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Set **P**

**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
English (Comp.)
Communication Skill (22221201)**

Day & Date: Saturday, 15-11-2025
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 Rewrite the following by choosing the correct alternative:**08**

- 1) The essay 'Does Education Do Harm?' is written by _____.
 a) Bertrand Russell b) Francis Bacon
 c) George Orwell d) T. S. Eliot
- 2) _____ regard the value of education as unquestionable.
 a) Practical men b) Educated men
 c) Eminent men d) Plutocrats
- 3) The essay 'The Spirit of Freedom' is written by _____.
 a) Rabindranath Tagore b) Francis Bacon
 c) T. S. Eliot d) Jawaharlal Nehru
- 4) In the age of monarchy, _____ gets manipulated to achieve their own personal interests.
 a) The kings b) The people
 c) The ministers d) The countries
- 5) The poem 'Our Earth will Not Die' is written by _____.
 a) Alexander Pope b) Niyi Osundare
 c) Christiana Rossetti d) John Keats
- 6) The poem 'Ode on Solitude' is written by _____.
 a) Niyi Osundare b) Alexander Pope
 c) Christiana Rossetti d) John Keats
- 7) The poem 'Remember' is a _____.
 a) Ode b) Sonnet
 c) Ballad d) Monologue
- 8) The synonym of 'amazing' is _____.
 a) Special b) Incredible
 c) Inquire d) Love

- Q.2 Write answer of the followings in short .(Any Four) 12**
- a)** What is the relation between education and virtue?
 - b)** What is the difference between being right and being original?
 - c)** What is the true sense of freedom?
 - d)** Discuss the theme of the poem 'Our Earth Will Not Die'.
 - e)** What is the central idea of the poem 'Ode on Solitude'?
 - f)** How does the beloved express her love in the poem 'Remember'?
- Q.3 a) Write a letter of application for the post of Teacher in English. 10**
- OR**
- b) Write a letter of application for the post of Assistant Manager in a co-operative bank.**
- Q.4 Discuss in detail the importance of 'Interpersonal Intelligence'. 10**

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**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
CHEMISTRY (Paper – III)
Organic Chemistry (22221208)**

Day & Date: Monday, 17-11-2025
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 most correct alternative for the following and rewrite the sentence. 08

- 1) Which of the following is a electrophile?

a) BF_3	b) H_2O
c) CH_3OH	d) NH_3
- 2) Carbocation is _____.

a) Electron rich	b) Electron deficient
c) Neutral	d) None of these
- 3) The hybridization of carbon involved in acetylene is _____.

a) sp^2	b) sp^3
c) sp	d) sp^3d
- 4) The bond angle in methane molecule is _____.

a) 120°	b) 180°
c) 90°	d) $109^\circ 5'$
- 5) Which of the following is the general formula of cycloalkane?

a) $C_nH_{2n} - 2$	b) C_nH_{2n}
c) $C_nH_{2n} + 2$	d) None of these
- 6) In benzene all carbon atoms are in _____ hybridized state.

a) sp^3	b) sp
c) sp^3d	d) sp^2
- 7) Internal Wurtz reaction is used for the preparation of _____.

a) alkane	b) alkene
c) Cycloalkane	d) alkyne
- 8) 1, 4-Pentadiene is an example of _____.

a) Isolated diene	b) Conjugated diene
c) Cumulated diene	d) None of these

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

- a) Define:
 - 1) bond length.
 - 2) bond energy.
- b) Draw the resonating structures of phenol.
- c) What are Enantiomers? Give one example.
- d) Write any two limitations of Kekule's structure of benzene.
- e) Give IUPAC names for the following.
 - 1) $\text{CH}_3\text{-CH}_2\text{-C}\equiv\text{C-H}$
 - 2) $\begin{array}{c} \text{CH}_3\text{-C=CH}_2 \\ | \\ \text{CH}_3 \end{array}$

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

- a) Addition reactions.
- b) Hybridization.
- c) Geometrical isomerism.

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

- a) What are reagents? Discuss the different types of reagents with suitable examples.
- b) What is optical activity? Discuss the optical isomerism of Lactic acid.
- c) What is the action of following on cyclopropane?
 - 1) Cl_2/light ,
 - 2) HBr ,
 - 3) $\text{conc. H}_2\text{SO}_4$,
 - 4) $\text{H}_2/\text{Ni}, 80^\circ$

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

- a) State Huckel's rule. Explain aromaticity of naphthalene and Pyrrole by applying Huckel's rule on it.
- b) What are dienes? Describe different types of dienes with suitable examples. Discuss any two methods of preparation of 1, 3-butadiene.

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**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
COMPUTER SCIENCE (Paper - III)
Introduction to Web Designing (22221229)**

Day & Date: Monday, 17-11-2025
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.

08

- Which built-in method returns the length of the string in JavaScript?
 - length()
 - size()
 - distance()
 - none of the above
- Choose the correct HTML tag for the smallest heading _____.
 - <h1>
 - <h2>
 - <h5>
 - <h6>
- _____ keyword is used to declare variables in JavaScript.
 - Date
 - Dim
 - Var
 - none of these
- Which of the following is an attribute of <Table> tag?
 - Src
 - link
 - Cellpadding
 - bold
- Web pages starts with which of the following tag?
 - <head>
 - <body>
 - <html>
 - None of these
- _____ tag does not have a closing tag.
 - Paired
 - Singular
 - Double
 - none of these
- Which of the following CSS property sets the font size of text?
 - font-size
 - text-size
 - Text
 - size
- What does a link attribute mean?
 - actual link
 - adjust link
 - active link
 - action link

- Q.2 Answer any four of the following. 08**
- a) Structure of HTML.
 - b) Multiple column in CSS.
 - c) Explain
 tag.
 - d) Write any two string built in functions.
 - e) What is Anchor tag?
- Q.3 Write short note on any two of the following. 08**
- a) Box Model.
 - b) CSS Border.
 - c) JavaScript - Dialog Boxes.
- Q.4 Answer any two of the following. 08**
- a) Explain CSS Position properties with example.
 - b) Explain features of JavaScript.
 - c) Explain different selectors in CSS.
- Q.5 Answer any one of the following. 08**
- a) Explain graphics tag with example.
 - b) Explain DOM in JavaScript with example.

