delta t}$ b) $\nabla \times J = - \frac{\delta \rho}{\delta t}$
 c) $\nabla \cdot J = - \delta \rho / \delta t$ d) $\nabla \cdot J = - \phi$

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. 06

- 1) The statement 'magnetic free poles do not exist', is justified by Maxwell's equation _____
- 2) Do EM waves travel in water?
- 3) Velocity of light in vacuum is _____
- 4) What does propagation vector indicate?
- 5) Are sound waves are Electromagnetic waves?
- 6) State Poisson's equation.

Q.2 Solve any Eight of the following. 16

- 1) Draw the graphical representation of Electromagnetic wave.
- 2) State Faraday's laws of induction.
- 3) Define Electric dipole moment.
- 4) Define Impedance and state its unit.
- 5) State any two properties of Electromagnetic waves.
- 6) Define volume density of charge.
- 7) Define permeability of magnetic material.
- 8) Define displacement current density D .
- 9) What do you mean by emf?
- 10) State Ampere's circuital law.

Q.3 A) Attempt any Two of the following. 10

- 1) Explain Maxwell's correction to Ampere's circuital law.
- 2) Derive an expression for Retarded Time & Retarded potential.
- 3) Derive Newmann's formula.

B) Short note/Solve 06

Write a note on total internal reflection.

Q.4 A) Attempt any Two of the following. 08

- 1) Explain the concept of Self-inductance and Mutual inductance.
- 2) Obtain an expression for total power radiated by an electric dipole.
- 3) Derive different form of Gauss law in Electrostatics.

B) Describe/Explain/Solve**08**

Define Reflection coefficient and transmission coefficient of EM wave. Calculate the Reflection coefficient and Transmission coefficients for normal incidence at water-air-interface. Given: Refractive index of water is 1.33 and Refractive index of air is 1.0

Q.5 Attempt any Two of the following.**16**

- a) Obtain the boundary conditions for EM field vectors D , E , B and H at the interface of two media.
- b) Considering plane wave solutions for electromagnetic waves through conductors, show that the propagation vector is a complex quantity
- c) Obtain the solution of Laplace's equation in spherical coordinate system, when potential is independent of azimuthal coordinate.

Day & Date: Sunday, 18-May-2025
Time: 03:00 PM To 06:00 PM

Instructions:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw neat diagrams and give equations wherever necessary.
- 4) Use of logarithmic tables and scientific calculator is allowed.

1) Vibrational spectra of diatomic molecule is observed in _____ region.

- a) Visible b) Near infrared
c) Microwave d) X-ray

2) As wavelength of radiation is increases, the energy of that radiation is

- a) Increases b) Decreases
c) Remains same d) None of these

3) The solutions which do not obey Raoult's law at all concentrations and temperatures are called as

- a) Ideal b) Non ideal
c) Binary d) None of these

4) The liquid mixture which boils at constant temperature without change in its composition is called azeotropic mixture.

- a) Zeotropic b) Fractional
c) Boiling d) Azeotropic

5) At constant pressure $dG = vdp - sdT$, then $\left(\frac{dG}{dT}\right)_p =$ _____

- a) S b) V
c) -S d) -p

6) The variation of melting point of solid with pressure is given by equation.

- a) Clapeyron clausius b) Arrhenius
c) Kirchhofs d) Gibbs

7) The work Function(A) is defined as

- a) $A=E+TS$ b) $\overline{A=H-TS}$
c) $A=E-TS$ d) $A=G+TS$

8) The temperature coefficient of most of the reactions lies between _____

- a) 1 and 2 b) 2 and 3
c) 3 and 4 d) 2 and 4

9) In a reaction, $2A + B \rightarrow C + D$. The molecularity of the reaction is _____

- a) 2 b) 0
c) 3 d) 1

10) Reactions which proceed in a series of successive stages initiated by suitable primary processes are called _____

- a) Opposing reactions b) Chain reactions
c) Parallel reactions d) Consecutive reactions

B) Fill in the blanks

06

- 1) Reactions which proceed in more than one way giving different sets of products are known as _____ reactions.
- 2) Selection rule for rotational spectra is _____
- 3) At equilibrium free energy change is _____
- 4) The temperature at which vapour pressure of liquid becomes equal to the atmospheric pressure is known as _____
- 5) The distance between two nearest crests or troughs is known as _____
- 6) The term fugacity has the dimension of _____

Q.2 Solve any Eight of the following

16

- 1) State Raoult's law
- 2) Define critical solution temperature.
- 3) Give the applications of rotational spectra.
- 4) Define consecutive reactions.
- 5) What is meant by Rayleigh scattering.
- 6) Define energy of activation.
- 7) Give any two applications of the Clausius-Clapeyron equation.
- 8) State law of mass action.
- 9) Define the terms fugacity and activity.
- 10) Define the terms wavelength and wave number.

Q.3 A) Attempt any two of the following

10

- 1) Describe in brief rotational spectra of diatomic molecule.
- 2) Discuss the fractional distillation of solutions of liquids in liquids with minimum boiling point.
- 3) Give the characteristics of third order reaction.

B) The equilibrium constant K_P for a reaction at 373K is 0.06 and at 403K it is 0.5953. Calculate the enthalpy change. (Given $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)

Q.4 A) Attempt any Two of the following. 08

- 1)** Distinguish ideal and non-ideal solutions.
- 2)** What is Arrhenius equation? How it is used to determine the value of energy of activation.
- 3)** Explain how the bond length of a diatomic molecule can be determined from the rotational spectra.

B) The rate of reaction gets double from 295k to 305k. calculate the energy of activation. (Given $R=8.314 \text{ JK}^{-1}\text{mol}^{-1}$) 08

Q.5 Attempt any Two of the following 16

- a)** Explain the variation of mutual solubility of partially miscible liquids with maximum critical solution temperature.
- b)** Derive thermodynamically vant hoff reaction isochore.
- c)** Define third order reaction. Derive an expression for the third order reaction when the initial concentration of all reactants is same.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Botany (Special Paper-XIII)
Plant Pathology (19201601)

Day & Date: Sunday, 18-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat and labelled diagrams wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of log table and calculators is allowed.

Q.1 A) Multiple Choice Questions. 10

- 1) The word pathology has been derived from _____ words Pathos means suffering.
 - a) Greek
 - b) Latin
 - c) both a and b
 - d) none of these
- 2) According to Stakman and Harrar 1957 plant disease is the _____ disorder.
 - a) Genetical
 - b) Physiological
 - c) Chemical
 - d) Biological
- 3) Plant disease show the _____ valuable symptoms is known as syndrome.
 - a) One
 - b) Zero
 - c) Several
 - d) All of these
- 4) Example of necrotic disease is _____.
 - a) Wilt
 - b) Blight
 - c) Mildew
 - d) All of these
- 5) Complete development of tissue or organ is known as _____.
 - a) Restoration
 - b) Callus
 - c) Sarcody
 - d) Bladder
- 6) Causal organism of the fruit rot of cucurbits disease is _____.
 - a) Albugo
 - b) Pythum
 - c) Cercospora
 - d) Puccinia
- 7) Example of mosaic virus is _____.
 - a) Tomato
 - b) Tobacco
 - c) both a and b
 - d) none of these

- 8)** Control measures of citrus canker are _____
 - a) Bordeaux
 - b) Streptomycin
 - c) Neem cake
 - d) All of these
- 9)** Oily spot disease occurs on _____
 - a) Pomegranate
 - b) Lemon
 - c) Bean
 - d) Wheat
- 10)** Maharashtra was the first State to establish an official Seed Certification Agency during _____
 - a) 1972
 - b) 1971
 - c) 1973
 - d) 1970

B) Fill in the Blanks.

06

- 1) plant pathology is that branch of _____
- 2) An organism that bears the activities of a parasite is known as _____
- 3) _____ is the first step in the contact of the inoculum with the host.
- 4) A virulent organism is considered to have a high capacity of _____
- 5) The implies exemption from infection by pathogen is known as _____
- 6) The disease occur all over the world is known as _____.

Q.2 Solve any eight of the following

16

- 1) What is smut?
- 2) Give the definition of blight.
- 3) What is mean by downy mildew?
- 4) Define seed certification.
- 5) Give the causal organism of citrus canker
- 6) What is symptoms?
- 7) Write the definition of necrotic.
- 8) What is plant pathology?
- 9) Give the definition of susceptible.
- 10) Define resistance.

Q.3 A) Attempt any two of the following.

10

- 1) Give the causes of disease.
- 2) Write the importance of plant disease.
- 3) Explain the disease cycle and control measures of Brown spot of Maize.

B) Write short notes any two of the following

06

- 1) Symptoms of Citrus canker
- 2) Control measure of Tobacco mosaic
- 3) Mode of transmission of Telya disease

Q.4 A) Attempt any two of the following

- 1) Explain the symptoms and causal organism of Little leaf of Brinjal.
- 2) Write the symptoms and control measures of Red rot of Sugarcane.
- 3) Describe the disease cycle and control measures of Tikka disease of Groundnut.

B) Attempt any two of the following**08**

- 1) Describe the seed treatment studied by you.
- 2) Write the seed certification.
- 3) Explain the scope of aerobiology.

Q.5 Attempt any two of the following**16**

- a) Explain the symptoms, causal organism, disease cycle and control measures of Wilt of Pigeon pea.
- b) Describe the symptoms, causal organism, disease cycle and control measures of Smut of Jowar.
- c) Give the symptoms, causal organism, disease cycle and control measures of White rust of Crucifers.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (Old) (CBCS): Examination March/April - 2025
Zoology (Special Paper-XIII)
Animal Physiology: Life Sustaining Systems (19201627)

Day & Date: Sunday, 18-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagrams wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of log table and calculators s allowed.

Q.1 A) Multiple choice questions.**10**

- 1) Systole is _____ phase of human heart.
 a) Contraction b) Initial
 c) Relaxation d) Final
- 2) Pacemaker of heart is _____.
 a) AV node b) SA node
 c) Bundles of Hiss d) Purkinje Fibre
- 3) Individuals with blood group _____ have both antigen A and B.
 a) AB b) O
 c) A d) B
- 4) Antigen _____ is also called as Rh factor.
 a) A b) B
 c) D d) AB
- 5) In _____ cells nucleus is absent in Human beings.
 a) Basophills b) Neutrophills
 c) Lymphocytes d) Red blood corpuscles.
- 6) _____ type of digestion is found in all vertebrates.
 a) Extracellular b) Mechanical
 c) Intracellular d) Chemical
- 7) The enzymes responsible for the digestion of lipids is called as _____.
 a) Peptides b) Lipases
 c) Erepsin d) Maltase
- 8) Phenomenon of active transport plays a leading role in the process of _____.
 a) Secretion b) Osmosis
 c) Absorption d) Dissolving

- 9)** In Uriotelic animals the excretory product is in the form of _____
a) Uric acid b) Urea
c) Ammonia d) Nitrate
- 10)** In mammalian blood the O₂ carrier respiratory pigment is _____
a) Bilirubin b) Biliverdin
c) Haemoglobin d) Bile

B) Fill in the blanks/definition/one sentence answer/ one word answer/ give the name/predict the product etc. **06**

- 1) Write the name of the Scientist who discovered ABO blood group system.
- 2) Write the name of the Valves found in Human heart.
- 3) Which fluid is present in pericardial space of human heart.
- 4) Define Respiration
- 5) Define Excretion.
- 6) Define Physiology.

Q.2 Solve any eight of the following. 16

- 1) Describe pericardium.
- 2) What is Rh factor.
- 3) Write the difference between arteries and vein.
- 4) Describe ABO blood group system.
- 5) Describe Malpighian body.
- 6) Define Digestion.
- 7) Explain Hemoglobin.
- 8) Explain AV node.
- 9) Respiration in Vertebrates carried by which three devices.
- 10) Digestion in mouth of Vertebrates.

Q.3 A) Attempt any two of the following. 10

- 1) Explain types of white blood corpuscles.
- 2) Glomerular filtration
- 3) Stress

B) Explain Dialysis. **06**

Q.4 A) Attempt any two of the following. 08

- 1) Explain the process of coagulation of blood.
- 2) Describe nervous and chemical control of respiration.
- 3) Describe the process of digestion in human stomach.

B) Describe the normal composition of urine. **08**

Q.5 Attempt any two of the following. 16

- Write on heart beat with reference to its origin and conduction.
- Explain in detail excretory system in human beings.
- Describe in detail transport of gases by blood in human beings.

Seat No.	

Set P

B.Sc. (Semester - VI) (New) (Old) (CBCS) : Examination March/April - 2025
Mathematics (Special Paper-XIII)
Metric Spaces (19201635)

Day & Date: Sunday, 18-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figure to right indicate full marks.

Q.1 A) Choose the correct alternative for each of the following. 10

- 1) For the discrete metric d for the set R which of the following is true _____.
 - a) $d(x, x) > 0 (x \in R)$ and $d(x, y) = 1 (x, y \in R, x \neq y)$
 - b) $d(x, x) = 1 (x \in R)$ and $d(x, y) = 0 (x, y \in R, x \neq y)$
 - c) $d(x, x) \neq 0 (x \in R)$ and $d(x, y) = 1 (x, y \in R, x \neq y)$
 - d) $d(x, x) = 0 (x \in R)$ and $d(x, y) = 1 (x, y \in R, x \neq y)$
- 2) In a metric space (M, ρ) for all $x, y, z \in M$ the triangle inequality is _____.
 - a) $\rho(x, y) = \rho(x, z) + \rho(z, y)$
 - b) $\rho(x, y) \leq \rho(x, z) + \rho(z, y)$
 - c) $\rho(x, y) \geq \rho(x, z) + \rho(z, y)$
 - d) $\rho(x, y) > \rho(x, z) + \rho(z, y)$
- 3) The metric space (R, d) or R_d is called _____ metric space.
 - a) absolute
 - b) usual
 - c) Discrete
 - d) normal
- 4) In R the diameter of the set $\{0, 1, 2, 3, \dots, 100\}$ is _____.
 - a) 100
 - b) 0
 - c) 99
 - d) 101
- 5) The subset E of the metric space M is closed subset of M if _____.
 - a) $E \neq \bar{E}$
 - b) $E = \bar{\bar{E}}$
 - c) $\bar{E} = M$
 - d) $E = \bar{E}$
- 6) In a metric space $M = [0, 1]$ with the absolute value metric $B\left[\frac{1}{4}, \frac{1}{2}\right] =$ _____.
 - a) $\left[0, \frac{3}{4}\right)$
 - b) $\left(\frac{1}{4}, \frac{3}{4}\right)$
 - c) $\left(\frac{1}{4}, \frac{1}{2}\right)$
 - d) $\left(\frac{3}{4}, \frac{1}{4}\right)$

- 7) If any metric space M , both M and $\emptyset$ are _____.
a) Open
b) Closed
c) Both a) and b)
d) Neither a) nor b)
- 8) Every compact metric space is _____.
a) complete and bounded
b) complete and totally bounded
c) complete and not bounded
d) Totally bounded and not complete
- 9) A closed subset of complete metric space is _____.
a) complete
b) closed
c) compact
d) bounded
- 10) Let $A = [0, 1]$ and $B = (1, 2]$ and R be a metric space with discrete metric d then $d(A, B) = \underline{\hspace{2cm}}$.
a) 0
b) 1
c) 2
d) $\frac{1}{2}$

B) Fill in the blanks.

06

- 1) For class l^2 , let $S = \{s_n\} \in l^2$ then the norm of s is defined as $\|s\|_2 = \underline{\hspace{2cm}}$.
- 2) If $M = R_d$ is the discrete metric space and $a \in R_d$ then $B[a; 1] = \underline{\hspace{2cm}}$.
- 3) Let $\text{In} = \left(-\frac{1}{n}, \frac{1}{n}\right)$ then $\bigcap_{n=1}^{\infty} \text{In}$ is $\underline{\hspace{2cm}}$.
- 4) Let G be an open subset of a metric space M then $G^1 = M - G$ is $\underline{\hspace{2cm}}$.
- 5) If $f(x) = x^2, (-1 \leq x \leq 1)$ then f attains maximum value at $x = \underline{\hspace{2cm}}$.
- 6) If the metric space M has the Heine-Borel property then M is $\underline{\hspace{2cm}}$.

Q.2 Attempt any Eight of following.

16

- 1) If $|x - 2| < \delta$ then prove that $\left| \frac{x+2}{x+2} \right| < \frac{\delta}{4}$
- 2) Let (M, d) be metric space and, let $x, x^1, y, y^1 \in M$ then prove that $|d(x, y) - d(x^1, y^1)| \leq d(x, x^1) + d(y, y^1)$
- 3) Define metric space (x, d)
- 4) If $\lim_{x \rightarrow a} f(x) = L$ and $\lim_{x \rightarrow a} g(x) = M$ then prove that $\lim_{x \rightarrow a} (f(x) + g(x)) = L + M$
- 5) If f is continuous at $a \in R'$ then prove that $|f|$ is also continuous at a .
- 6) Define open ball $B[a, r]$ in real line.

- 7) Consider the usual metric $g(x, y) = |x - y|$ for $[0, 1]$ then describe $B\left(\frac{1}{2}, 1\right)$
- 8) If $u = \{u_n\}_{n=1}^{\infty}$ and let $T_u = \left\{\frac{u_n}{2}\right\}_{n=1}^{\infty}$, then prove that T is contraction on l^2
- 9) Let $T: R^2 \rightarrow R^2$ be a function defined by $T(x) = \frac{x}{2}$ prove that T is contraction.
- 10) Define ε -dense in A .

Q.3 A) Attempt any two of the following. 10

- 1) Let $d: R \times R \rightarrow R$ such that $d(x, y) = 0$ if $x = y$
 $= 1$ if $x \neq y$
 Then prove that (R, d) is metric space.
- 2) If F_1 and F_2 is closed subsets of metric space (M, g) the $F_1 \cup F_2$ is closed.
- 3) If A is totally bounded of (x, d) , then prove that $\bar{A}$ is totally bounded.

B) State and prove Minkowski Inequality 06

Q.4 A) Attempt any two of the following. 08

- 1) If A is closed subset of the compact metric space (M, g) then the metric space (A, g) is also compact.
- 2) If G_1 and G_2 are open subset of the metric space M then $G_1 \cap G_2$ is open.
- 3) Let (M, g) be metric space. if $\{s_n\}_{n=1}^{\infty}$ is Converges sequence of point in M then $\{s_n\}_{n=1}^{\infty}$ is a Cauchy sequence.

B) Let (M, g) be completed metric space, for each $n \in I$, let F_n be closed bounded subset of M such that. 08

i) $F_1 \supset F_2 \supset F_3 \supset \dots \supset F_n \supset F_{n+1} \supset \dots$

ii) $\text{diam } F_n \rightarrow 0$ as $n \rightarrow \infty$ then $\bigcap_{n=1}^{\infty} F_n$ contains precisely one point.

Q.5 Attempt any two of the following. 16

- a) Show that $d: R^2 \rightarrow R^2$ such that $d(x, y) = \max\{|x_1 - y_1|, |x_2 - y_2|\}$ where $x = (x_1, x_2)$ and $y = (y_1, y_2)$ are in R^2 is a metric on R^2 .
- b) Let $\langle M, g \rangle$ be complete metric space. If T is a contraction on M then there is only one point x in M such that $T_x = x$.
 Let $\langle M_1, g_1 \rangle$ and $\langle M_2, g_2 \rangle$ be metric spaces and let $F: M_1 \rightarrow M_2$,
- c) then F is continuous in M_1 iff $f^{-1}(F)$ is closed subset of M , whenever F is closed subset of M_2 .

Seat No.	

Set P

B.Sc. (Semester - VI) (New) (Old) (CBCS) : Examination March/April - 2025
Statistics (Special Paper-XIII)
Statistical Inference–II (19201643)

Day & Date: Sunday, 18-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labeled diagrams whenever necessary.
 4) Use of log table and calculator is allowed.

Q.1 A) Choose the correct alternatives from the following. 10

- 1) Which of the following is correct if $P(5.25 < 0 < 20.25) = 0.95$
 - a) 5.25 and 20.25 are 95% confidence limit.
 - b) The length of the confidence interval is 20.
 - c) Both a) and b)
 - d) None of These
- 2) For finding the confidence interval for ratio of variances of two normal populations, the distribution used is
 - a) Chi-square
 - b) t
 - c) F
 - d) none of these
- 3) Out of the two types of error in testing, the more severe error is
 - a) type I error
 - b) type II error
 - c) both a) and b) are equally severe
 - d) no error is severe
- 4) Test of $H_0: \mu = 70$ against $H_1: \mu > 70$ leads to
 - a) left tailed test
 - b) right tailed test
 - c) two tailed test
 - d) none of these
- 5) The decision criteria in SPRT depends on the functions of
 - a) type I error
 - b) type II error
 - c) type I error and type II error
 - d) none of the two types of errors.
- 6) Degrees of freedom is related to
 - a) no. of observations in a set
 - b) hypothesis under test
 - c) no. of independent observations in a set
 - d) none of the above

- 7) Wilcoxon's signed-rank test considers the differences ($X_i - M_0$) by way of
 a) signs only b) magnitude only
 c) signs and magnitude d) all the above
 both
- 8) The ratio of likelihood under H_0 and the entire parametric space is called _____ test.
 a) Probability ratio b) Sequential probability ratio
 c) Likelihood ratio d) None of These
- 9) Neyman - Pearson lemma provides
 a) Unbiased C. R. b) Most powerful C. R.
 c) Admissible C. R. d) Minimal C. R.
- 10) In Sequential Probability Ratio Test (SPRT) the sample size is
 a) fixed b) a random variable
 c) fixed but small d) fixed but large

Q.1 B) Define the following **06**

- 1) Hypothesis
- 2) Type-2 error
- 3) Size of test
- 4) Run
- 5) Composite hypothesis
- 6) Run

Q.2 Explain the following terms. (Any Eight) **16**

- 1) UMP test
- 2) Type-1 error
- 3) M.P. test
- 4) Type-2 error
- 5) Null and Alternative
- 6) Confidence interval.
- 7) State confidence interval for μ when σ^2 is unknown in case of N (μ, σ^2) distribution.
- 8) State confidence interval for population proportion P
- 9) Likelihood test
- 10) OC function

Q.3 A) Solve any Two of the following. **10**

- 1) A coin is for which the probability of occurrence of head is P, thrown 7 times and null hypothesis is $H_0: P = 1/2$ tested against $H_1: P = 1/4$ is accepted more than one head appears, then compute i) size of test ii) power of test
- 2) Obtain $100(1-\alpha)$ % confidence interval for, the parameter σ^2 in case of N (μ, σ^2) distribution, when μ is known.
- 3) Describe the procedure of Run test.

B) State the procedure of Kolmogorov - Smirnov test for two independent samples. **06**

Q.4 A) Solve any Two of the following. **08**

- 1)** Let X be a Bernoulli variate with p.m.f
 $P(x, \theta) = \theta^x (1 - \theta)^{1-x}; x = 0, 1, 0$
 Construct SPRT test for testing $H_0: \theta = \theta_0$ against $H_1: \theta = \theta_1$,
- 2)** Obtain $100(1-\alpha)$ confidence interval for ratio of two population variances in case of normal distribution.
- 3)** Describe the procedure of sign- test

Q.4 B) Derive the likelihood ratio test for testing $H_0: \mu = \mu_0$ against $H_1: \mu \neq \mu_0$ when a sample of size n is taken from $N(\mu, \sigma^2)$.

Q.5 Answer the following questions in detail. **16**

- 1)** State and prove Neyman- Pearson lemma.
- 2)** Obtain SPRT for testing $H_0: \lambda = \lambda_0$ against $H_1: \lambda = \lambda_1$ where λ is the parameter of poisson distribution, find appropriate expressions for OC function and ASN function.
- 3)** Describe the procedure of Mann-Whitney U-test.

Seat No.	

Set	P

B.Sc. (Semester - VI) (New) (Old) (CBCS) : Examination March/April - 2025
Geology (Special Paper-XIII)
Photo geology & Remote Sensing (19201652)

Day & Date: Sunday, 18-May-2025

Max. Marks: 80

Time: 03:00 PM To 06:00 PM

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagrams wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of log table and calculators is allowed.

Q.1 A) Multiple choice questions. 10

- 1) GIS uses the information from which of the following sources?
 - a) Non- spatial information system
 - b) Spatial information system
 - c) Global information system
 - d) Position information system
- 2) Which data model requires less space for computer storage?
 - a) Raster
 - b) Elevation
 - c) Vector
 - d) None of these
- 3) Which one of the following band composites is called as False Colour Composite?
 - a) Bands 1, 2 & 3
 - b) Bands 2, 3 & 4
 - c) Both A and B
 - d) None of these
- 4) GIS stores the non-spatial data in _____ format
 - a) Raster
 - b) Vector*
 - c) PDF
 - d) Tabular
- 5) A unique reflectance pattern of individual object on the earth is called as _____
 - a) Spectral signature
 - b) Optical sign
 - c) Spatial signature
 - d) Signature
- 6) A pocket stereoscope is used to view _____
 - a) Digital satellite data
 - b) Hard copy of aerial data
 - c) Microscopic minerals
 - d) Fine grained minerals in the field.

- 7) Specular reflection occurs when electromagnetic radiation reflects from _____ surface
 - a) Rough
 - b) Smooth
 - c) Both a & b
 - d) None of these
 - 8) Which one of the following band composites is called as true colour composite?
 - a) Bands 1,2&3
 - b) Bands2,3&4
 - c) Bands3,4&5
 - d) Bands 4, 5 & 6
 - 9) An intersection point where two or more vector lines meet is _____
 - a) Code
 - b) Node
 - c) Corner
 - d) Junction
 - 10) Gamma rays in electromagnetic spectrum has _____
 - a) Short wavelength and high frequency
 - b) Long wavelength and high frequency
 - c) Short wavelength and low frequency
 - d) Long wavelength and low frequency
- B) Answer the following questions in one sentence.**
- 1) What will be the dip angle of horizontal bed?
 - 2) India falls in which zone of UTM?
 - 3) Which sensor produce its own energy source.
 - 4) In radar imaging, the direction of orientation in which the electrical field vector of electromagnetic radiation vibrates .
 - 5) What is the wavelength range of visible spectrum?
 - 6) Satellite imageries are acquired by using which platform

Q.2 Solve any Eight of the following

- 1) Define Photogrammetry
- 2) What is LISS III?
- 3) What is orbit and its types?
- 4) What is the percentage of forward and lateral overlaps?
- 5) What is spatial data?
- 6) What is spectral range of radiowaves ?
- 7) What is scale of large scale aerial photographs
- 8) Name the two infrared bands in LANDSAT
- 9) What is radiometric resolution?
- 10) What is active remote sensing ?

Q.3 A) Attempt any Two of the following.

- 1) Describe vertical aerial photographs
- 2) Describe atmospheric windows.
- 3) Describe ray diagram of mirror stereoscope.

B) Write short note on spatial resolution

- Q.4 A) Attempt any Two of the following** **08**
- 1)** Describe spectral signature
 - 2)** Explain passive sensor with examples
 - 3)** What is platform? Explain their types?
- B) Describe supervised and unsupervised classification** **08**
- Q.5 Attempt any Two of the following.** **16**
- a)** What is difference between vector and raster data structure? Specify what geological applications are used in each data structure.
 - b)** What are the errors of flying?
 - c)** Explain types of satellite orbit.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination March/April - 2025
Microbiology Paper-XIII
Microbial Genetics (19201660)

Day & Date: Sunday, 18-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions: 1) All questions are compulsory.
 2) Draw neat labeled diagrams wherever necessary.
 3) Figures to the right indicate full marks.
 4) Use of log tables and calculators is allowed.

Q.1 A) Multiple choice questions.**10**

- 1) Which of the following enzymes is responsible for unwinding the DNA double helix during replication?
 - a) DNA polymerase I b) DNA gyrase
 - c) DNA helicase d) Topoisomerase
- 2) Which enzyme is primarily responsible for the synthesis of RNA primer during DNA replication in *E. coli*?
 - a) DNA helicase b) DNA ligase
 - c) Primase d) DNA polymerase III
- 3) Which of the following is the primary function of RNA polymerase in transcription?
 - a) Synthesize RNA from a DNA template
 - b) Synthesize DNA from an RNA template
 - c) Repair DNA during replication
 - d) Splice introns from pre-mRNA
- 4) The process of splicing involves the removal of which regions from pre-mRNA?
 - a) Exons b) Introns
 - c) Promoters d) Codons
- 5) Which enzyme is primarily used to cut DNA at specific sequences in genetic engineering?
 - a) DNA polymerase b) RNA polymerase
 - c) Restriction endonuclease d) Ligase
- 6) Which technique is commonly used to amplify a specific DNA sequence in vitro?
 - a) Gel electrophoresis
 - b) Polymerase Chain Reaction (PCR)
 - c) Cloning
 - d) DNA sequencing

- 7) Protein engineering involves:
 - a) Designing new proteins with desired properties
 - b) Sequencing DNA to discover protein structures
 - c) Editing genes to create new organisms
 - d) Using enzymes to cut proteins
- 8) Which of the following is the primary purpose of gel electrophoresis in DNA analysis?
 - a) To replicate DNA
 - b) To separate DNA fragments based on size
 - c) To sequence DNA
 - d) To amplify DNA
- 9) The Protein Data Bank (PDB) is a database that stores:
 - a) Nucleic acid sequences
 - b) Three-dimensional structures of proteins
 - c) Genetic information on organisms
 - d) Information on metabolic pathways
- 10) Which of the following is a common application of DNA fingerprinting?
 - a) Gene cloning
 - b) Paternity testing and forensic analysis
 - c) DNA sequencing
 - d) Gene therapy

B) One sentence answer**06**

- 1) In transcription, the RNA polymerase enzyme binds to which region of the gene?
- 2) Which molecule acts as the inducer in the Lac operon system?
- 3) Give the full form of NCBI
- 4) What is the role of ethidium bromide in gel electrophoresis?
- 5) Which type of restriction endonuclease enzyme cuts DNA within its recognition site?
- 6) What is the primary role of DNA polymerase III in DNA replication?

Q.2 Solve any Eight of the following.**16**

- 1) Define Operon
- 2) Define Bioinformatics
- 3) Enlist the various enzymes involved in DNA Replication
- 4) Write any two names of vectors used in Genetic engineering
- 5) Define Genetic engineering
- 6) What is the role of DNA ligase in molecular biology?
- 7) What is BLAST in bioinformatics?
- 8) Enlist any two applications of genetic engineering in the agricultural sector
- 9) What is the role of EMBL in the field of bioinformatics?
- 10) Define vector

- Q.3 A) Attempt any Two of the following. 10**
- 1) Describe the concept of Lac operon
 - 2) Explain the effect of mutation on translation
 - 3) Write the various applications of DNA fingerprinting
- B) Write a short note on Protein Engineering 06**
- Q.4 A) Attempt any Two of the following. 08**
- 1) Explain the time course of phenotypic expression
 - 2) Describe the Cis-trans complementation test
 - 3) Explain the Replica Plate technique for the isolation of Auxotrophic Mutants.
- B) Explain in detail the process of Bacterial Transcription 08**
- Q.5 Attempt any Two of the following. 16**
- a) Explain in detail the Agarose Gel Electrophoresis for the separation of DNA
 - b) Describe in detail the mechanism of bacterial DNA Replication
 - c) Explain in detail the DNA sequencing by the Sanger Dideoxy method

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (Old) (CBCS) : Examination March/April - 2025
Electronics (Special Paper-XIII)
Power Electronics (19201676)

Day & Date: Sunday, 18-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagram **whenever** necessary
 3) Figures to the right indicate full marks.
 4) Use of **log table** and **scientific calculator** is allowed.

Q.1 A) Chose correct alternative and rewrite the sentence **10**

- 1) Conduction in SIT is due to _____ charge carries.
 - a) Both majority and minority
 - b) Only minority
 - c) Only majority
 - d) All of these
- 2) Another name for a COMFET is _____
 - a) GTO
 - b) SBS
 - c) Power MOSFET
 - d) IGBT
- 3) In an SCR circuit the supply voltage is generally _____ that of break over voltage
 - a) Less than
 - b) Equal to
 - c) Greater than
 - d) Equal to load current
- 4) Another name for Class-D commutation is _____ technique.
 - a) Complementary Voltage commutation
 - b) Auxiliary voltage commutation
 - c) Self commutation
 - d) Resonant Pulse commutation
- 5) The magnitude of gate current _____ then the forward break-over voltage decreases.
 - a) Zero
 - b) Equal to anode current
 - c) Decrease
 - d) Increases
- 6) The purpose of phase control in controlled rectifiers is _____
 - a) To regulate the output voltage
 - b) To control the conduction angle
 - c) To minimize harmonic distortion
 - d) To increase the efficiency

- 7) In single phase half wave Controlled rectifier with resistive load the output is _____
- $V_{out} = \frac{V_m}{2\pi} \cos \alpha$
 - $V_{out(avg)} = \frac{V_{m(max)}}{2\pi} (1 - \cos \alpha)$
 - $V_{out(avg)} = \frac{V_{m(max)}}{2\pi} (1 + \cos \alpha)$
 - $V_{out(avg)} = \frac{V_{m(max)}}{2\pi} (\cos \alpha - \cos \beta)$
- 8) _____ is used to convert DC power into variable DC power
- Cyclo-converter circuit
 - Chopper circuit
 - Controlled rectifier
 - Inverter circuit
- 9) _____ of the following is not a characteristic of PUT.
- bilateral conduction
 - negative resistance
 - peak-point voltage
 - intrinsic stand-off ratio
- 10) The full form of SMPS is _____
- Slow Mode Power Supply
 - Short Mode Power Supply
 - Switch Mode Power Supply
 - Static Mode Power Supply

Q.1 B) Answer in One sentence**06**

- Define holding current of SCR.
- Define firing angle.
- What is the typical value of the on state voltage of SCR?
- State the types of Gate triggering.
- What is the primary function of SMPS?
- Which method is most frequently used to turn on the SCR?

Q.2 Solve any Eight of the following**16**

- Define forward break over voltage and latching current.
- Draw the symbols of PUT and IGBT.
- Draw constructional diagram of power MOSFET.
- Give classification of inverter based on configuration and output waveform.
- Draw the block diagram of SMPS.
- Why power devices are not operates with higher frequency.
- State the disadvantages of SCR.
- State phase control principle.
- Draw the circuit diagram of RC triggering.
- Why controlled rectifiers are used?

Q.3 A) Attempt any Two of the following**10**

- Describe the working of a single-phase full-bridge inverter.
- Explain turn on and off process of GTO.
- Explain SCR triggering circuit by using UJT.

B) Explain the working of complementary voltage commutation technique **06**

Q.4 A) Attempt any Two of the following. 08

- 1)** Describe the working of Power B JT
- 2)** Explain the working of step-down chopper.
- 3)** Explain the working of flasher circuit by using SCR

B) Describe the any four SCR's turn-on mechanism. **08**

Q.5 Attempt any Two of the following. 16

- 1)** Using a constructional diagram, describe working of IGBT.
- 2)** Describe the working of parallel inverter using SCR.
- 3)** Describe the operation of a single-phase full wave controlled rectifier with inductive load and effect of freewheeling diode.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (Old) (CBCS) : Examination March/April - 2025
Computer Science (Paper-XIV)
Web Technology (19201668)

Day & Date: Sunday, 18-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) **Draw neat labeled** diagrams wherever necessary.
 3) Figures to the right indicate full marks.

Q.1 A) Multiple choice questions. 10

- 1) The _____ event is the last stage of the Web forms lifecycle.

a) Event Handling	b) Page_Load
c) Page_Unload	d) Page_Exit

- 2) The _____ file can define global variable and that can be access from any web page in web application.

a) .aspx	b) Web.config
c) .cs	d) Global.asax

- 3) ViewState in ASP.NET is used for _____.

a) Storing data on the client-side
b) Storing data on the server-side
c) Passing data between pages
d) Maintaining the state of controls during postbacks

- 4) The _____ state management technique in ASP.NET is suitable for maintaining user-specific data during a user's visit to the website.

a) ViewState	b) Session state
c) Cookies	d) Application state

- 5) The _____ control is commonly used to display a hierarchical menu of site navigation links.

a) Tree view	b) siteMapPath
c) List View	d) Menu

- 6) The _____ attribute of the SiteMapNode element specifies the UPL of the associated page.

a) url	b) NavigateUrl
c) path	d) link

- 7) The _____ method of the Command class is used to execute a SQL command and returns a single value
a) ExecuteNonQueryO b) ExecuteReaderO
c) ExecuteScalarO d) ExecuteRowO
- 8) What is the purpose of content placeholders in Master Pages?
a) To define areas where content pages can insert their content
b) To store metadata about the web page
c) To define global settings for the entire application
d) To handle user authentication
- 9) The _____ method is used to add items dynamically to a DropDownList control in ASP.NET
a) Additem b) Add
c) Update d) Extend
- 10) The _____ configuration file is commonly used to configure ASP.NET's membership and role management features.
a) web.config b) global.asax
c) machine.config d) membership.config

Q.1 B) Fill in the blanks**06**

- 1) The _____ databases is by default / commonly used with ASP.NET's membership provider for user management.
- 2) The _____ control is used to display a message when validation fails in ASP.NET.
- 3) The _____ property is used to bind data to a GridView control in ASP.NET.
- 4) DataTable or DataSet classes are available in _____ namespace
- 5) The default value for ActiveViewIndex of Multiview control is _____
- 6) The _____ property of TextBox control is used to create password type text box in ASP.NET.

Q.2 Solve any Eight of the following.**16**

- 1) What is IIS? Explain use of IIS.
- 2) Describe the ASP.NET TextBox control and its various properties and events.
- 3) Explain Timer control with example.
- 4) Describe difference between The Data Reader and Data Adapter.
- 5) Explain SiteMap file with example.
- 6) Explain Themes and Skins.
- 7) Explain OutputCache directive.
- 8) Explain use of App_GlobalResources and App_LocalResources folder.
- 9) Explain nested master pages with example.
- 10) Discuss the purpose and usage of the ASP.NET FileUpload control.

- Q.3 A) Attempt any Two of the following. 10**
- 1) What are different page structures supported by Asp.Net? Explain each in detail.
 - 2) Design web page which validates the number divisible by 9 and 10 and also check number is lies between 1000 to 100000.
 - 3) How to use XML file in TreeView Control? Explain with example.
- B) What is Authentication & Authorization? Explain different providers used for Authentication & Authorization. 06**
- Q.4 A) Attempt any Two of the following. 08**
- 1) Design web page which shows current year calendar having weekends in red color.
 - 2) What is page life cycle? Explain in detail.
 - 3) What is validation group? Explain with example.
- B) Design web page which displays department total salary using stores procedure.(use Appropriate Table) 08**
- Q.5 Solve any Two of the following 16**
- 1) What is Server-side state management? Explain Application state in detail with example.
 - 2) Discuss the different categories of web controls available in ASP.NET. Explain with examples.
 - 3) What is AJAX? Explain Server side and client-side architecture of AJAX.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Physics (Paper-XV)
Materials Science (19201620)

Day & Date: Sunday, 25-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) The ceramics normally exhibit _____ nature.
 - a) brittle
 - b) hard
 - c) soft
 - d) none of the above
- 2) _____ is opposite to ductility.
 - a) Hardness
 - b) Stiffness
 - c) Brittleness
 - d) None of the above
- 3) _____ monomers undergo additional polymerization.
 - a) Saturated
 - b) Aliphatic
 - c) Unsaturated
 - d) Aromatic
- 4) Ceramics are examples of _____.
 - a) Large particle composites
 - b) Continuous fiber composites
 - c) Microcomposites
 - d) Short fiber composites
- 5) Size of nanoparticle is _____.
 - a) 10 - 20 nm
 - b) 5 - 10 nm
 - c) 20 - 30 nm
 - d) 100 – 200 nm
- 6) The most important property of nanomaterial is _____.
 - a) Friction
 - b) Temperature
 - c) Pressure
 - d) Force
- 7) The strength of composite is _____.
 - a) Low
 - b) High
 - c) Zero
 - d) Infinite
- 8) The materials which are used for structural application in the field of medicine are _____.
 - a) Metals
 - b) Composites
 - c) Biomaterials
 - d) Alloys

- 9) PTZ means _____.
 a) Phosphor, zinc, tin
 b) Lead zirconium titanate
 c) Potassium zirconium titanate
 d) Phosphor zinc titanate
- 10) The tanning operations on skin of animal produces _____.
 a) Leather
 b) Cloth
 c) Wool
 d) Blood

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. **06**

- 1) What is creep?
- 2) Define the term elasticity.
- 3) What do you mean by dielectric strength?
- 4) Write any two examples of elastomers.
- 5) Give any two uses of biomaterials.
- 6) Give any two applications of composites.

Q.2 Solve any Eight of the following. 16

- a) Define specific heat.
- b) Define polymerization.
- c) Give four examples of ceramics.
- d) What are composites?
- e) Write applications of nanomaterials.
- f) What is biomechanism?
- g) What are homopolymers?
- h) Give classification of ceramics.
- i) Write important properties of ceramics.
- j) Define term nanotechnology.

Q.3 A) Attempt any Two of the following. 10

- 1) Discuss classification of materials.
- 2) Discuss ceramic processing.
- 3) Explain properties and applications of biomaterials.

B) Write short note on fabrication methods of composites. **06**

Q.4 A) Attempt any Two of the following. 08

- 1) Discuss thermosetting polymers.
- 2) Explain properties of nanomaterials.
- 3) Explain properties of composite materials.

B) Explain mechanical and electrical properties of materials. **08**

Q.5 Attempt any Two of the following.**16**

- a)** Discuss various physical methods of synthesis of nanostructured materials.
- b)** Discuss various methods of fabrication of polymers in detail.
- c)** Explain particle reinforced composites and fibre reinforced composites.

Seat No.	

Set	P

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Chemistry (Special Paper-XIV)
Inorganic Chemistry (19201611)

Day & Date: Sunday, 25-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative.

10

- 1) Geometry of $\text{Fe}(\text{CO})_5$ is _____.
 a) tetrahedral b) square planar
 c) octahedral d) trigonal bipyramidal
- 2) _____ is the modern method for separation of lanthanides.
 a) Fractional crystallization b) Ion-Exchange
 c) Fractional precipitation d) Complex formation
- 3) Free electron theory for bonding in metals was introduced by _____.
 a) Pauling b) Felix Bloch
 c) Drude and Lorentz d) Kammerlingh Onnes
- 4) Both oxides of Phosphorus i.e. P_4C_6 and P_4O_{10} are exist as _____.
 a) dimer b) trimer
 c) tetramer d) trimer and dimer respectively
- 5) _____ gas is evolved at cathode during corrosion of metals.
 a) N_2 b) O_2
 c) H_2 d) CO_2
- 6) In dimethylberyllium, Be-C-Be bridges are formed by _____ bonds.
 a) 3c-2e b) 1c-3e
 c) 2c-2e d) 2c-3e
- 7) _____ is a lanthanide element does not occur in nature.
 a) Cerium b) Promethium
 c) Terbium d) Neodymium
- 8) The bond angle in borazine is _____ degree.
 a) 90 b) 109
 c) 180 d) 120

- 9) _____ corrosion occurs when solid-gas heterogeneous system is formed.
- | | |
|----------------|--------------------|
| a) Atmospheric | b) Electrochemical |
| c) Solution | d) Immersed |
- 10) _____ is the hybridization of Cr in $\text{Cr}(\text{CO})_6$?
- | | |
|----------------------------|-------------------|
| a) sp^2 | b) Sp^3 |
| c) d^2sp^3 | d) dsp^3 |

B) Answer the following.**06**

- 1) What is the indication of 'p' in nomenclature of organometallic compounds?
- 2) Borazine is also called inorganic benzene, True or False?
- 3) State Differential Aeration principle.
- 4) Type of hybridization in XeC_4 molecule is _____.
- 5) Define organometallic compounds.
- 6) ${}^{238}_{92}\text{U} + {}^{16}_8\text{O} \rightarrow \text{_____} + 4{}_0^1\text{n}$

Q.2 Solve any Eight of the following.**16**

- a) Write the outer electronic configuration of Gadolinium and Ytterbium.
- b) Give any two properties of metallic solids in brief.
- c) Explain in brief, why borazine undergoes addition reaction with HCl.
- d) Write the applications of passivity.
- e) Give any two methods of synthesis of alkyl or aryl compounds of Lithium.
- f) Explain in brief position of Lanthanides in periodic table.
- g) Give the applications of superconductors.
- h) Describe in short the structure and formation of SO_2 on the basis of VBT.
- i) Explain the factor 'position of metals in electrochemical series' which affects corrosion of metal.
- j) Give the classification of metal carbonyl compounds with example.

Q.3 A) Attempt any Two of the following.**10**

- 1) Discuss the classification of solids on the basis of band Theory (MOT).
- 2) What is passivity? Explain oxide film theory for passivity of metal.
- 3) Describe the structure of XeF_2 on the basis of VBT.

B) Write a note on neutron capture followed by β -decay method for preparation of Transuranic elements. Give its limitations.**06****Q.4 A) Attempt any Two of the following.****08**

- 1) Describe Chemical Vapour Deposition (CVD) method for preparation of 1-2-3 ceramic superconductor
- 2) Explain the bulk separation method for separation of Lanthanides from their minerals.
- 3) Illustrate the structure of $\text{Ni}(\text{CO})_4$ with the help of VBT.

B) Discuss the methods of protection of metals from corrosion. **08**

Q.5 Attempt any Two of the following. **16**

- a)** What are f-block elements? Write atomic number, name of elements, symbol and electronic configuration of Actinides.
- b)** What are extrinsic semiconductors? Explain p-type semiconductor in detail. Give the applications of semiconductor.
- c)** Discuss the structure of diborane.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Botany (Special Paper-XIV)
Plant Biotechnology (19201602)

Day & Date: Sunday, 25-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Select the correct alternative. 10

- 1) The first and the initial step in Recombinant DNA technology is _____.
 a) isolation of genetic material
 b) cutting the gene at the recognition sites
 c) amplifying the gene copies through Polymerase chain reaction (PCR)
 d) ligation of DNA Molecules
- 2) _____ is used as vector in recombinant DNA technology.
 a) Fungus
 b) Bacteriophage
 c) Plasmodium
 d) Viroids
- 3) *Agrobacterium* is used in _____ method of gene transfer.
 a) Physical
 b) Biological
 c) Chemical
 d) Natural
- 4) Golden rice was produced to overcome the deficiency of _____ in children.
 a) vitamin B 12
 b) vitamin C
 c) vitamin A
 d) vitamin D
- 5) _____ technique is useful for amplification of DNA.
 a) Southern Blotting
 b) Northern Blotting
 c) Western Blotting
 d) PCR
- 6) Annealing reaction temperature in PCR is lowered to _____.
 a) 46-50°
 b) 5-10°
 c) 21-37°
 d) 54-60°
- 7) Methods of micropropagation includes _____.
 a) Meristem culture
 b) Callus culture
 c) Suspension Culture
 d) all of these

- 8) In somatic hybridization _____ used for hybridization.
 - a) protoplast of the same plant
 - b) meristem
 - c) protoplast of different variety
 - d) embryo
- 9) Indian Council of Agricultural Research (ICAR) has its headquarters at _____.
 - a) New Delhi
 - b) Chennai
 - c) Coimbatore
 - d) Bhubaneswar
- 10) The ICAR has played a pioneering role in _____.
 - a) plant tissue culture
 - b) rDNA technology
 - c) green revolution
 - d) environmental awareness

B) Answer the following.

06

- 1) Enlist enzymes involved in recombinant DNA Technology.
- 2) Define vectors.
- 3) Define explant.
- 4) Define totipotency.
- 5) Enlist any two transgenic plants.
- 6) Define reporter gene.

Q.2 Solve any Eight of the following.

16

- Give the function of DNA ligase enzyme.
- Write down the applications of southern blotting technique
- What is the principal of northern blotting technique?
- Enlist the instruments used in tissue culture laboratory.
- What are the advantages of a genomic library?
- What is transgenic plant?
- Why golden rice is important?
- What is gene cloning?
- What is plant tissue culture?
- What is micropropagation?

Q.3 A) Attempt any Two of the following.

10

- 1) Discuss the role of biotechnology in agriculture development.
- 2) Discuss in brief technique of tissue culture.
- 3) What are the applications of somatic hybridization?

B) Write short note on plasmid.

06

Q.4 A) Attempt any Two of the following.

08

- 1) Explain in brief stages of micropropagation.
- 2) Importance of DNA libraries.
- 3) Explain in brief biological method of gene transfer.

B) Explain in detail southern blotting technique.

08

Q.5 Attempt any Two of the following.

16

- a)** Explain in detail another Culture technique.
- b)** Explain in detail enzymes involved in recombinant DNA technology with their roles.
- c)** Describe in brief Polymerase Chain Reaction.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New/Old) (CBCS) Examination: March/April - 2025
Zoology (Special Paper-XIV)
Evolutionary Biology (19201628)

Day & Date: Sunday, 25-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) The photoautotroph organisms are _____.
 a) Cyanobacteria b) bryophytes
 c) algae d) bacteria
- 2) Theory of Lamarck was based on _____.
 a) adaptive collisions b) adaptive radiation
 c) adaptive modification d) adaptive movement
- 3) The Jurassic period belongs to the _____ era.
 a) proterozoic b) mesozoic
 c) archezoic d) cenozoic
- 4) A biogenesis theory of origin supports _____.
 a) The origin of life due to pre-existing organism
 b) origin of life from blue green algae
 c) Organic evolution is due to chemical reaction
 d) spontaneous generation
- 5) This condition is essential for population to be in Hardy Weinberg equilibrium _____.
 a) random mating b) no mutations
 c) large population d) all of these
- 6) The tracking of evolutionary history of organism is _____.
 a) ontogeny b) phylogeny
 c) analogy d) homology
- 7) Which of the following had smallest brain capacity?
 a) Homo habilis b) Homo erectus
 c) Homo sapiens d) Homo neanderthalensis

- 8) Human evolution actually starts in _____.
a) France b) America
c) Africa d) Central Asia
- 9) Sympatric speciation arises due to _____.
a) non-overlapping population of the same area
b) geographical isolation
c) overlapping population of the same area
d) non-reproductive overlapping population of the same area
- 10) The first man to use fire was _____.
a) Neanderthal man b) Homo erectus
c) Cro-Magnon-man d) Australopithecus

B) Fill in the blank/Definition/One sentence answer/ One word answer/ 06
Give the name/Predict the product etc.

- 1) Evolution
- 2) Fossil
- 3) Allopatric
- 4) Homo- sapien
- 5) Natural selection
- 6) Mutation

Q.2 Solve any Eight of the following. 16

- RNA World
- Describe chaemogeny
- Population
- Sympatric speciation
- Galapagos finches
- Primate characteristics
- K-T extinction
- Explain variations& their role in evolution.
- Micro-evolution
- Globin gene family

Q.3 A) Attempt any Two of the following. 10

- 1) Describe Lamarckism.
- 2) Explain organic evolution.
- 3) Describe geological time scale.

B) Explain Darwinism. 06

Q.4 A) Attempt any Two of the following. 08

- 1) Explain evolution of man.
- 2) Describe Hardy Weinberg Law.
- 3) Explain macroevolution.

B) Explain the properties of genetic code. 08

Q.5 Attempt any Two of the following.

16

- a)** Describe different types of fossils.
- b)** Explain endosymbiotic theory.
- c)** Describe neo- Darwinism.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Mathematics (Special Paper-XIV)
Numerical Analysis (19201636)

Day & Date: Sunday, 25-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative.**10**

- 1) Find $\nabla_{y_5}^3 =$ _____.
 - a) $y_5 - 3y_4 + 3y_3 - y_2$
 - b) $y_5 + 3y_4 - 3y_3 + y_2$
 - c) $y_5 + 3y_4 + 3y_3 + y_2$
 - d) $y_5 + 3y_4 - 3y_3 + y_2$
- 2) If $\Delta^3 e^x =$ _____.
 - a) $(e + 1)^3 e^x$
 - b) $(e - 1)^3 e^x$
 - c) $(e - 1)^4 e^x$
 - d) $(e - 1)^n e^x$
- 3) $\Delta \nabla =$ _____.
 - a) δ
 - b) M
 - c) δ^2
 - d) M^2
- 4) If $\left(E^{\frac{1}{2}} + E^{-\frac{1}{2}}\right)(1 + \Delta)^{1/2} =$ _____.
 - a) $\Delta + 1$
 - b) $\Delta - 1$
 - c) $\Delta + 3$
 - d) $\Delta + 2$
- 5) Gauss backward interpolation formula is used interpolate value of y for _____.
 - a) $0 < P < 1$
 - b) $0 < P < \alpha$
 - c) $-1 < P < 0$
 - d) $-\alpha < P < 0$
- 6) The Lagrange's interpolation formula for unequal intervals for n points is a polynomial of degree _____.
 - a) $n - 1$
 - b) $n + 1$
 - c) n
 - d) $n - 3$
- 7) The number of strips in Simpson's $\left(\frac{3}{8}\right)^{\text{th}}$ rule is multiple of _____.
 - a) 1
 - b) 2
 - c) 4
 - d) 3

- 8) In Trapezoidal rule, the function $y = f(x)$ is take to be _____.
 a) Straight line b) Parabola
 c) Circle d) Ellipse
- 9) If $\lambda_1, \lambda_1, \lambda_1$ are real and equal rools then c.f.= _____.
 a) $(c_1 + c_2n + c_3n^2)(\lambda_1)^n$ b) $c_1(\lambda_1)^n + c_2(\lambda_1)^n + c_3(\lambda_1)^n$
 c) $(c_1 - c_2n - c_3n^2)(\lambda_1)^n$ d) $(c_1 + c_2 + c_3n)(\lambda_1)^n$
- 10) The order of equation $y_{n+2} - y_{n+1} + 2y_n = 2$ is _____.
 a) 1 b) 3
 c) 4 d) 2

B) Answer the following .**06**

- 1) The solution of $u_{x+2} - 6u_{x+1} + 9u_x = 0$ is _____.
 2) The P.I. of $u_{n+2} - 4u_{n+1} + 4u_n = 2^n$ is _____.
 3) The value of $\Delta(ab^x) =$ _____.
 4) $\Delta \tan^{-1} x =$ _____.
 5) Trapezoidal rule states that _____.
 6) If $f(0) = 1, f(2) = 5, f(3) = 10, f(x) = 14$ then $x =$ _____.

Q.2 Solve any Eight of the following.**16**

- a) If $y = a(3)^x + b(-2)^x$ and $h = 1$, prove that $(\Delta^2 + \Delta - 6)y = 0$
 b) With usual notation, prove that $M = \frac{1}{2} \left(E^{\frac{1}{2}} + E^{-\frac{1}{2}} \right)$.
 c) With usual notation, prove that $hD = \log(1 + \Delta) = -\log(1 - \nabla)$
 d) State Newton's backward interpolation formula.
 e) State Gauss's forward interpolation formula.
 f) State Newton - Cotes quadrature formula.
 g) State the Simpson's $\left(\frac{3}{8}\right)^{\text{th}}$ rule for integration.
 h) Solve $u_{n+3} - 2u_{n+2} - 5u_{n+1} + 6u_n = 0$
 i) Solve $y_{n+2} - 5y_{n+1} - 6y_n = 4^n, y_0 = 0, y_1 = 1$
 j) Define linear difference equation with constant coefficients.

Q.3 A) Attempt any Two of the following.**10**

- 1) Prove that $1 + \delta^2 M^2 = \left(1 + \frac{1}{2} \delta^2\right)^2$
 2) State and prove Newton's forward interpolation formula.
 3) Solve
 1) $y_{n+2} - 4y_{n+1} + 3y_n = 5^n$
 2) $y_{x+1} - y_x + xy_{x+1}y_x = 0$ given $y_1 = 2$

B) State and prove Lagrange's interpolation formula for unequal intervals.**06**

Q.4 A) Attempt any Two of the following.**08**

- 1) From the following table, estimate the number of students who obtained marks between 40 and 45.

Marks:	30-40	40-50	50-60	60-70	70-80
No. of Students:	31	42	51	35	31

- 2) Use the Trapezoids rule to estimate the integral $\int_0^2 e^{x^2} dx$ taking the numbers 10 intervals.
- 3) With usual notation prove that
- 1) $\Delta = E - 1$
 - 2) $E = e^{hD}$

B) Solve**08**

- i) $y_{x+1}yx + (x+2)y_{x+1} + xy_x + x^2 + 2x + 2 = 0$
- ii) $y_{n+2} - 2y_{n+1} + y_n = n^2 2^n$

Q.5 Attempt any Two of the following.**16**

- a) State and prove Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule and hence evaluate $\int_0^6 \frac{dx}{1+x^2}$

- b) Evaluate

- 1) $\Delta^2 \left(\frac{x^2}{\cos 2x} \right)$
- 2) $\Delta^2 \left(\frac{5x+12}{x^2+5x+6} \right)$

- c) Find the value of $\cos(1.74)$ from the following table.

x :	1.7	1.74	1.78	1.82	1.86
$\sin x$:	0.9916	0.9857	0.9781	0.9691	0.9584

Day & Date: Sunday, 25-May-2025
Time: 03:00 PM To 06:00 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.
4) Use of calculator is allowed.

1) If $Y_1 < Y_2 \dots Y_n$ is an order statistic from a distribution with pdf $f(x)$ and CDF $F(X)$ then probability distribution of Y_r can be obtained using

- a) Concept of multinomial distribution
b) Concept of first definition of derivative
c) Both a and b
d) Neither a nor b

- 2) Which one of the following is an order statistic?
- a) sample mode b) sample median
- c) sample mean d) none of these

- 3) Let $\{X_n, n \geq 1\}$ be a sequence of iid r.v.s. each with mean μ and variance σ^2 . Let $S_n = \sum_{i=1}^n X_i$. Then the limiting distribution of Z is normal if $Z =$ _____.

- a) $\frac{S_n - \mu}{(\sigma/\sqrt{n})}$

c) $\frac{S_n - n\mu}{n\sigma^2}$

b) $\frac{S_n - n\mu}{(\sigma/\sqrt{n})}$

d) $\frac{S_n - n\mu}{\sigma\sqrt{n}}$

- 4) Convergence in probability of sample mean to population mean is implied by _____.

- a) C.L.T.
b) Weak law of large numbers
c) Chebyshev's inequality
d) None of these

- 5) We say that state i leads to state j if $\exists n \geq 0$ such that $P^n(i, j) > 0$.

- a) $P_{ij}^{(n)} \geq 0$
- b) $\overline{P_{ij}^{(n)}} = 0$
- c) $P_{ii}^{(n)} > 0$
- d) None of these

- 6) A stochastic matrix

- a) Row sums are unity b) Column sums are unity
c) Both (a) and (b) d) neither (a) nor (b)

- 7) In M/M/1 : ∞ FCFS model the queue discipline is _____.
 a) first in last out b) first in first out
 c) last in first out d) last in last out
- 8) If $X_n \xrightarrow{P} X$ then _____.
 a) $X_n^2 \xrightarrow{P} X$ b) $X_n^2 \xrightarrow{L} X^2$
 c) $X_n^2 \xrightarrow{2} X^2$ d) $X_n^2 \xrightarrow{P} X^2$
- 9) In usual notations expected waiting time in the system is given by _____.
 a) $W_s = (\lambda - \mu)$ b) $W_s = (\lambda - \mu)^{-1}$
 c) $W_s = (\mu - \lambda)$ d) $W_s = (\mu - \lambda)^{-1}$
- 10) Markov property is based on _____.
 a) unconditional probability b) expectation
 c) conditional probability d) none of these

B) Answer the following.**06**

- 1) In usual notations CDF of first order statistic is given by _____.
- 2) If Y_n follows B(n,p) then proportion of success to the number of trials Y_n/n converges to _____ in probability as $n \rightarrow \infty$
- 3) Let $X_1, X_2, \dots, X_n$ be i.i.d U(0,1) variates and $X_{(n)} = \max(X_1, X_2, \dots, X_n)$. Then $E[X_{(n)}] =$ _____.
- 4) Non recurrent state is also called as _____.
- 5) In M/M/1 : ∞ FIFO model, distribution of inter arrival time is _____.
- 6) If $\rho = 5$ queue length will be _____.

Q.2 Solve any Eight of the following.**16**

- a) In usual notations state the p.d.f of r^{th} order statistic.
- b) State the distribution sample median, (when sample n is odd).
- c) Let $X_{(1)}, X_{(2)}, X_{(3)}, X_{(4)}$, be the order statistic of a random sample of size 4 drawn from the distribution having p.d.f.

$$f(x) = \begin{cases} e^{-x} & , 0 < x < \infty \\ 0 & , 0. w \end{cases}$$

Find p.d.f. of n^{th} order statistic

- d) Define convergence in distribution.
- e) Let $X_1, X_2, X_3, \dots, X_n$ be a random samples from a $\chi^2_{(10)}$ distribution. Test whether WLLN holds good..
- f) Give one example of continuous state and continuous time of stochastic process.
- g) What are the queue disciplines in queuing theory?
- h) Suppose one step TPM is

$$P = \begin{bmatrix} 0.7 & 0.3 \\ 0.4 & 0.6 \end{bmatrix}$$

construct two step TPM.

- i) Define accessible state and communicating state of Markov chain.
- j) Write any two operating characteristic in queuing system.

Q.3 A) Attempt any Two of the following. 10

- 1) Let $x_1, x_2, x_3, \dots, x_n$, be a sequence of r.v. with mean μ and variance σ^2 then show that $\frac{S_n}{n} \xrightarrow{p} \mu$, where $S_n = x_1 + x_2 + x_3 + \dots + x_n$
- 2) Let $\{X_n, n \geq 1\}$ be a Markov chain with states space $\{0, 1, 2\}$ and one step TPM

$$P = \begin{bmatrix} 0.1 & 0.5 & 0.4 \\ 0.6 & 0.2 & 0.2 \\ 0.3 & 0.4 & 0.3 \end{bmatrix}$$

and initial probability distribution $P(X_0 = i) = 1/3, i = 0, 1, 2$ Find

- $(X_2 = 2/X_1 = 1)$
 - $P(X_2 = 2, X_1 = 1/X_0 = 2)$
 - $P(X_2 = 2, X_1 = 1, X_0 = 2)$
- 3) In M/M/1 : ∞ FIFO model, show that average number of customers in the system and queue are $\frac{\rho}{1-\rho}$ and $\frac{\rho^2}{1-\rho}$ respectively.

B) Let $X_{(1)}, X_{(2)}, X_{(3)}, X_{(4)}$ be the order statistic of a random sample of size 4 drawn from the distribution having p.d.f. 06

$$f(x) = \begin{cases} e^{-x} & , 0 < x < \infty \\ 0 & , o.w \end{cases}$$

Find $P(X_{(4)} \geq 3)$

Q.4 A) Attempt any Two of the following. 08

- Explain the assumptions made in queuing model M/M/1 : ∞ FCFS
- For a random sample of size n from a distribution with pdf $f(x)$ and CDF $F(x)$ obtain the cdf and pdf of first order statistics.
- Let X_i be i.i.d. $B(1, p)$ then show that WLLN holds good for this sequence $\{X_n\}$.

B) For a Markov chain $\{X_n, n \geq 1\}$ one step TPM is as follows 08

$$P = \begin{bmatrix} 0 & 1 & 0 \\ p & 0 & q \\ 0 & 1 & 0 \end{bmatrix} \text{ check whether states are recurrent or not}$$

Q.5 Attempt any Two of the following. 16

- Customer arrives at a box office window being served by a single person according to Poisson input process with a mean rate of 60 per hour. The time required to serve a customer has an exponential distribution with mean of 40 seconds. Determine
 - utilization rate of this system
 - average length of queue
 - average length of non-empty queue
 - mean waiting time of an arrival
- If X is $B(100, 0.5)$ then find the approximate value of $P(Y = 50)$ using CLT, where $Y = \frac{1}{n} \sum X_i$ ($P(Z \leq 1) = 0.8143$ $P(Z \leq -1) = 0.1587$ $Z \sim N(0, 1)$)
- Show that the distribution of sample median of a random sample of size $(2n+1)$ from $U(0, 1)$ follows beta distribution of first kind.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New/Old) (CBCS) Examination: March/April - 2025
Geology (Special Paper-XIV)
Geomorphology and Geotectonic (19201653)

Day & Date: Sunday, 25-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) _____ land comprises, Africa, South America, India, Australia and Antarctica.
 - a) Gondwana
 - b) Laurasia
 - c) Panthalassa
 - d) India
- 2) _____ erosion is a fluvial process of erosion that lengthens a stream, a valley or a gully at its head.
 - a) Headward
 - b) Valley deepening
 - c) Valley widening
 - d) None of these
- 3) Asthenosphere is the zone _____.
 - a) Separating crust and mantle
 - b) Within upper mantle
 - c) Within the lower mantle
 - d) Separating core and mantle
- 4) Radial or centrifugal drainage pattern forms over _____.
 - a) Circular basin
 - b) Domal structure
 - c) Elongated ridge
 - d) Oceanic cliffs
- 5) What do scientists believe is the force behind the plate tectonics theory?
 - a) Convection currents
 - b) the Sun's gravity
 - c) gravity slab pull
 - d) the movement of the planets
- 6) The rock which is well polished by wind abrasion is called _____.
 - a) Yardangs
 - b) Pedestal rock
 - c) Ventifacts
 - d) Desert pavements
- 7) Partial melting and the production of magma takes place at _____.
 - a) divergent plate boundaries
 - b) ocean-ocean convergent plate boundaries
 - c) ocean-continent plate boundaries
 - d) All of these

- 8) Landforms of mesa and butte are formed on _____ structure.
- Granitic batholiths
 - Horizontal lava flows or sedimentary beds
 - Folded and faulted region
 - Limestone region
- 9) The tectonically active volcanic mountain of Pacific Ocean is regarded as _____.
- Ring of Fire
 - Ring of volcano
 - mountain of fire
 - Island of volcano
- 10) Which of the following is exogenic process?
- Earthquake
 - Deposition
 - Volcano
 - None of these

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. **06**

- _____ is the type of plate boundary of the Indian plate along the Himalayan mountains?
- The term for wear and tear of the load sediments being transported by a moving natural agency through the process of mutual impacts is _____.
- Raised banks of meandering rivers formed by deposition of fine sand, silt and clay during overbank flooding are called _____.
- Volcanism is recorded as a linear array of volcanic seamounts and islands parallel to the direction the plate is moving.
- The mechanical loosening and removal of the material from the rocks due to pressure exerted by the running water is called _____.
- Alluvial deposits of roughly triangular shape that are deposited by major rivers at their mouths within the sea are called _____.

Q.2 Solve any Eight of the following.

16

- Give two examples of exogenous processes.
- Define lithosphere.
- Define Uniformitarianism.
- Name the continents related to Gondwanaland.
- List the types of geological features related to convergent plate boundary.
- Give any two erosional features of wind.
- What is polycyclic landscape?
- Name the depositional feature of karst topography.
- Give the example of mountains result by collision between two continents?
- List the depositional features of river.

Q.3 A) Attempt any Two of the following.

10

- Write short note on Sea floor spreading.
- What is eustatic rejuvenation? Explain in brief
- Define orogeny. Describe in short the formation of Himalaya.

B) Write short note on diastropism and volcanism. **06**

Q.4 A) Attempt any Two of the following. 08

- 1) Explain the term 'Uniformitarianism'
- 2) Describe the erosional features of Wind with suitable diagram.
- 3) Write note on Paleomagnetism.

B) Define plate. Explain the types of plate boundary with suitable examples. **08**

Q.5 Attempt any Two of the following. 16

- a)** Define Continental drift. Explain the continental drifting with its evidences.
- b)** Describe in brief the magmatism and seismic activity related to plate boundaries.
- c)** Explain in detail the three stages of river with its suitable features.

Day & Date: Sunday, 25-May-2025
Time: 03:00 PM To 06:00 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.

- The precipitation of enzyme using saturated concentration of ammonium sulphate is known as _____.
 - Salting in
 - Salting out
 - Fractionation
 - Dialysis
- _____ the end product of pentose phosphate pathway.
 - Glycerate
 - Ribulose 5 phosphate & NADPH
 - Pyruvate
 - Lactate
- _____ enzyme play vital role during bioluminescence in bacteria.
 - Ligase
 - Luciferase
 - Photolyase
 - Phosphorylase
- In Calvin cycle of carbon assimilation first formed 3 carbon compound is _____.
 - 3-Phosphoglycerate
 - 3-glycerate
 - glucose
 - starch
- The term enzyme coined by _____.
 - Louis Pasteur
 - Wilhelm Kuhne
 - Robert Koch
 - William Arthur
- _____ is allosteric Enzyme.
 - Amylase
 - Lactate Dehydrogenase
 - Protease
 - Aspartate Transcarbamoylase
- Koshland's theory of enzyme action is known as _____ theory.
 - Reduced fit
 - Induced fit
 - Lock and Key
 - Coenzyme-Enzyme
- If $K_m = S$, the velocity of enzyme catalyzed reaction is _____.
 - V_{max}
 - $\frac{1}{2} V_{max}$
 - $\frac{1}{4} V_{max}$
 - unchanged

- 9) The purification of enzyme on the basis of their net charge carried out by _____ chromatography method.
- | | |
|-------------------|---------------|
| a) Ion exchange | b) affinity |
| c) gel filtration | d) adsorption |
- 10) In catabolite repression of Lac operon, β galactosidase enzyme encoded by _____ structural gene.
- | | |
|----------|----------|
| a) Lac I | b) Lac Y |
| c) Lac Z | d) Lac a |

B) Answer the following.**06**

- 1) Define Translation.
- 2) GOGAT Stands for _____.
- 3) Define Isoenzymes.
- 4) Define Co-repressor.
- 5) _____ Chromatography method is used for the purification of enzymes on the basis of their size.
- 6) Define Enzyme Specificity.

Q.2 Solve any Eight of the following.**16**

- a) Define ribozyme.
- b) Principle of affinity chromatography.
- c) Define Operon.
- d) Draw the Flowchart of Glyoxylate Pathway.
- e) Significance of V_{max} & K_m .
- f) Enlist the various methods of Cell disruption.
- g) Define Induced Fit Hypothesis.
- h) Enlist the enzymes involved in ED Pathway.
- i) Define Dialysis.
- j) Enlist Various Habitats of Bioluminescent organisms.

Q.3 A) Attempt any Two of the following.**10**

- 1) Describe in short factors affecting the enzyme activity - Strain and Distortion.
- 2) Discuss in detail purification of enzyme on the basis of molecular size and electric charge.
- 3) Describe in short Pyruvate as key metabolite in carbohydrate metabolism.

B) Write in detail regulation of enzyme by catabolite repression.**06****Q.4 A) Attempt any Two of the following.****08**

- 1) Write Note on Enzyme Assay.
- 2) Define Allosteric Enzymes and Write in Short about Sequential Model.
- 3) Describe in detail Phosphoketolase Pathway.

B) Define Bioluminescence and explain in detail about its mechanism. **08**

Attempt any Two of the following. **16**

- a)** Describe in detail about assimilation of Carbon.
- b)** Define Immobilization of enzymes, describe in detail its method and application of enzyme immobilization.
- c)** Describe in detail protein synthesis in prokaryotes.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Electronics (Special Paper-XIV)
Embedded System Design (19201677)

Day & Date: Sunday, 25-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Use of scientific calculator is allowed.

Q.1 A) Select the correct alternative. 10

- 1) An electronics system designed for _____ application is called as an embedded system.

a) dedicated	b) general
c) hardware	d) None of these
- 2) The super loop used in embedded C program is always _____ loop.

a) for	b) endless
c) ending	d) none of these
- 3) The data range of float variable is _____ bytes.

a) 8 byte	b) 1 byte
c) 2 bytes	d) 4 bytes
- 4) Which of following embedded C statement is used to configure Port 1 in Input mode?

a) P1 = 0x55	b) P1 = 0x00
c) P1=0xFF	d) P1=0xAA
- 5) _____ is the input statement of C Language.

a) printf()	b) scanf()
c) getch()	d) None of these
- 6) The C Language consists of _____ keywords.

a) 16	b) 256
c) 64	d) 32
- 7) In serial programming, _____ is checked to identify the completion of data.

a) TR Flag	b) TI Flag
c) TF Flag	d) RI Flag

- 8) To generate time delay _____ technique is used.
 - a) Software
 - b) Hardware
 - c) both hardware & software
 - d) forever
- 9) In C Programming _____ function is having highest priority.
 - a) Main
 - b) Arithmetic
 - c) Defined
 - d) Output
- 10) In C program, variables are declared _____ to write the program.
 - a) locally
 - b) globally
 - c) either globally or locally
 - d) separately

B) Answer the following.**06**

- 1) Define In-system programming.
- 2) Name the IDE which is used to create firmware for 8051 microcontroller.
- 3) State the name of header file necessary to include in embedded C program for 8051.
- 4) Which code or type of the character should be sent to LCD to display the BCD data on LCD?
- 5) Name the statement which are used for superloop in embedded C programming.
- 6) On execution of the statement $X = Y/Z$, where $Y = 15$, $Z = 4$, what is the value returned to X, if X variable is float type?

Q.2 Solve any Eight of the following.**16**

- a) Give the format specifier for integer and character.
- b) Define constants and variables of the C Language.
- c) Give any four conditions of the control statement.
- d) State the types of the If statement.
- e) What is user defined function?
- f) Mention any four applications of an embedded system.
- g) State any four characteristics of an embedded system.
- h) Mention the name of control signals of 16x2 LCD.
- i) State the data types of the C language.
- j) State the logical operators available in C language.

Q.3 A) Attempt any Two of the following.**10**

- 1) What is if control statement? Discuss if control statement with suitable example.
- 2) Write Embedded C program for toggling the LED at Port 0.
- 3) Write embedded C program for generation of square of at port P1 using timer delay.

B) What is operators in C programme? Explain any two operators with suitable program.**06**

- Q.4 A) Attempt any Two of the following. 08**
- 1) Explain the minimum hardware requirement for embedded system with diagram.
 - 2) Explain the concept of superloop in embedded C.
 - 3) Write embedded C program to transfer the message ELECTRONICS serially continuously.
- B) Discuss the interfacing of 16x2 LCD to microcontroller 8051 with embedded C program. 08**
- Q.5 Attempt any Two of the following. 16**
- a) What is Loop statement? Describe in detail Loop statements with suitable example.
 - b) Describe in detail the designing of an embedded system for temperature measurement.
 - c) With suitable diagram & embedded C programme describe interfacing of stepper motor to 8051.

Seat No.	

Set P

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Computer Science (Special Paper-XV)
Advanced Java (19201669)

Day & Date: Sunday, 25-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Select the correct alternative. 10

- 1) How many types of JDBC drivers are available?

a) 3	b) 4
c) 2	d) 5
- 2) What type of servlets use these methods do Get(), do Post(), do Head(), do delete(f), do Trace()?

a) Generic Servlets	b) Http Servlets
c) Http Class	d) both a and b
- 3) Thin driver is also known as?

a) Type 3 Driver	b) Type 2 Driver
c) Type 4 Driver	d) Type 1 Driver
- 4) Which packages represent interfaces and classes for servlet API?

a) javax. servlet	b) javax. servlet, http
c) Both A & B	d) None of the above
- 5) Which methods are used to bind the objects on Http Session instance and get the objects?

a) Set Attribute	b) Get Attribute
c) Both A & B	d) None of the above
- 6) Which tag is used to execute java source code in JSP?

a) Declaration Tag	b) Scriptlet tag
c) Expression tag	d) None of the above
- 7) Which is not a directive?

a) Include	b) Page
c) Export	d) Taglib
- 8) Which method in the HttpServlet class is used to handle HTTP POST requests?

a) doGet()	b) doPost()
c) Serviced	d) init()

- 9) Which of the following annotations is used to mark a field as the primary key in HB?
- a) @Id
 - b) @Primary Key
 - c) @Key
 - d) @Primary
- 10) Hibernate ORM stands for?
- a) Class Relational Mapping
 - b) Class Object Mapping
 - c) Object Relational Mapping
 - d) None of the above

- B)** Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. **06**
- 1) In JDBC, Parameterized queries can be executed by _____.
 - 2) CGI stands for _____.
 - 3) All annotations of Hihernate are defined in the _____ package.
 - 4) _____ configuration file is used to configure Hibernate settings?
 - 5) In JSTL, _____ is used for set the specified variable from a particular scope.
 - 6) TLD stands for _____.

Q.2 Solve any Eight of the following. 16

- a) What is Java Bean?
- b) Define JDBC API.
- c) What are the advantages of Servlet over CGI?
- d) What are the steps to create application of Strut?
- e) What is ORM?
- f) What is Session Tracking?
- g) What is use of Result Set interface?
- h) What are advantages of Cookies in session tracking?
- i) List out web servers.
- j) What are the differences between Statement and Prepared Statement?

Q.3 A) Attempt any Two of the following. 10

- 1) Explain JSP page life cycle.
- 2) Explain Steps to create application of hibernate.
- 3) Write a program to implements Servlet Config interface'.

B) Short note on servlet API. 06

Q.4 A) Attempt any Two of the following. 08

- 1) Write a program to make CRUD operations on student table.
- 2) Explain annotations of Hibernate.
- 3) Explain any 4 JSP implicit objects?

B) Explain different types of JDBC Statements. 08

Q.5 Attempt any Two of the following.

16

- a)** Explain exception handling in JSP with suitable example.
- b)** Explain any two session tracking mechanisms with example.
- c)** Explain any 4 attributes of page directives with example.

Seat No.	

Set	P

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Physics (Paper - XVI)

Atomic, Molecular Physics and Quantum Mechanics (19201621)

Day & Date: Monday, 05-May-2025

Max. Marks:80

Time: 03:00 PM To 06:00 PM

- Instructions:** 1) All questions are compulsory.
 2) Figures to right indicate full marks.
 3) Draw neat labeled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Multiple choice questions:**10**

- 1) The transition from nS levels to the lowest P level give rise to the series of spectral lines is called _____.
 a) sharp b) principal
 c) diffuse d) fundamental
- 2) Most intense line in doublet corresponds to _____.
 a) maximum j value b) j and ℓ change in same way
 c) both a and b together d) zero j value
- 3) If the coupling between C^* and s^* is not broken in an external magnetic field, then we observe _____.
 a) normal Zeeman effect b) anomalous Zeeman effect
 c) Paschen-back effect d) Stark effect
- 4) When the atom is placed in external weak magnetic field, then we observe _____.
 a) normal Zeeman effect b) anomalous Zeeman effect
 c) Paschen-back effect d) Stark effect
- 5) Pure rotational spectra occurs in _____.
 a) ultraviolet region b) infra-red region
 c) microwave region d) visible region
- 6) If wave function Ψ is imaginary then probability density is _____.
 a) negative b) positive
 c) a positive real quantity d) a negative real quantity
- 7) Reduced Plank's constant is _____.
 a) $h/2\pi$ b) h/π
 c) $h\pi$ d) $2\pi h$

- 8) The separation between two successive energy levels in harmonic oscillator is _____.
 a) $\hbar\omega$ b) $\hbar\omega/2$
 c) $3/2 \hbar\omega$ d) $2/3 \hbar\omega$
- 9) The energy spectrum of particle in one-dimensional rigid box has the nature of _____.
 a) infinite sequence of discrete energy levels
 b) infinite sequence of equidistant energy levels
 c) exponential increasing
 d) exponential decreasing
- 10) The kinetic energy operator is given by _____.
 a) $= -\frac{\hbar^2}{2m}\nabla^2 + V(r)$ b) $= -\frac{\hbar^2}{2m}\nabla^2$
 c) $= -i\hbar\frac{\partial}{\partial x}$ d) $= i\hbar\frac{\partial}{\partial t}$

B) Fill in the blank.**06**

- 1) In the alkali spectra, the selection rule for j in emission transition is _____.
- 2) Good quantum numbers in Paschen- Back effect are _____.
- 3) The effect of external field on spectral line is known as _____.
- 4) The reduced mass (μ) of rigid rotator is given by _____.
- 5) Raman shift occurs in _____.
- 6) Reduced Plank's constant is _____.

Q.2 Solve any Eight of the following.**16**

- a) State Heisenberg's uncertainty principle.
- b) Give any two properties of Raman lines.
- c) What is an operator?
- d) What is Stark effect?
- e) Find eigen value of $(\sin nx)$ for operator d^2/d^2x
- f) Define Raman effect, Stoke's line and antistoke's line.
- g) Calculate the reduced mass of CO diatomic molecule.
 [Mass of C = 1.99×10^{-26} kg & Mass of O = 2.66×10^{-26} kg]
- h) State Probability density.
- i) What is a commutation rule?

Q.3 A) Attempt any Two of the following.**10**

- 1) Obtain Zero point energy in case of linear harmonic oscillator from Heisenberg's uncertainty principle.
- 2) Derive the expression for vibrational energy levels of diatomic molecule.
- 3) The Raman exciting line in an experiment is $4358 \text{ \AA}$. A sample gives Stoke's line at $4458 \text{ \AA}$. Deduce the wavelength of anti-Stoke's line.

B) What is the Paschen Back effect? Obtain an expression for term value. **06**

Q.4 A) Attempt any Two of the following. **08**

- 1) Show that $[\hat{H}, \hat{P}] = 0$
- 2) State all quantum numbers.
- 3) State and express Ladder operator.

B) Using the steady state Schrodinger's wave equation, derive the energy eigen values and normalization condition for the motion of particle in one dimensional rigid box. **08**

Q.5 Attempt any Two of the following. **16**

- a)** Explain anomalous Zeeman effect and obtain an expression for term shift.
- b)** Solve Schrodinger's equation for hydrogen atom and discuss the radial wave equation.
- c)** Derive Schrodinger's time dependent wave equation in three dimension.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (Old) (CBCS) : Examination March/April - 2025
Chemistry (Special Paper - XV)
Organic Chemistry (19201612)

Day & Date: Monday, 05-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams and give equations wherever necessary.

Q.1 A) Select the most correct alternative. 10

- 1) _____ is an example of six membered aromatic heterocyclic compound.

a) Pyrrole	b) Furan
c) Pyridine	d) Piperidine
- 2) _____ is used as antitubercular drug.

a) Isoniazid	b) Pamaquine
c) Tolbutamide	d) Cetirizine
- 3) _____ is an example of monosaccharides.

a) Lactose	b) Glucose
c) Sucrose	d) Starch
- 4) _____ vitamin is a not fat-soluble vitamin.

a) A	b) D
c) K	d) B
- 5) Electrophilic substitution in pyridine takes place at positions _____.

a) 3 & 5	b) 2 & 4
c) 2, 4 & 6	d) 2 & 6
- 6) Sucrose on hydrolysis gives _____.

a) 2 glucose units	b) 2 fructose units
c) glucose + galactose	d) Glucose + fructose
- 7) _____ iodine atoms are present in thyroxine.

a) 2	b) 3
c) 4	d) 5
- 8) Phenobarbitone is an example of _____ drug.

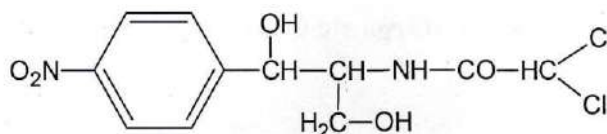
a) anti-malarial	b) antidiabetic
c) C.N.S.	d) antitubercular

- 9) Reactive dye forms _____ bond with fibers like cotton rayon etc.
a) ionic b) co-ordinate
c) metallic d) covalent
- 10) _____ is a natural insecticide.
a) Pyrethroid b) Monocrotophos
c) Methoxychlor d) Baygon

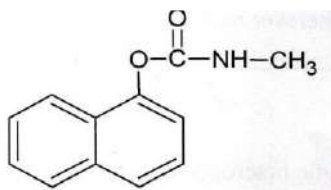
B) Fill in the blanks.

06

- 1) Pyrrole on nitration with nitric acid in presence of acetic anhydride gives _____.
- 2) Glucose is aldehyde carbohydrate having _____ carbon atoms.
- 3) Name of following drug is



- 4) When a mixture of furan, ammonia and steam is passed over heated alumina gives _____.
- 5) Name of following insecticide is _____.



- 6) Lemon is rich source of vitamin _____.

Q.2 Solve any Eight of the following.

16

- a) Explain basic nature of pyrrole.
- b) What are source and deficiency of vitamin A.
- c) Give two methods of preparation of pyridine.
- d) Define the terms
 - 1) Homopolysaccharide
 - 2) Heteropolysaccharide
- e) What are hormones? Give its example.
- f) Give the synthesis of Baygon.
- g) Define auxochrome and chromophore.
- h) Define antidiabetic drug with example.
- i) Give any two uses of ethephon.
- j) What are carbohydrates? Give its general formula.

Q.3 A) Attempt any Two of the following.

10

- 1) Discuss Skraup's Synthesis of quinoline with mechanism.
- 2) What is chemotherapeutic agent? How they are classified?
- 3) Give any two methods for synthesis of adrenaline.

- B)** Discuss classification of carbohydrate.

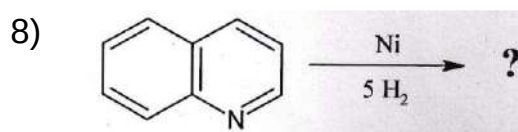
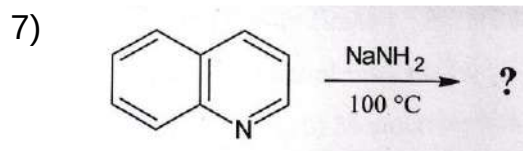
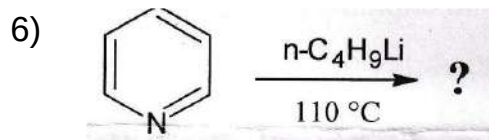
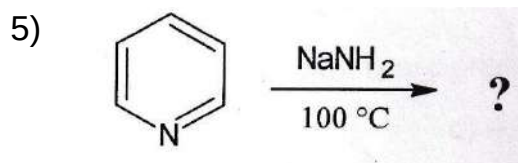
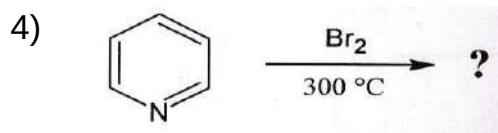
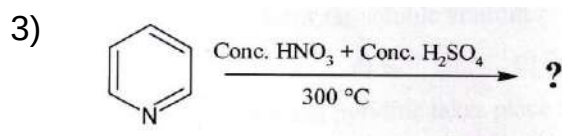
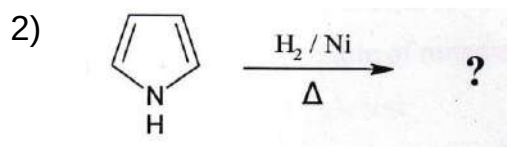
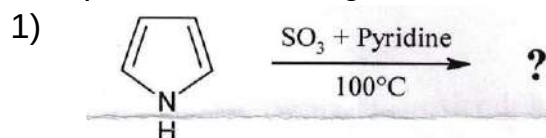
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Q.4 A) Attempt any Two of the following.**08**

- 1) Give synthesis and uses of Indole-3-acetic acid.
- 2) Give the synthesis of Orange IV and Malachite green.
- 3) Prove the presence of $-NH_2$, $-COOH$ and phenolic $-OH$ groups in thyroxine.

B) What are qualities of ideal drug? Give the synthesis of ibuprofen.**08****Q.5 Attempt any Two of the following.****16**

- a) Explain configuration of D-glucose from D-arabinose.
- b) What are dyes? Give classification of dyes based on chemical constitution.
- c) Complete the following reactions.



Day & Date: Monday, 05-May-2025
Time: 03:00 PM To 06:00 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.
4) Use of log table and calculators is allowed.

10

- Page 1 of 3

- 8) G2 phase is called as _____.
 a) pre mitotic phase b) Post mitotic phase
 c) lengthy phase d) none
- 9) Detoxification takes place in _____.
 a) Mitochondria b) Cell wall
 c) Peroxisomes d) Cell membrane
- 10) Crossing over is also called as _____.
 a) Mutation b) Recombination
 c) Linkage d) All the above

B) Give answer in one sentence.**06**

- 1) What is cell?
- 2) Which is power house of cell?
- 3) What is cell biology?
- 4) What is chromosome?
- 5) What is meiosis?
- 6) What is TEM?

Q.2 Solve any Eight of the following.**16**

- a) Write types of chromosomes.
- b) Define mitosis.
- c) Draw well labeled structure of mitochondria.
- d) Define prokaryotic cell.
- e) Enlist phases of cell cycle.
- f) Define karyotype.
- g) Write any four advantages of scanning electron microscope.
- h) Write significance of meiosis.
- i) Give the functions of cytoskeleton.
- j) Enlist types of microscopy.

Q.3 A) Attempt any Two of the following.**10**

- 1) Describe principle, working of transmission electron microscope.
- 2) Describe in detail phases of mitosis.
- 3) Describe ultra structure of chloroplast.

B) Write a note on light microscope.**06****Q.4 A) Attempt any Two of the following.****08**

- 1) Describe cell cycle in detail.
- 2) Describe the ultra structure of endoplasmic reticulum.
- 3) Write procedure to prepare sample for electron microscopy.

B) Write a note eukaryotic cell components.**08**

Q.5 Attempt any Two of the following.

16

- a)** Write difference in mitosis & meiosis.
- b)** Write working and principle of phase contrast microscopy.
- c)** Explain cell as a unit of life.

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B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Zoology (Special Paper - XV)
Animal Behavior and Chronobiology (19201629)

Day & Date: Monday, 05-May-2025
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.
4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) The study of biological rhythms that occur in a regular sequence is called _____.
 - a) Chronobiology
 - b) Animal behavior
 - c) Biological clock
 - d) Biodiversity
- 2) _____ theory is also known as classical conditioning.
 - a) Pavlov's
 - b) Von Frisch
 - c) Lorenz
 - d) Tinbergen
- 3) The ability of animal to ignore irrelevant stimuli is _____ type of behavior.
 - a) Conditioned reflex
 - b) Habituation
 - c) Imprinting
 - d) Ignorance
- 4) Honey bees are _____.
 - a) Social ants
 - b) Social termites
 - c) Social insects
 - d) Social crustaceans
- 5) Honey bees perform waggle dance to convey information about direction and distance for _____ sources.
 - a) Water
 - b) Food
 - c) Mating
 - d) Escape from predators
- 6) The biological difference between male and female is called _____.
 - a) Sexual behavior
 - b) Altruism
 - c) Animal diversity
 - d) Sexual dimorphism
- 7) _____ rhythm are the physical, mental and behavioral changes in organisms experiences over a 24 hour cycle.
 - a) Lunar
 - b) Circadian
 - c) Tidal
 - d) Biological

- 8) Tidal rhythms that are governed by _____.
a) Moon b) Star
c) Sun d) Earth
- 9) _____ hormone help to regulate the body sleep wake and circadian rhythm.
a) Melanin b) Melatonin
c) MSH d) Mucus
- 10) Dr. Halberg was regarded as the father of _____.
a) Cytology b) Biochemistry
c) Genetics d) Chronobiology

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc.

06

- 1) Ethology is the scientific study of _____.
- 2) Define imprinting.
- 3) Give the names of cast of honey bee.
- 4) What is photoperiod?
- 5) Define census.
- 6) What is instinct behavior?

Q.2 Solve any Eight of the following.

16

- a) Define animal behavior.
- b) Give any example of a proximate cause of behavior.
- c) What is Altruism?
- d) Foraging dance of Honey bee.
- e) Fundamentals of asymmetric sex.
- f) What is intersexual selection?
- g) Define biological oscillation.
- h) Define biological clock.
- i) Application of chrono pharmacology.
- j) What is chronotherapy?

Q.3 A) Attempt any Two of the following.

10

- 1) Write the brief profile of Konrad Lorenz and Ivan Pavlov.
- 2) Explain difference between instinct and learnt behavior.
- 3) Describe the role of melatonin in biological clock.

B) Role of chromo pharmacology in various diseases

06

Q.4 A) Attempt any Two of the following.

08

- 1) Give an account of intrasexual selection in animals.
- 2) Write significance of Biological clock.
- 3) Describe short term and long term rhythms.

B) Give an account of honey bee as a social insect.

08

Q.5 Attempt any Two of the following.

16

- a)** Describe the brief history of ethology.
- b)** Describe regulation of seasonal reproduction in higher vertebrates.
- c)** Give an account of chrono medicines.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Mathematics (Special Paper - XV)
Graph Theory (19201637)

Day & Date: Monday, 05-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative. 10

- 1) If $e = (u, v)$ is directed edge in diagraph then u is called as _____.
 a) isolated vertex b) terminal vertex
 c) initial vertex d) none of these
- 2) A vertex is called isolated vertex if and only if it has a degree _____.
 a) 0 b) 1
 c) 2 d) 3
- 3) A vertex with zero out degree is called as _____.
 a) sink b) source
 c) initial vertex d) none of these
- 4) Repeated vertex is not allowed in _____.
 a) walk b) trial
 c) circuit d) path
- 5) Complete graph K_n is Eulerian if $n =$ _____.
 a) 2 b) 4
 c) 5 d) 6
- 6) A tree T with 5 vertices has _____ edges.
 a) 5 b) 4
 c) 6 d) 3
- 7) In a rooted tree if vertex u has no children then u is called as _____.
 a) leaf b) siblings
 c) internal vertex d) none of these
- 8) Sum of degrees of the vertices in undirected graph is _____.
 a) even b) odd
 c) prime d) none of these
- 9) Convert $1011010_{(2)}$ to decimal number _____.
 a) 91 b) 90
 c) 92 d) 81

- 10) Convert $1475_{(10)}$ to octal number ____.
- a) 2704 b) 2705
c) 2703 d) 2702

B) Fill in the blank.

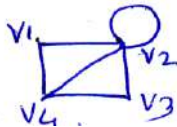
06

- 1) Convert $3526_{(18)}$ to binary _____.
- 2) Convert Hexadecimal number $3D59_{(16)}$ to octal _____.
- 3) A vertex with zero in degree is called as _____.
- 4) The graph K_{33} is called as _____ bipartite graph.
- 5) Draw tree on six vertices _____.
- 6) Draw a wheel on 5 vertices _____.

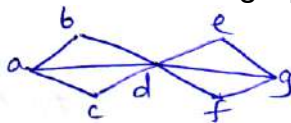
Q.2 Solve any Eight of the following.

16

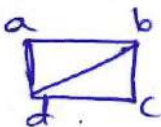
- Convert $0.4375_{(10)}$ to octal number.
- Convert $0.78125_{(10)}$ to Hexadecimal number.
- Define regular graph and give example.
- Find degree of each vertex.



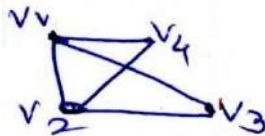
- Give an example which is Eulerian but not Hamiltonian.
- Find diameter of graph.



- g)** Verify Euler's formula $n - e + r = 2$ for



- h) Define adjacency and incidence matrix.
- i) Find any four spanning tree of graph.

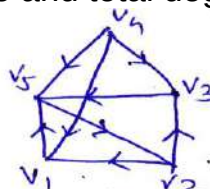


- j) Represent the expression in binary tree.
 $(A + B) * (C - D)$

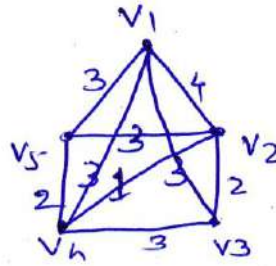
Q.3 A) Attempt any Two of the following.

10

- 1) Show that a simple graph with n vertices and k component can not have more than $\frac{(n-k)(n-k+1)}{2}$ edges.
- 2) Find in degree, out degree and total degree of each vertex.



- 3) Using Prim's Algorithm, find minimal spanning tree of weighted graph.



B) Convert

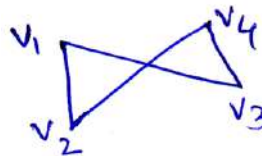
06

- 1) $39.B8_{(16)}$ to decimal number
- 2) $21.673_{(8)}$ to binary number

Q.4 A) Attempt any Two of the following.

08

- 1) Show that in a complete n -ary tree with i internal vertices the number of leaf vertex P is given by $P = \frac{(n-1)(i-1)}{n}$
- 2) Find number of walk of length '3' from V_2 to V_4



- 3) What is value of
prefix expression $* -84 + 6/42$
postfix expression $823 * -2 \uparrow 63/+$

B) Convert

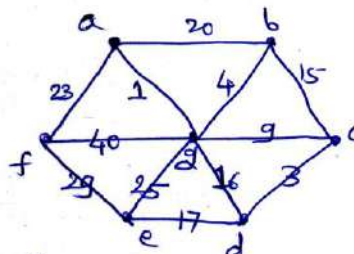
08

- 1) $(33.24)_{(8)}$ to binary
- 2) $(9719)_{(10)}$ to Hexadecimal
- 3) $(110101.1101)_{(2)}$ to decimal
- 4) $(3D59)_{(16)}$ to octal

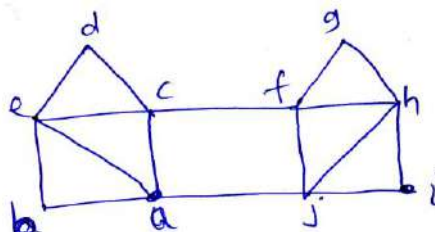
Q.5 Attempt any Two of the following.

16

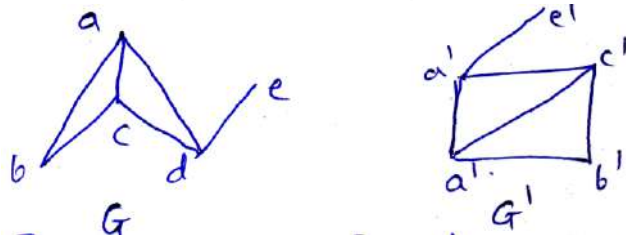
- a) By using Kruskal's Algorithm find minimal spanning tree of graph.



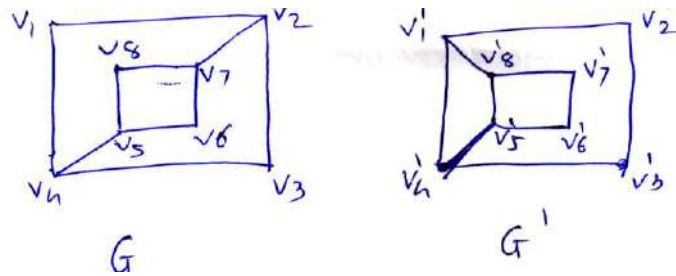
- b) By using Fleury's Algorithm find Euler's circuit in graph.



- c) 1) Show that following graphs are isomorphic.



- 2) Show that following graphs are not isomorphic.



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B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Statistics (Special Paper - XV)
Designs of Experiments (19201645)

Day & Date: Monday, 05-May-2025
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose the correct alternative from the following. 10

- 1) The error degrees of freedom in LSD is 12. Hence degrees of freedom for treatment is _____.
a) 4 b) 2
c) 3 d) 5
- 2) A factorial experiment with three factors each at two levels is called _____.
a) 2×3 factorial experiment b) 3×2 factorial experiment
c) 3^2 factorial experiment d) 2^3 factorial experiment
- 3) In factorial experiments the effect totals are obtained by _____.
a) Kendoll b) Yates
c) Karl Pearson d) None of these
- 4) In a RBD, which of the following is an unbiased estimator of error variance?
a) Treatment sum of squares
b) Treatment mean sum of squares
c) Error sum of squares
d) Error mean sum of squares
- 5) The total number of interaction effects in a 2^3 factorial experiment is _____.
a) 3 b) 4
c) 5 d) 8
- 6) In LSD every treatment effects occurs one & only once in every _____.
a) Row b) Column
c) Row & Column d) None of these
- 7) In efficiency of design D_1 relative to D_2 is $E > 1$, then _____.
a) D_1 is more efficient than D_2
b) D_2 is more efficient than D_1
c) D_1 & D_2 are equally efficient
d) Can't say

- 8) The analysis of covariance procedure is a combination of _____.
 a) analysis of variance and regression analysis
 b) analysis of variance and correlation
 c) both a) and b)
 d) neither a) nor b)
- 9) Local control helps to _____.
 a) reduce the no. of treatments
 b) increase the no. of plots
 c) reduce the error variance
 d) increase the error d.f
- 10) In ANOCOVA the least square estimate of $\beta =$ _____.
 a) E_{xx}/E_{yy}
 b) E_{xy}/E_{xx}
 c) E_{yy}/E_{xy}
 d) none of these

B) Attempt all of the following.**06**

- 1) What is full form of ANOCOVA?
- 2) State the formula to find missing value in CRD.
- 3) State the formula to find M.S.S.
- 4) Define experimental unit.
- 5) Explain the term Treatment.
- 6) State three principles of design of experiments.

Q.2 Solve any Eight of the following.**16**

- a) Describe CRD.
- b) Give one practical situation where Anocova is applicable.
- c) Describe the principle of replication.
- d) State mathematical model used in LSD.
- e) Define efficiency of design of experiment.
- f) Define treatment and block.
- g) Explain split plot design.
- h) Give two merits of CRD.
- i) State main effects in 2^2 factorial experiment.
- j) Define Experimental error.

Q.3 A) Attempt any Two of the following.**10**

- 1) Explain total and partial confounding.
- 2) Estimate the parameters in CRD.
- 3) Derive the formula for one missing observation in RBD.

B) Give layout, Mathematical model and ANOVA table of RBD.**06****Q.4 A) Attempt any Two of the following.****08**

- 1) Derive the formula for one missing observation in LSD.
- 2) Derive the formula for Efficiency of LSD over CRD.
- 3) Explain Yate's procedure to obtain factorial effect totals in 2^2 factorial experiment.

- B)** Explain the procedure of testing of equality of two treatment means in RBD. **08**

Q.5 Attempt any Two of the following. 16

- a)** Derive the formula for two missing observations in Latin Square Design.
- b)** Derive the expressions for main and interaction effects in 2^3 factorial experiment.
- c)** State mathematical model, assumptions and analysis of variance table in case of CRD.

Seat No.	

Set P

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Geology (Special Paper - XV)
Environmental Geology (19201654)

Day & Date: Monday, 05-May-2025
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary

Q.1 A) Rewrite the sentence by filling the blanks with the correct answer from the given option. 10

- The solution of reducing the slope angle is used to prevent _____.
 - flood
 - tsunami
 - subsidence
 - landslide
- The main effect of human activities that causes subsidence is by _____.
 - vibrations from highways
 - increasing runoff by paving
 - lowering the water table
 - removing vegetation
- Fire is common hazard associated with the _____ activity.
 - volcano
 - flood
 - landslide
 - subsidence
- The most destructive landslides generally occur on _____.
 - gentle slopes
 - intermediate slopes
 - steep slopes
 - leveled ground
- What is the Polar climate like?
 - Cold
 - Very cold
 - Hot
 - Warm
- The Albedo of vegetation on the earth is _____ due to its reflectance.
 - very low
 - low
 - white
 - high
- Slides are less likely where rock layers dips _____.
 - parallel to slope
 - into the slope
 - steeply
 - gently against slope
- Method of natural Channel spreading controls probable _____ in future.
 - flood
 - tsunami
 - landslide
 - volcano

- 9) In the urban areas, _____ is a solution for flood hazard.
- restoration of flood plains
 - channel cleaning and deepening
 - non-disposal of garbage in stream
 - all solutions as mentioned in a, b & c
- 10) What percentage of energy that enters in the atmosphere that is absorbed by the atmosphere that leaves 51% for the earth's surface to absorb?
- | | |
|-------|-------|
| a) 30 | b) 21 |
| c) 19 | d) 70 |

B) Answer the following. 06

- Define Bolting for landslide.
- Define landslide.
- Define Retention Wall for landslide
- Define earthquakes.
- Define 'greenhouse effect'.
- Define Flood Plain.

Q.2 Solve any Eight of the following. 16

- What is an avalanche?
- What is dam failure?
- What is a water spreading solution?
- What is 'gully plugging'?
- What is gabion structure?
- What is an artificial levee?
- What is channel modification?
- What is the energy budget of earth?
- What is a coastal hazard related to subsidence?
- What is global warming?

Q.3 A) Attempt any Two of the following. 10

- Explain the climate like between 30 to 40 degree Latitude region.
- Explain in detail process of channel spreading method application to control floods. Draw neat diagrams.
- Explain five preparedness measures of volcanic hazard.

B) Write the Hazardous effects of Tsunami. 06

Q.4 A) Attempt any Two of the following. 08

- Describe role of continuous contour trenching (CCT) in hazard prevention.
- Explain non-conventional energy resources.
- Explain the relation of rock type that impacts floods activities.

B) Role of vegetation & rock structures in flood and landslide hazards. 08

Q.5 Attempt any Two of the following.

16

- a)** Describe in details the causes & effects of subsidence & prevention measures.
- b)** Explain tropical climate & add note on its coastal nature.
- c)** Describe the hydro thermal energy? Add note on India's potential for the same.

Seat No.	

Set P

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Microbiology (Special Paper - XV)
Clinical Microbiology (19201662)

Day & Date: Monday, 05-May-2025
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.
4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative.

10

- On blood agar *Vibrio cholera* show _____ hemolysis.
 - alpha
 - eta
 - gamma
 - target
- Rapid test for detection of *Clostridium perfringens* is _____.
 - VDRL test
 - Nagler's reaction
 - Kahn test
 - Elisa test
- Cigar bundle arrangement is observed with _____.
 - Mycobacterium leprae*
 - Vibrio cholera*
 - Helicobacter pylori*
 - Pseudomonas aeruginosa*
- Oxidase test positive is a characteristic of _____ organisms.
 - Mycobacterium leprae*
 - Pseudomonas aeruginosa*
 - Helicobacter pylori*
 - Klebsiella pneumoniae*
- Cerebral malaria is caused by _____.
 - Plasmodium falciparum*
 - Plasmodium malariae*
 - Plasmodium ovale*
 - Plasmodium vivax*
- The cyst of *Giardia lamblia* contains _____ nuclei.
 - two
 - four
 - three
 - six
- Which of the following Ebola virus species is not fatal among humans?
 - Zaire
 - Cote d'Ivoire
 - Bundibugyo
 - Reston
- Swine flu is _____ disease.
 - respiratory bacterial
 - viral respiratory
 - fungal
 - protozoal

- 9) Hydrophobia is associated with _____ viral infections.
- a) Rabies b) Hepatitis
- c) Ebola d) Swine flu
- 10) Transmission of Ebola infection is through _____ of patient.
- a) blood b) saliva
- c) urine d) all of these

B) Answer the following question in one sentence.

06

- 1) Define chemotherapy.
- 2) What is hydrophobia.
- 3) Name the causative agent of swine flu.
- 4) Name any two antifungal agents.
- 5) What is attenuation?
- 6) Name the drugs used to treat AIDS.

Q.2 Solve any Eight of the following.

16

- Which pigments are produced by *Pseudomonas aeruginosa*?
- Draw a labeled diagram of structure of Rabies virus.
- What is cholera red reaction?
- Name any two antifungal agents and their action.
- What are toxoids?
- What are the symptoms of swine flu?
- What is pathogenicity?
- What is subunit vaccine? Give one example.
- What is dermatophycosis?
- Draw a neat labeled diagram of *Giardia lambda*.

Q.3 A) Attempt any Two of the following.

10

- 1) Toxins produced by *Clostridium perfringens*.
- 2) Bacterial toxins.
- 3) Mechanism of drug resistance

B) Write Short note on "bioweapons".

06

Q.4 A) Attempt any Two of the following.

08

- 1) Live attenuated vaccines
- 2) Laboratory disposal of clinical samples and culture media
- 3) Cryptococcosis

B) Write the ideal characteristics of chemotherapeutic agents. Describe the mechanism of action of following antibiotics - penicillin, streptomycin, trimethoprim, quinolones.

08

Q.5 Attempt any Two of the following.**16**

- a)** Write an essay on “Ebola” with respect to following points-
 - 1) causative agent
 - 2) mode of transmission
 - 3) symptoms
 - 4) diagnosis
 - 5) prophylaxis
- b)** Write an essay on “Leprosy”.
- c)** Describe in detail life cycle of malarial parasite.

Seat No.	

Set P

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Electronics (Special Paper - XV)
Electronics Instrumentation (19201678)

Day & Date: Monday, 05-May-2025
 Time: 03:00 PM To 06:00 PM

Total Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) The basic objectives of data acquisition system _____.
 a) to acquire the data
 b) to process the data
 c) to provide human interface
 d) all of these
- 2) In X-Y Recorders the dc error signal is converted to ac signal by _____.
 a) chopper
 b) servo motor
 c) balance error detector
 d) transducers
- 3) Normally data acquisition system is _____ measurement system.
 a) on-line
 b) off-line
 c) both (a) and (b)
 d) can't say
- 4) In electronic circuit in which dc signal is converted into an ac signal, amplified by standard amplifier and finally converted back to dc signal is called _____.
 a) chopper
 b) clamper
 c) inverter
 d) rectifier
- 5) The _____ techniques are used to eliminate noise or interference in the signal.
 a) grounding
 b) electrostatic shielding
 c) electromagnetic shielding
 d) all of these
- 6) Stress and strain curves are plotted using _____.
 a) Strip chart recorder
 b) X-Y recording
 c) X-T recorder
 d) All of these
- 7) Which of the _____ formula for pH calculation?
 a) $\log_{10}[H^+]$
 b) $-\log_{10}[H^+]$
 c) $\log_2[H^+]$
 d) $-\log_2[H^+]$

- 8) Digital storage oscilloscope has _____ Modes.
- a) 3 b) 2
- c) 4 d) 5
- 9) The chassis of an instrument is connected to the earth ground to _____.
- a) get proper current in the load
- b) gel proper voltage across the load
- c) eliminate leakage path
- d) disconnect load from the circuit
- 10) The CRO is electron beam _____.
- a) current meter b) voltmeter
- c) op-amp non-inverting d) all of these

B) One word answer

06

- 1) How many pins of IC AD620?
- 2) What is the range of pH?
- 3) How many Op-Amps are used in instrumentation amplifier.
- 4) Give full form of DMM.
- 5) How many external resistors are required, in case of AD 620 for Gain set with gain range 1 to 1,000.
- 6) What is output voltage of AD594/595 pre calibrated precision amplifier from thermocouple signal?

Q.2 Solve any Eight of the following.

16

- a) List the names of display units.
- b) List out the basic components of a Magnetic recorder.
- c) Give the features AD 620.
- d) Draw block diagram of digital multimeter.
- e) What is Isolation Amplifier?
- f) State the applications of IC AD 620.
- g) What is need of DAS?
- h) What is the role of preamplifier in signal conditioning.
- i) Draw General block diagram for electronics instrument design for measurement.
- j) State the features of the programmable instrumentation amplifier.

Q.3 A) Attempt any Two of the following.

10

- 1) Explain data logger in details.
- 2) Write a note on Function Generator.
- 3) Write a note on computer-based DAS.

B) Explain Digital data recorder.

06

- Q.4 A) Attempt any Two of the following. 08**
- 1) Draw and explain the block diagram of Conductivity meter.
 - 2) Write a note on LCR Q meter.
 - 3) What is Grounding? Explain it in brief.

- B) Write a note on Digital Storage Oscilloscope. 08**

- Q.5 Attempt any Two of the following. 16**
- a)** Describe general DAS with block diagram. And explain the multichannel DAS.
 - b)** Give Salient features. Draw and Explain Block diagram and Pin description of Precision amplifiers AD594/595.
 - c)** Explain the bridge amplifier for signal conditioning.

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B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Computer Science (Paper - XVI)
Data Communication and Networking - II (19201670)

Day & Date: Monday, 05-May-2025
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Select the correct alternative. 10

- 1) Which is not an application layer protocol?
a) HTTP
b) SMTP
c) FTP
d) TCP
- 2) Communication between a computer and a keyboard involves _____ transmission.
a) Automatic
b) Half-duplex
c) Full-duplex
d) Simplex
- 3) Bits can be sent over guided and unguided media as analog signal by _____.
a) digital modulation
b) amplitude modulation
c) frequency modulation
d) phase modulation
- 4) Which transmission media provides the highest transmission speed in a network?
a) coaxial cable
b) twisted pair cable
c) optical fiber
d) electrical cable
- 5) The physical layer is responsible for _____.
a) line coding
b) channel coding
c) Modulation
d) all of the mentioned
- 6) The network layer is concerned with _____ of data.
a) bits
b) frames
c) packets
d) bytes
- 7) Transmission control protocol _____.
a) is a connection-oriented protocol
b) uses a three way handshake to establish a connection
c) receives data from application as a single stream
d) all of the mentioned

- 8) Which of this is not a guided media?
a) Fiber optical cable b) Coaxial cable
c) Wireless LAN d) Copper wire
- 9) Which one of the following is not a function of network layer?
a) Routing b) Inter-networking
c) Congestion control d) Error control
- 10) Application layer offers _____ service.
a) End to end
b) Process to process
c) Both End to end and Process to process
d) None of the mentioned

B) Fill in the blank.**06**

- 1) _____ is the process of extracting data from the received modulated signal.
- 2) _____ is the process of efficiently selecting a path in a network along which data packets will travel to their destination.
- 3) A conversation on walkie-talkie is a _____ data flow.
- 4) _____ is used to access and operate a remote computer on a network.
- 5) TCP/IP stands for _____.
- 6) FTP stands for _____.

Q.2 Solve any Eight of the following.**16**

- a) What is Noise?
- b) Define Period, Frequency.
- c) Define Error and its types.
- d) Define Framing.
- e) Long form of HTTP and WWW.
- f) Define Routers and Gateways.
- g) What is Retransmission?
- h) Define Network.
- i) Long form of CSMA/CA and CSMA/CD.

Q.3 A) Attempt any Two of the following.**10**

- 1) Explain Satellite Communication in detail.
- 2) Explain Checksum Check with example.
- 3) Explain Link State Routing with example.

B) Differentiate between Hub and Switch.**06****Q.4 A) Attempt any Two of the following.****08**

- 1) Explain Data Flow in detail.
- 2) Explain Modulation in detail.
- 3) Explain POP.

B) Explain Multiplexing in detail.**08**

Q.5 Attempt any Two of the following.

16

- a)** Explain Data Compression in detail.
- b)** Explain Switching in detail.
- c)** Explain ISO-OSI reference model in detail.

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B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Physics (Paper-XVII)
Electronics (19201622)

Day & Date: Tuesday, 06-May-2025
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.
4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- Op. amp has input base currents are 30 nA and 20 nA, the input offset current is _____.
 - 20 nA
 - 25 nA
 - 30 nA
 - 10 nA
- In IC555, pin number 4 is _____.
 - Ground
 - Reset
 - Output
 - Trigger
- _____ is also called as Silicon Unilateral Switch.
 - PNPN diode
 - Tunnel Diode
 - Zener Diode
 - Varactor Diode
- Op Amp. inverting mode produces phase shift of _____ degree between its input and output.
 - 0
 - 90
 - 120
 - 180
- _____ tube having single anode and multi cathodes.
 - CRT
 - Nixie
 - Vacuum
 - X ray
- OP AMP is basically _____ amplifier.
 - differential
 - power
 - current
 - voltage
- E-MOSFET can be operated in _____ mode.
 - enhancement
 - both enhancement as well as depletion
 - depletion
 - neither enhancement nor depletion

- 8) Astable mode of IC555 consists of $R_A=3\text{ K}\Omega$ and $R_B = 4\text{ K}\Omega$. Calculate duty cycle in %.
- a) 42.5 b) 52.5
c) 63.6 d) 72.5
- 9) The color of light emitted in LED depend upon _____.
a) applied bias
b) semiconductor material and doping level
c) used condition
d) temperature
- 10) SCR is _____ device.
a) power control b) power switching
c) oscillator d) amplifier

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. **06**

- 1) Draw an equivalent circuit of SCR.
- 2) Define the term breakover voltage.
- 3) Why the name MOSFET?
- 4) Write the formula of Duty cycle.
- 5) Define input bias current.
- 6) What is Operational Amplifier?

Q.2 Solve any Eight of the following. 16

- a) Draw the symbols of n and p channel D- MOSFET.
- b) Write the names of SCR turn ON and turn OFF methods.
- c) Compare transfer characteristics of D-MOSFET and E-MOSFET.
- d) Draw the constructional diagram of Triac.
- e) Draw diagram of Nixie tube.
- f) Write characteristics of Op. Amp.
- g) Draw circuit diagram of Op.Amp.as adder.
- h) Draw pin diagram of IC 555.
- i) IC555 monostable mode consists of $R=3K\Omega$ and $C = 0.01 \mu F$. Calculate pulse width.
- j) OP AMP is used in inverting mode with $R_1=2K\Omega$ and voltage gain 25. Calculate feedback resistance.

Q.3 A) Attempt any Two of the following. 10

- Draw and explain block diagram of operational amplifier.
- Explain construction, working of SCR.
- Op. amp. is used in non-inverting mode with $R_1 = 2 \text{ K}\Omega$, $R_2 = 12 \text{ K}\Omega$. Calculate output voltage for input voltage of 200 mV and 3V.

B) Short note on LCD. **06**

- Q.4 A) Attempt any Two of the following. 08**
- 1) Explain circuit operation of E-MOSFET.
 - 2) Design an IC 555 astable multivibrator to generate the output signal with frequency 400 Hz, duty cycle 70% and $C = 0.1 \mu F$.
 - 3) Explain the structure and operation of EPID.
- B) Explain op. amp. as differentiator. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Explain with neat circuit diagram, IC 555 as square wave generator.
 - b) Explain op. amp. as integrator.
 - c) Explain construction, working and the characteristics of Triac.

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Chemistry (Special Paper-XVI)
Analytical and Industrial Organic Chemistry (19201617)

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.
4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) In India, sucrose is manufactured from _____.
a) molasses
b) sugarcane
c) sugar beet
d) All of these
- 2) Among the following which is a synthetic polymer?
a) Starch
b) Silk
c) Polythene
d) wool
- 3) Alkaline hydrolysis of fats/oils is called _____.
a) esterification
b) neutralization
c) diazotization
d) saponification
- 4) 1,3-butadiene on treatment with _____ gives Buna-S rubber.
a) styrene
b) acrylonitrile
c) formaldehyde
d) phenol
- 5) Paper chromatography is based on _____.
a) partition coefficient
b) adsorption coefficient
c) solvent extraction
d) none of these
- 6) In vulcanization of rubber _____ is used.
a) Carbon
b) Sodium
c) Iron
d) Sulphur
- 7) In green chemistry _____ principles are studied.
a) 10
b) 11
c) 12
d) 14
- 8) In soap manufacture by hot process _____ is added to salt out the soap.
a) Acid solution
b) Alkali solution
c) Brine solution
d) Water

- 9) Ketone on reduction with LiAlH_4 form _____ alcohol.
a) primary b) secondary
c) tertiary d) none of these
- 10) Indigo is an example of _____ dye.
a) direct b) vat
c) reactive d) disperse dyes

B) Fill in the blank.

06

- 1) The chemical formula of sucrose is _____.
- 2) Alkene on oxidation using forms _____ cis-diols.
- 3) Friedel Craft's acylation reactions using zeolites are used to introduce _____ groups into the aromatic nucleus.
- 4) Bakelite is obtained by the reaction of formaldehyde with _____.
- 5) 1,3 butadiene and acrylonitrile on polymerization give _____.
- 6) The name of monomer of natural rubber is _____.

Q.2 Solve any Eight of the following.

16

- a) Define the terms:
 - 1) Elastomer
 - 2) Thermosetting
- b) What is rate of flow (RF value)?
- c) Name any two bye-products of sugar industry.
- d) Give any two principles of green chemistry.
- e) Write the reactions involved in saponification.
- f) Name the steps involved in the production of raw sugar.
- g) Write names of raw materials used for manufacture of soap.
- h) Define the terms:
 - 1) Desizing
 - 2) Scouring
- i) What are ionic liquids?
- j) What is general principle of chromatography?

Q.3 A) Attempt any Two of the following.

10

- Explain hot process for manufacture of soap.
- Write a note on Ziegler-Natta polymerisation.
- Explain with diagram multiple effect evaporation process.

B) Give any three synthetic applications of LiAlH_4 .

06

Q.4 A) Attempt any Two of the following.

08

- 1) Write a short note on ionic liquids.
- 2) Write a short note on by-products of alcohol industry.
- 3) What is reactivity reversal/umpolung? Explain with suitable example.

B) Give synthesis and uses of Buna-S and Buna-N rubbers.

08

Q.5 Attempt any Two of the following.

16

- a)** Explain cationic addition polymerisation and anionic addition polymerisation with suitable examples.
- b)** Explain process of manufacture of ethyl alcohol from molasses.
- c)** Explain different types of detergents.

Seat No.	

Set P

B.Sc. (Semester - VI) (New)(Old) (CBCS) Examination: March/April - 2025
Botany (Special Paper – XVI)
Nursery, Gardening & Horticulture (19201608)

Day & Date: Tuesday, 06-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Select the correct alternative. 10

- 1) A _____ is place where plants are propagated and grown to a desired age.

a) Park	b) Garden
c) Nursery	d) Farm
- 2) Which of the following Tests are determining quality of seed?

a) Germination Test	b) Viability Test
c) Purity Test	d) All of these
- 3) Seed certification agency 'MAHABEEJ' is located at _____.

a) Akola	b) Amravati
c) Solapur	d) Kolhapur
- 4) How many of the following can help in breaking seed dormancy?

a) Changing Environmental condition
b) Chilling Condition
c) Application of Auxin
d) All of these
- 5) Nursery can be described as _____.

a) Area where seedlings are prepared
b) Where agriculture raw materials are produced
c) Both a and b
d) Cultivation of crop
- 6) Where does Bonsai originate from?

a) China	b) Japan
c) Europe	d) India
- 7) Vegetative propagation is an _____ method of plant reproduction.

a) Sexual	b) Asexual
c) Seed	d) Seedlings

- 8) In Grafting the part of plant that becomes the upper portion or top of the new plant is called _____.
a) Stock b) Root Stock
c) Scion d) Stalk
- 9) Biopesticides are pesticides of _____ Origin.
a) chemical b) biological
c) physical d) none of these
- 10) Which of the following is Example of cut flower?
a) Gladiolus b) Aster
c) Both a and b d) Geranium

B) Fill in the blank.

06

- 1) The study of growing and marketing flowers is called _____.
- 2) _____ Layering is a method of propagating new trees and shrubs.
- 3) The concept of computer application for landscape gardening is comparatively _____.
- 4) _____ is the joining of parts of plants together in such way that they unite and continue to grow as a single plant.
- 5) Seed dormancy is defined as the tendency of seed that prevent its _____ even under suitable and favorable conditions.
- 6) _____ Stores seeds to preserve genetic diversity hence it is also called gene bank.

Q.2 Solve any Eight of the following.

16

- a) Define gardening.
- b) What do you mean by seed certification?
- c) What are the natural method of breaking of seed Dormancy?
- d) Define Genetic Erosion.
- e) What is vegetative propagation?
- f) Define layering.
- g) Give definition of budding.
- h) What is Bonsai?
- i) Define cut flowers.
- j) Define fertilizer.

Q.3 A) Attempt any Two of the following.

10

- Give advantages and disadvantages of Computer Aided Designing (CAD) in designing outdoor landscapes.
- Give Application of manures.
- Describe vegetative reproduction and their types with Example.

B) Write short notes any Two of the following.

06

- What are the objectives of seed Testing?
- Explain scope of Nursery.
- Explain cutting vegetative propagation.

- Q.4 A) Attempt any Two of the following. 08**
- 1) Give the weed control method studied by you.
 - 2) Describe any two cut flowers studied by you.
 - 3) Describe formal garden.
- B) Attempt any Two of the following. 08**
- 1) Give advantage of vegetative propagation.
 - 2) Define seed viability and Explain factors affecting seed viability?
 - 3) Describe the Computer application in landscaping.
- Q.5 Attempt any Two of the following. 16**
- a) Briefly Describe types and structure of seed.
 - b) Describe the importance of flower shows and Exhibition studied by you.
 - c) Explain the elements of Landscape design.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Botany (Special Paper-XVI)
Biostatistics (19201609)

Day & Date: Tuesday, 06-May-2025

Max. Marks: 80

Time: 03:00 PM To 06:00 PM

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Select the correct alternative. 10

- 1) To collect the data according to area or region is called ____ classification.

a) Geographical	b) Qualitative
c) Chronological	d) Quantitative
- 2) _____ gives information about the contents of the table.

a) Caption	b) Title
c) Footnote	d) Table number
- 3) In a throw of coin _____ is the probability of getting tail.

a) 1	b) 1/2
c) 1/4	d) 1/3
- 4) Quantitative variable that can have any numerical values are called _____.

a) Quantitative variables	b) Discrete variable
c) Continuous variable	d) absolute variable
- 5) The sum of all probabilities equal to _____.

a) 4	b) 1
c) 3	d) 2
- 6) Mean, Median and Mode are _____.

a) Measures of deviation
b) Ways of sampling
c) Measures of control tendency
d) Measure of central tendency
- 7) A graph that uses bars of various heights to represents the frequencies _____.

a) Pie graph	b) bar graph
c) Histogram	d) pareto graph

- 8) The midpoint of the values after they have been ordered from the smallest to the largest or the largest to the smallest is called ____.
 - a) Mean
 - b) Median
 - c) Lower quartile
 - d) Upper quartile
- 9) The total of all the observations divided by the number of observations is called _____.
 - a) Arithmetic mean
 - b) Geometric mean
 - c) Median
 - d) Harmonic mean
- 10) The rejection probability of Null Hypothesis when it is true is called as _____.
 - a) Level of Confidence
 - b) Level of significance
 - c) Level of Margin
 - d) Level of Rejection

B) Answer in one sentence.

06

- 1) What is the meaning of Mode?
- 2) Which are the types of Chi- Square tests?
- 3) Define Mean.
- 4) Define Statistical data.
- 5) What is meaning of footnote?
- 6) Define Biostatistics.

Q.2 Solve any Eight of the following.

16

- Enlist the types of variable.
- Define Central tendency.
- Write the simple formula of Chi square test
- What do you mean by probability?
- Enlist the source of primary data.
- Write any two uses of statistics.
- Define outcome in *probability*.
- Define tabulation.
- The following are the ages of the first ten students who enrolled in a certain college. Find the mean 23,21,18,17,19,21,20,18,19,24.
- What is the meaning of sampling?

Q.3 A) Attempt any Two of the following.

10

- Describe types of bar diagram.
- Explain Student's t test
- Describe Histogram.

B) Write a note on secondary data.

06

Q.4 A) Attempt any Two of the following.

08

- 1) Which are essentials of satisfactory table?
- 2) Write basic principles of Statistics.
- 3) Describe any two kinds of probability.

B) Describe methods of primary data collection.

08

Q.5 Attempt any Two of the following.

16

- a)** Discuss the parts of table?
- b)** Write functions of Statistics.
- c)** What is a Chi square test? Describe fundamentals of hypothesis testing.

Seat No.	

Set P

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Zoology (Special Paper- XVI)
Applied Zoology (19201630)

Day & Date: Tuesday, 06-May-2025
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagrams wherever necessary.
4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative.

10

- 1) Breeding of fish in specially constructed tanks and ponds are known as _____.
 - a) Aquaculture
 - b) Pisciculture
 - c) Pearl culture
 - d) Vermiculture
- 2) Freezing, smoking, canning and pickling of fishes are most popular methods of fish _____.
 - a) Preservation
 - b) Breeding
 - c) Conservation
 - d) Fishing
- 3) Rearing of fish in salt water is called _____ fishery.
 - a) Fresh water
 - b) Estuarine water
 - c) Marine water
 - d) Brackish water
- 4) Fishing gears and nets are tools to capture _____ organisms.
 - a) Aquatic
 - b) Terrestrial
 - c) Arboreal
 - d) Desert
- 5) The practice of maintaining honey bee colonies in bee hives is called _____.
 - a) Sericulture
 - b) Vermiculture
 - c) Apiculture
 - d) Aquaculture
- 6) _____ species of honey bee are giant.
 - a) *A.cerana*
 - b) *A.dorsata*
 - c) *A.florea*
 - d) *A.indica*
- 7) Palas, Kusum and Ber are the host plants of _____ insect.
 - a) Honey bee
 - b) Lac
 - c) *B.mori*
 - d) Mosquito

- 8) _____ is the leading producer of silk followed by India.
a) Japan b) China
c) Shrilanka d) Norway
- 9) Custard is a product of _____.
a) Poultry b) Lac culture
c) Apiculture d) Dairy
- 10) The yellow colour of cow milk is due to the _____.
a) Polytene b) Pepsin
c) Carotene d) Chitin

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. **06**

- 1) *Macrobranchium malcolmsonii* is a scientific name of fresh water ____.
- 2) Full form of GIB.
- 3) Define sericulture.
- 4) *Bombyx mori* feed on _____ leaves.
- 5) Use of wax.
- 6) Define poultry.

Q.2 Solve any Eight of the following. 16

- Breeding pond
- Fish seed
- Fishing gear
- Medicinal value of honey
- Lac insect
- Bee hive
- Name of the common dairy animals
- Nutritive value of egg
- Zebrafish
- What are transgenic animals?

Q.3 A) Attempt any Two of the following. 10

- Give an account on fish preservation.
- What is apiculture? Describe bee products.
- Life cycle of silkworm.

B) Describe life cycle of lac insect. 06

Q.4 A) Attempt any Two of the following. 08

- 1) Give an account on prawn culture.
- 2) Describe species of honey bees in India.
- 3) Give an account on types of silk.

B) Give an account on Milk products. 08

Q.5 Attempt any Two of the following. 16

- a)** Give an account on byproducts of fishing industry.
- b)** Describe bee products and their uses.
- c)** Give an account on applications of remote sensing and GIS in fisheries.

- 6) $\int_b^{\infty} \frac{x^{3/2}}{\sqrt{x^4 - a^4}} dx$, where $b > a$ is _____.
a) convergent
b) divergent
c) absolutely convergent
d) conditionally convergent
- 7) The value of $\int_0^{\pi/2} \int_0^{a \cos \theta} r \sin \theta \, dr d\theta$ is _____.
a) $\frac{a^2}{6}$
b) $\frac{a^2}{3}$
c) $\frac{a^2}{2}$
d) $\frac{5a^2}{6}$
- 8) Area lying between the parabola $y^2 = 4x$ and $2x - 3y + 4 = 0$ is _____.
a) y_3
b) 3
c) 1
d) 9
- 9) The value of $\int_1^2 \int_0^3 y dy dx$ is _____.
a) 3
b) 5
c) 0
d) 7
- 10) To change given double integral from Cartesian to polar, we use the formula _____.
a) $dx dy = dr d\theta$
b) $dx dy = r \, dr d\theta$
c) $dx dy = \theta \, dr d\theta$
d) None of these

B) Answer the following.

06

- 1) Define improper integral.
- 2) Test the convergence of $\int_{\alpha}^{\infty} \frac{dx}{x^3 + 2x + 3}$
- 3) Prove that $\sqrt{n-1} = n \sqrt{\frac{1}{n}}$
- 4) Prove that $B(m, n) = B(n, m)$
- 5) The value of $\int_0^1 \int_0^1 (x^2 + y^2) dx dy = \underline{\hspace{2cm}}$.
- 6) Evaluate $\int_0^2 \int_0^{3y} y dx dy$

Q.2 Answer any Eight of the following.

- a) Define improper integrals of first kind.
- b) Test the convergence of $\int_0^2 \frac{dx}{x^2 - 4x + 3}$
- c) $\int_0^{2\pi} \tan x \, dx$ is improper integral of kind.
- d) Show that $\sqrt{1} = 1$
- e) Prove that $\sqrt{\infty} = \infty$
- f) Define beta function.
- g) Find the value of $B(4,5)$
- h) Evaluate $\int_0^1 \int_{x^2}^{2-x} y \, dy \, dx$
- i) Write the limits of double integral $\iint_R (x^2 + y^2) \, dx \, dy$ over $x = 0, y = 0, x + y = 1$
- j) Find by using double integration area of $x^2 + y^2 = a^2$

Q.3 A) Attempt any Two of the following.

10

- 1) Prove that $B(m, n) = \int_0^1 \frac{y^{n-1}}{(1+y)^{m+n}} \, dy$
- 2) Show that the improper integral $\int_a^b \frac{dx}{(x-a)^r}$ is convergent if and only if $\alpha < 1$.
- 3) Evaluate $\iint y \, dx \, dy$ over the area bounded by $y = x^2$ and $x + y = 2$

- B)** Show that every absolutely convergent integral is convergent.

06

Q.4 A) Attempt any Two of the following.

08

- 1) Evaluate $\iint \gamma^2 \sin \theta \, d\theta \, dr$ over the upper half the cardioid $\gamma = a(1 + \cos \theta)$
- 2) Show that the improper integral $\int_a^b f(x) \, dx$ converges at $x = a$ if and only if to every $\epsilon > 0$, there corresponds $\delta > 0$ such that

$$\left| \int_{a+\lambda_1}^{a+\lambda_2} f(x) \, dx \right| < \epsilon, \quad 0 < \lambda_1 < \lambda_2 < \delta$$
- 3) Evaluate $\int_3^7 (x-3)^{1/4} (7-x)^{1/4} \, dx$

B) State and prove Duplication formula for gamma functions. **08**

Q.5 Attempt any Two of the following. **16**

a) Prove that

$$\beta(p, q) = \frac{\Gamma(p) \cdot \Gamma(q)}{\Gamma(p+q)}$$

b) If $f(x)$ and $g(x)$ are positive functions for all $0 < x \leq b$ having $x = a$ as a point of infinite discontinuity and $\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = L$ is non zero finite number then prove that,

$$\int_a^b f(x) dx \text{ and } \int_a^b g(x) dx \text{ behave alike.}$$

c) Change the order of integration and hence evaluate

$$\int_{x=0}^1 \int_{y=0}^{\sqrt{1-x^2}} \frac{y \, dy \, dx}{(1+y^2)\sqrt{1-x^2-y^2}}$$

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Mathematics (Special Paper-XVI)
Programming in C (19201638-B)

Day & Date: Tuesday, 06-May-2025

Max. Marks: 80

Time: 03:00 PM To 06:00 PM

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Q.1 A) Choose the correct alternative of the following. 10

- 1) Which of the following is not a valid 'C' data type?

a) int	b) float
c) string	d) double
- 2) Which of the following operator is used to access the value at a specific memory address in C?

a) &	b) *
c) \$	d) #
- 3) What will be the output of the following code?


```
int x = 5 ;
x + = 3 ;
Print ("%d", x);
```

a) 3	b) 5
c) 8	d) error
- 4) What is the return type of the main() function in C?

a) void	b) int
c) float	d) char
- 5) Which of the following statements is true about arrays in C?

a) arrays can be of any size
b) arrays can only store one data type
c) arrays are dynamin in size
d) arrays start from index 1.
- 6) Which operator is used for conditional (ternary) operation in C?

a) &&	b) ?:
c) ++	d) ==
- 7) The expression $x++$ is an example of _____.

a) Post - increment operator
b) Pre - increment operator
c) relational operator
d) logical operator

- 8) Which of the following C constructs is used to jump out of loops?
 - a) continue
 - b) break
 - c) goto
 - d) return
- 9) In C, the function `printf()` is used for _____.
 - a) input
 - b) output
 - c) reading files
 - d) opening files
- 10) Which keyword is used to define a constant in C?
 - a) constant
 - b) #define
 - c) static
 - d) const

B) Fill in the blank.

06

- 1) _____ is used to store a single character in C.
- 2) A _____ is a collection of data elements of the same types in C.
- 3) The _____ operator is used to compare two values for equality.
- 4) A function that calls itself is called _____.
- 5) The _____ statement is used to make decisions in C programming.
- 6) The C function _____ is used to get the length of a string.

Q.2 Attempt any Eight of the following.

16

- Write the syntax of simple structure of C.
- Define constants in C with example.
- Write rules regarding variable name.
- What is the use of logical operator?
- Explain the difference between $++x$ and $x++$.
- What is the purpose of symbolic constants?
- List the different types of loops.
- Write the 'C' expression for the following.

$$9x^{7/2} + 18x^5 - \left(\frac{2}{5}\right)x^4 + ax^3 + \left(\frac{1}{3}\right)x^2 + x - 18.5$$

- i) Write the syntax of switch case statement.
- j) What do you mean by Sentinel loop?

Q.3 A) Attempt any Two of the following.

10

- 1) Explain if....else statement with example.
- 2) Write a note on exit controlled and entry controlled loops.
- 3) Write a program in C - to calculate the area and volume of a sphere.

B) Attempt any One of the following.

06

- 1) Write a note on relational operators in C.
- 2) Explain the concept of arrays in C and how two-dimensional arrays are declared and initialized.
- 3) Write a note on for loop and extend it for nested loop.

Q.4 A) Attempt any Two of the following.

08

- 1) Write a note on operators used in C.
- 2) Write a C program to find the largest number in an array.
- 3) Describe the syntax and use of elseif ladder.

B) Discuss in detail the primary data types with examples. **08**

Q.5 Attempt any Two of the following. **16**

- a)** Discuss in detail the types of 'C' expressions used in C.
- b)** Describe the need for user - defined functions in C. What is multifunction in C? Provide an example program using functions.
- c)** Write a 'C' program to calculate and display the electricity bill based on the following conditions:
 - If the units consumed are ≤ 100 , the charge is Rs. 3 per unit
($\leq$)
 - If the units consumed are ≤ 200 , the charge is Rs. 5 per unit
($\leq$)
 - If the units are ≥ 200 , the charge is Rs. 8 per unit.
 - If fixed sur-charge of Rs. 50 is added for all customer.

Seat No.	

Set	P

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Statistics (Special Paper-XVI)
Quality Management and Reliability (19201650)

Day & Date: Tuesday, 06-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Multiple choice questions. 10

- 1) Control Chart is a _____.
 a) Process monitoring tool b) Process control tool
 c) Both a and b d) None of these
- 2) Consumer's risk is probability of _____.
 a) Accepting lot of good quality
 b) Accepting lot of bad quality
 c) Rejecting lot of good quality
 d) Rejecting lot of bad quality
- 3) EWMA charts are better than Shewhart control charts in detecting the ____ shift.
 a) Small process b) Medium process
 c) Large process d) Every process
- 4) Which of these is not part of magnificent tools for Statistical Process Control?
 a) Pareto chart b) Flow chart
 c) Scatter diagram d) 2^k factorial design
- 5) Which charts are particularly more effective for sample size One?
 a) P-charts b) C-charts
 c) $\bar{X}$ & S chart d) CUSUM Chart
- 6) Which of the following is not a Dimension of quality?
 a) Performance b) Aesthetics
 c) Check sheet d) Features

- 7) Producer's risk is probability of _____.
 - a) Accepting lot of good quality
 - b) Accepting lot of bad quality
 - c) Rejecting lot of good quality
 - d) Rejecting lot of bad quality
- 8) DMAIC is often associated with _____.
 - a) Acceptance sampling
 - b) Six -Sigma
 - c) Five- Sigma
 - d) Kaizen board
- 9) The structure function of a binary system S takes any one of _____ possible values.
 - a) 4
 - b) 2
 - c) 3
 - d) None of these
- 10) Average Total Inspection for single sampling plan _____.
 - a) $n \cdot P_a + N \cdot (1 - P_a)$
 - b) $n \cdot P + N \cdot (1 - P)$
 - c) $N \cdot P + n \cdot (1 - P)$
 - d) $N \cdot P_a + n \cdot (1 - P_a)$

B) Fill in the blank.**06**

- 1) EWMA Control charts first introduced by _____.
- 2) PDSA stands for _____.
- 3) AOQL stands for _____.
- 4) Number of dimensions of quality is _____.
- 5) The purpose of Acceptance sampling is to _____.
- 6) A set of components whole functioning ensures the functioning of the system is known as _____.

Q.2 Solve any Eight of the following.**16**

- a) Define Quality.
- b) What is Consumer's risk?
- c) Define Block diagram.
- d) Write the long-form of PDCA Cycle.
- e) Define sample inspection.
- f) What is the meaning of quality?
- g) What is six sigma?
- h) Define 100% inspection.
- i) Define 2 out of 3 system.
- j) Define AOQ.

Q.3 A) Attempt any Two of the following.**10**

- 1) Write a note on magnificent tool of quality-Pareto diagram.
- 2) Show that hazard rate of a series system of components having independent life times is summation of component hazard rates.
- 3) Define minimal cut set and minimal path set.

B) Explain EWMA control chart for monitoring process mean.**06**

- Q.4 A) Attempt any Two of the following. 08**
- 1) Explain the relationship between Survival Function and Hazard function.
 - 2) Explain DMAIC Cycle.
 - 3) Define LTPD.
- B) Explain Eight dimensions of quality. 08**
- Q.5 Solve any Two of the following. 16**
- a) Explain CUSUM chart.
 - b) Explain Double sampling plan.
 - c) Explain Six-Sigma methodology.

Seat No.	

Set

P

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Statistics (Special Paper - XVI)
Time Series Analysis (19201651)

Day & Date: Tuesday, 06-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Draw neat labelled diagrams whenever necessary.
 3) Figures to the right indicate full marks.
 4) Use of log table and calculators is allowed.

Q.1 A) Choose the correct alternatives from the following. 10

- 1) A fire in a factory delaying production for some weeks is _____.
 a) Irregular variations b) Secular trend
 c) Cyclical variations d) Seasonal variations

- 2) Moving average remove the cyclical variation if _____.
 a) the period is even
 b) the period is odd
 c) the average is weighted
 d) the period is same as that of cycle

- 3) Least square method _____.
 a) reduces the calculations
 b) does not give estimate of future
 c) reduces the sum of squares of errors
 d) is subjective

- 4) In time series analysis the method of moving averages, is used to estimate _____.
 a) seasonal variations b) trend
 c) cyclical variations d) irregular variations

- 5) In time series analysis the exponential smoothing method helps to _____.
 a) smoothout the fluctuations
 b) remove trend
 c) estimate exponential trend
 d) estimate logarithmic trend

- 6) In autoregressive model we assume that _____.
 a) the successive values in time series to be dependent
 b) the successive values in time series to be independent
 c) the regression analysis is better than time series analysis
 d) the values in time series are non-normal

- 7) In moving average method, we cannot find trend values of some ____.
- end points
 - middle points
 - starting and end periods
 - starting periods
- 8) Prosperity, Recession, Depression and Recovery in a business is an example of ____.
- Irregular variations
 - Secular trend
 - Cyclical variations
 - Seasonal variations
- 9) Secular trend in time series is of nature ____.
- Increasing
 - Decreasing
 - Stagnant
 - all the above
- 10) Seasonal variations are ____.
- short term variation
 - long term variation
 - sudden variation
 - none of the above

B) Fill in the blanks:**06**

- In time series values are arranged in ____ order.
- In time series multiplicative model gives $Y = \text{____}$.
- In time series additive model gives $Y = \text{____}$.
- Increase sales due to Diwali is due to ____ component time series.
- Ratio to moving average method is used to estimate ____ component.
- The link relative is defined as ____.

Q.2 Solve the following: (Any Eight)**16**

- Trend
- Define 'time series' and give illustrations of time series from various fields.
- Write the difference between seasonal variations and cyclical variations.
- Write four components of time series.
- Write note on irregular variations.
- What do you mean by stationarity?
- Define autocorrelation function.
- Explain the term 'season'.
- Describe the term 'Business cycle'.

Q.3 A) Solve the following: (Any Two)**10**

- Describe the progressive average method.
- Discuss the importance and utility of time series analysis in various fields.
- Describe the procedure of Run test.

Q.3 B) Describe the procedure of curve fitting least square method. **06**

Q.4 A) Attempt the following. (Any Two) **08**

- 1) Describe the procedure of double exponential smoothing.
- 2) Explain how to fit MA (1) model.
- 3) Explain moving average method.

Q.4 B) Illustrate with examples of the following term. **08**

- 1) Secular trend
- 2) Seasonal variations
- 3) Cyclical variations
- 4) Irregular variations

Q.5 Attempt the following. (Any Two) **16**

- a) Obtain the seasonal indices for the quarters by simple average method assuming that trend is absent.

Year	Quarters No.			
	I	II	III	IV
2017	37	41	33	35
2018	37	39	36	36
2019	40	41	33	31
2020	33	44	40	40

- b) Describe the procedure of link relative method.
- c) Describe the procedure of 'single exponential smoothing'.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Geology (Special Paper-XVI)
Geochemistry (19201655)

Day & Date: Tuesday, 06-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.
 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- 1) The rock resembling of Tektites is _____.
 a) The Obsidian b) The basalt
 c) The rhyolites d) The granochiorite
- 2) The radioactive decay of unstable nuclides, which causes variation in the isotopic composition of the daughter products.
 a) Stable isotope b) Isotopes
 c) Radiogenic isotopes d) None of the above
- 3) The Sun's major constituents are _____.
 a) H & He b) O₂ and N₂
 c) NH₃ and CO₂ d) None of these
- 4) Chondrites are consisting primarily of _____.
 a) Olivine only b) Pyroxene only
 c) Olivine and/or pyroxene d) Iron and Nickle
- 5) Quartz and Tridymite are the example of _____.
 a) Polymorphism b) Isomorphism
 c) Diadochy d) None of these
- 6) A bond that results from the total transfer of electrons from one atom to another is known as:
 a) Ionic bond b) Covalent bond
 c) Hydrogen bond d) Van der Waals bond
- 7) Long-term changes in the geochemical cycle are known as _____.
 a) Periodic changes b) Permanent changes
 c) Secular changes d) Perennial changes
- 8) Which of the following radioactive element has half life of 5730 years?
 a) 235Uranium b) Thorium
 c) 14C d) 160

- 9) The group of trace elements having large ionic radius, such as potassium, rubidium, caesium, strontium, and barium are called ____.
- a) LILE b) REE
c) HFSE d) transitional elements
- 10) The element with maximum cosmic abundance is ____.
- a) Helium b) Hydrogen
c) Nitrogen d) Oxygen

B) Fill in the blank.

06

- 1) Meteorites showing Widmanstätten structure are known as _____.
- 2) Elements are those of the B subgroup whose ions have 18-electrons in the outer shell are _____.
- 3) The type of chemical bond that forms when atoms give away or take electrons is called as _____.
- 4) Among the chemical elements, the most abundant chemical element in the earth's crust is _____.
- 5) According to Clarke (1971), _____ is the most abundant sedimentary rocks in average composition of crust.
- 6) Different element with same neutron number but with different values of atomic weight and protons are known as _____.

Q.2 Solve any Eight of the following.

16

- a) List the four atmophile elements of geochemical classification.
- b) Name any four stable isotopes of oxygen.
- c) Define Camouflaged.
- d) Name the types of colloids.
- e) Name two distinct group of siderites of different chemical and mineralogical composition are _____.
- f) List the four major oxides of average composition of igneous rocks.
- g) Define Radiogenic isotopes.
- h) Name the high field strength elements.
- i) Give the two examples of Ionic bonding.
- j) Name the lighter planets of the Solar system.

Q.3 A) Attempt any Two of the following.

10

- Discuss in short Ur-Th-Pb method of dating the geologic event.
- Explain in brief cosmic abundance of elements with suitable diagram.
- Define colloids. Explain in types of colloids with suitable example.

B) Write short note on Geochemical cycle.

06

- Q.4 A) Attempt any Two of the following. 08**
- 1) Write short note on Radioactive decay.
 - 2) Discuss in brief the composition of crust.
 - 3) Explain the difference between compatible and incompatible trace elements.
- B) Describe the types of chemical bonding with coordination number. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Explain in details the composition of Meteorites.
 - b) Define stable isotopes. Explain in brief the types of stable isotopes.
 - c) Give an account of geochemical classification of the elements.

Seat No.	

Set **P**

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Microbiology (Special Paper- XVI)
Environmental Microbiology (19201663)

Day & Date: Tuesday, 06-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Select the correct alternative. 10

- 1) Microbial catalyzed redox reactions leads to metal _____.
 a) Mobilization b) Immobilization
 c) Reduction d) Hydrolysis
- 2) _____ diseases are caused by suspended particulate matter.
 a) Obesity b) Kidney
 c) Respiratory d) Mental
- 3) _____ waste is non-biodegradable.
 a) Biofertilizers b) Agricultural
 c) Crop waste d) Radioactive
- 4) _____ is an example of photochemical oxidant.
 a) Acid b) CO₂
 c) SO₃ d) Peroxyacetyl nitrate
- 5) Organisms growing at low temperature are called _____.
 a) Psychrophiles b) Barophiles
 c) Alkalophiles d) Mesophile
- 6) Methanogenic microbes have a significant role at _____ stage.
 a) Secondary treatment b) Biological Oxidation
 c) Primary treatment d) Sludge digestion
- 7) _____ is used for enumeration of coliforms in liquid waste.
 a) DMC b) COD
 c) Thermal d) Radiation
- 8) Cosmic rays such as gamma rays causes _____ pollution.
 a) Soil b) Noise
 c) Thermal d) Radiation
- 9) _____ is a process used by the plants to accumulate heavy metals.
 a) Phyto transformation b) Phytodegradation
 c) Phytoaccumulation d) Biotransformation

- 10) _____ causes ozone depletion.
- | | |
|--------|--------|
| a) CFC | b) BHC |
| c) PAN | d) DDT |

B) Define the following: **06**

- 1) Eutrophication
- 2) Aerosols
- 3) Osmophiles
- 4) Microbial leaching
- 5) Invert molasses
- 6) BOD

Q.2 Answer any Eight of the following. **16**

- a) Write the objectives of biosafety.
- b) What is recombinant DNA?
- c) How do microorganisms survive in air?
- d) Write the significance of acidophiles.
- e) What are the types of waste?
- f) What is whey?
- g) What is carbon sequestration?
- h) Define COD and give its significance.
- i) Write on sedimentation step in waste water treatment.
- j) What is equalization?

Q.3 A) Attempt any Two of the following. **10**

- a) Write an account on the types of fresh water bodies.
- b) Explain the microorganisms involved and biochemistry of microbial leaching.
- c) Describe the bioaerosol control in detail.

B) Give an account on Thermophiles with examples and significance. **06**

Q.4 A) Attempt any Two of the following. **08**

- 1) Explain bioremediation with reference to any substances like lead mercury, arsenic or radioactive substances.
- 2) Explain the concept of carbon sequestration and carbon credit.
- 3) Write an account on NIH guidelines on biosafety.

B) Explain various types of sugar and distillery waste and its treatment. **08**

Q.5 Attempt any Two of the following. **16**

- a) Write an account of waste water assessment and management.
- b) Explain the treatment of waste of paper and pulp and textile industry.
- c) Explain various methods of oil recovery, with emphasis on microbially enhanced oil recovery.

Seat No.	

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B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination March/April - 2025
Electronics (Special Paper-XVI)
Modern Communication Systems (19201684)

Day & Date: Tuesday, 06-May-2025
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw neat labelled diagrams wherever necessary.
- 4) Use of log table and calculators is allowed.

Q.1 A) Select the correct alternative. 10

- In mobile communication each cell is connected to _____.
 - control unit
 - transmitter
 - computer
 - MTSO
- Receiver channel 21 is 860.66 MHz so receiver channel 22 is _____ MHz.
 - 860.36
 - 860.63
 - 860.96
 - 860.69
- RADAR is acronym for _____.
 - radio detection and ranging
 - radio amplification detection and ranging
 - range detection
 - None of these
- A wave guide is _____ filter.
 - low pass
 - band pass
 - high pass
 - band stop
- _____ is most widely used LAN configuration.
 - star
 - ring
 - bus
 - tree
- Quadrature amplitude modem uses _____ system.
 - AM only
 - QPSK only
 - AM and PM
 - FM and PSK
- Avalanche Photo Diode operates with _____.
 - forward bias
 - reverse bias
 - Neither a) nor b)
 - Either a) or b)
- Permanent bond in optical fiber is _____.
 - joinder
 - binder
 - splicing
 - connector

- 9) Typical down link frequency for satellite is _____
- a) 14 GHz b) 2 GHz
c) 4 GHz d) Any of these
- 10) _____ is device that converts up link frequency into down link.
- a) duplexer b) earth station
c) equalizer d) transponder

B) Fill in the blank.

06

- 1) The satellite used for only one country is ____ satellite.
- 2) ____ are transmission lines used to produce filter and tuned circuit for micro wave.
- 3) In ____ LAN, if one station fails, whole system fails.
- 4) Cellular radio contains a programmable read only memory chip is called as ____.
- 5) The most fiber optic light source emits light in ____ spectrum.
- 6) Synchronous transmission begins with ____.

Q.2 Answer any Eight of the following.

16

- a) Define optical fiber communication.
- b) What is geostationary satellite?
- c) What is role of MTSO in cell phone?
- d) What is digital data code?
- e) What are transmission lines used in microwave communication?
- f) List the application of internet.
- g) Draw the block diagram of pulsed radar.
- h) What is transponder and Duplexer?
- i) List the applications of optical fiber communication.
- j) Define cellular communication.

Q.3 A) Attempt any Two of the following.

10

- 1) Explain Cavity resonator.
- 2) Write note on blue tooth.
- 3) Explain logic unit and control unit of cell phone with block diagram.

B) Explain satellite earth station with block diagram.

06

Q.4 A) Attempt any Two of the following.

08

- 1) Explain need of light and working principle of optical fiber.
- 2) How satellite orbit is selected?
- 3) What are microwave semiconductor devices? Explain Gunn diode.

B) What is network topology? What are its types? Explain Bus and Ring topology.

08

Q.5 Attempt any Two of the following.

16

- a)** What is optical fiber? Explain its types.
- b)** Explain Klystron tube with neat diagram.
- c)** Explain satellite communication system with neat block diagram.

Seat No.	

Set P

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Computer Science (Paper-XVII)
Advanced Python (19201671)

Day & Date: Tuesday, 06-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Multiple choice questions. 10

- 1) The background color of a tkinter window is changed using _____.
 a) window.bg_color = "color_name"
 b) window.configure(bg="color_name")
 c) window.set_bg("color_name")
 d) window.bg("color_name ")
- 2) The bind() method in tkinter is used to _____.
 a) Binds a function to a widget event
 b) Binds the initial value of a widget
 c) Adjusts the layout of a widget
 d) Retrieves the text from a widget
- 3) The _____ widget is used to display an image in tkinter.
 a) ImageWidget b) Picture
 c) ImageView d) PhotoImage
- 4) In Django, _____ is used to include a template in another template.
 a) {% load %} tag b) {% extends %} tag
 c) {% include %} tag d) {% import %} tag
- 5) The _____ method is used to execute SQL queries.
 a) execute() b) execute_query()
 c) run_query() d) query()
- 6) The _____ method is used to remove a widget from a tkinter window.
 a) widget.remove() b) widget.destroy()
 c) widget.hide() d) widget.delete()
- 7) In python, the _____ module is used for UDP sockets.
 a) udp b) socketudp
 c) udosockets d) socket

- 8) To create a new Django project, _____ command is used.
 - a) create-django-project b) start-django
 - c) django-admin startproject d) new-django-app
- 9) How does Django handle URL routing?
 - a) Using the urls.py file
 - b) Through configuration files like routes.php
 - c) Django doesn't support URL routing
 - d) Through the .htaccess file
- 10) _____ is NOT a valid Django field type.
 - a) StringField b) TextField
 - c) CharField d) IntegerField

B) Fill in the blank.**06**

- 1) The _____ method is used to add padding around a widget in tkinter.
- 2) XML stands for _____.
- 3) The _____ method is used to places widgets in rows and columns format.
- 4) The _____ command is used to create a superuser in Django.
- 5) To install MySQLdb, _____ pip command is used.
- 6) The _____ file contains project-wide settings in Django.

Q.2 Solve any Eight of the following.**16**

- a) How to establish connection with MySQL database in python program? Write code.
- b) What is migration? Give command related to migrations.
- c) What command is used to create a new Django app within a project? Give example.
- d) What are difference between DOM API and SAX API?
- e) How to get IP address? Give example,
- f) Explain difference between app and project.
- g) Explain Message widget with example.
- h) How to use Stored Procedure for operations in database?
- i) Explain extent property of create_arc method.
- j) What is spinbox? Explain with example.

Q.3 A) Attempt any Two of the following.**10**

- 1) Explain Parsing XML with SAX API's with example.
- 2) Explain Django architecture in detail.
- 3) Explain different layout manager used in tkinter with example.

- B) Explain different Event patterns used in tkinter python. Give example. 06**

- Q.4 A) Attempt any Two of the following. 08**
- 1) What is Template in Django? Explain with example.
 - 2) Write python code for sending email.
 - 3) Explain canvas container with example.
- B) What is model in Django? Explain different Field types and Field options in model. Give example. 08**
- Q.5 Solve any Two of the following. 16**
- a) Explain different Client Socket and server Socket Methods with example.
 - b) What is use of bind() method? Explain with example.
 - c) Write python code to display database records in tabular format.

Seat No.	

Set P

B.Sc. (Semester - VI) (New) (Old) (CBCS) Examination: March/April - 2025
Software Testing (19201671-01)

Day & Date: Wednesday, 07-May-2025
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Draw neat labelled diagrams wherever necessary.

Q.1 A) Multiple choice questions.

10

- 1) Which metric is critical for understanding the user experience in Performance Testing?
 - a) Response time
 - b) Network bandwidth
 - c) Code complexity
 - d) Memory usage
- 2) To validate whether the system is conforming to its business requirements is _____.
 - a) Non functional testing
 - b) Verification process
 - c) Functional testing
 - d) Analysis Phase
- 3) Given a field that accept numbers in the range of 1 to 500, then validating the field with below three inputs.
 -less than 1
 -between 1 to 500
 -and greater than 500
 is called _____.
 - a) Boundary value analysis
 - b) Equivalence class partitioning
 - c) White-box testing
 - d) Decision Table
- 4) Which phase consumes maximum effort to fix an error?
 - a) Requirements analysis and specifications
 - b) Design phase
 - c) Coding phase
 - d) Feasibility study phase
- 5) What is the main purpose of Exploratory Testing?
 - a) To execute pre-written test cases
 - b) To follow a structured test plan
 - c) To explore the application without pre-defined tests
 - d) To write code

- 6) If you were a lead developer of a software company and you are asked to submit a project/product within a stipulated time-frame with no cost barriers, which model would you select?
 - a) Waterfall
 - b) RAD
 - c) Spiral
 - d) Incremental
- 7) Which type of testing is focused on how the software performs under specific conditions?
 - a) Non-functional Testing
 - b) System Testing
 - c) Unit Testing
 - d) Integration Testing
- 8) What is the purpose of smoke testing?
 - a) To perform exhaustive testing
 - b) To check the basic functionality of an application
 - c) To verify compliance with specifications
 - d) To test security features
- 9) Which SDLC model allows for flexibility and iterative development?
 - a) Waterfall
 - b) Spiral
 - c) V-Model
 - d) Big Bang
- 10) What does a high Test Execution Coverage indicate?
 - a) most of the code has been tested
 - b) there are no defects
 - c) tests are expensive
 - d) tests are automated only

B) Fill in the blank.**06**

- 1) Writing a test summary report is a major task of _____.
- 2) Test cases are designed during _____.
- 3) _____ Test Document is used to define the Exit Criteria of Testing.
- 4) _____ is designed to evaluate the system's stability over an extended period.
- 5) _____ level focuses on individual components or modules.
- 6) A deviation from the specified or expected behaviour that is visible to end-users is called _____.

Q.2 Solve any Eight of the following.**16**

- a) What is the need of software testing?
- b) Define Error Guessing
- c) What is the purpose of test planning?
- d) What is cyclomatic complexity?
- e) What is a test case?
- f) How would you calculate Test Case Efficiency?
- g) Define Retrospect Meeting.
- h) What is monkey testing?
- i) What is the purpose of the Software Development Life Cycle (SDLC)?
- j) What is the focus of System Testing?

- Q.3 A) Attempt any Two of the following. 10**
- a) Explain acceptance testing in details.
 - b) Explain different parameters of performance testing.
 - c) Explain Load testing in details.
- B) What is regression testing, and when is it typically performed? 06**
- Q.4 A) Attempt any Two of the following. 08**
- 1) What is integration testing? Explain Bottom up integration Testing? And its advantages.
 - 2) Why smoke testing is needed? Explain with example.
 - 3) Difference between Bug and Defect.
- B) What is Test execution report? Explain elements of Test execution report. 08**
- Q.5 Solve any Two of the following. 16**
- a) Explain Software Test Life cycle.
 - b) Explain V- Model in details.
 - c) Explain black box techniques.