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Set **P**

**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
CHEMISTRY (Paper – IV)
Analytical Chemistry (22221209)**

Day & Date: Tuesday, 18-11-2025
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.
(At. Wts.: H=1, C=12, O=16, N= 14, Na =23, Cl = 35.5)

Q.1 Multiple choice questions**08**

- 1) The solution of known strength is known as _____ solution.
 - a) Standard
 - b) Normal
 - c) Molar
 - d) Molal
- 2) In ascending chromatography, suitable solvent with proper height is placed at the _____ of the chamber.
 - a) Centre
 - b) bottom
 - c) Middle
 - d) top
- 3) Paper chromatography is _____ form of chromatography.
 - a) liquid-gas
 - b) liquid-solid
 - c) gas - gas
 - d) liquid- liquid
- 4) Which of the following has highest calorific value?
 - a) carbohydrates
 - b) fats
 - c) proteins
 - d) vitamins
- 5) In Kjeldahl's method, nitrogen in the organic compound is converted to _____.
 - a) ammonium sulphate
 - b) nitric acid
 - c) nitrogen
 - d) $NaNO_2$
- 6) Carius method is used for the estimation of _____.
 - a) carbon
 - b) nitrogen
 - c) hydrogen
 - d) halogen
- 7) The reciprocal of viscosity is called _____.
 - a) surface tension
 - b) frictional resistance
 - c) fluidity
 - d) none of these

- 8) The unit of dipole moment is _____
- a) calories
 - b) joules
 - c) faraday
 - d) debye

Q.2 Answer any four of the following. 08

- a) Define the term.
 - 1) Normality.
 - 2) Molarity.
- b) Give the principle of Lassaigne's test.
- c) What are the advantages of Ostwald's viscometer?
- d) What is the basic principle of paper chromatography?
- e) Give the major constituents of milk.

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

- a) Basic principle of titrimetric analysis.
- b) Food preservation.
- c) Electrical polarization of molecules.

Q.4 Answer any two of the following. 08

- a) Discuss applications of paper chromatography.
- b) Mention any four substances which have zero dipole moment.
- c) 1.8×10^{-4} kg of an organic compound when subjected to combustion method produced 1.08×10^{-4} kg of water and 2.64×10^{-4} kg of carbon dioxide. Determine percentage of hydrogen and carbon in the compound.

Q.5 Answer any one of the following. 08

- a) Describe the principle, construction and working of Abbe's refractometer.
- b) Describe Kjeldahl's method for estimation of nitrogen in an organic compound.

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**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
COMPUTER SCIENCE (Paper – IV)
Operating System (22221230)**

Day & Date: Tuesday, 18-11-2025
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) The operating system where fixed time slot is allocated to each active process is _____.
a) Real time O.S b) Time-sharing O.S
c) Batch O.S d) Multiprogramming O.S
- 2) Interval between the time of submission and completion of the job is called _____.
a) Waiting time b) Throughput
c) Turn-around time d) Response time
- 3) _____ is a technique of temporarily removing inactive programs from the Memory of Computer system.
a) Swapping b) Spooling
c) Semaphore d) Scheduler
- 4) Virtual memory can be implemented with _____.
a) Segmentation b) Paging
c) Both A and B d) None of the above
- 5) 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
- 6) The banker's algorithm is used for deadlock _____.
a) Prevention b) Recovery
c) Detection d) Avoidance
- 7) A program in execution is called _____.
a) Process b) Instruction
c) Procedure d) Function
- 8) _____ Memory allocation scheme suffers from external fragmentation.
a) Swapping b) Pure demand paging
c) Segmentation d) Paging

- Q.2 Answer any four of the following. 08**
- a) What is mean by Multiprogramming Operating System?
 - b) Define the term Process Scheduling?
 - c) What is mean by Paging?
 - d) Define the term disk scheduling?
 - e) What is Process Synchronization?
 - f) What is fragmentation?
- Q.3 Write short note on any two of the following. 08**
- a) Write Short note on FCFS.
 - b) Write Short note on Process Control Block?
 - c) Write Short note on Demand paging.
- Q.4 Answer any two of the following. 08**
- a) What is Process? Explain Process states with block diagram?
 - b) What is Swapping? Explain Swapping with diagram?
 - c) Explain Dinning Philosopher Problem?
- Q.5 Answer any one of the following. 08**
- a) What is deadlock? Explain Banker's algorithms for deadlock avoidance?
 - b) Define Operating system? Explain the different Services provided by Operating System?

Day & Date: Wednesday, 19-11-2025
Time: 12:00 PM To 02:00 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.

08

- Page 1 of 2

- Q.2 Answer any four of the following. 08**
- a) State first law of thermodynamics.
 - b) What are the properties of liquid helium?
 - c) Draw neat labeled diagram of Otto cycle.
 - d) What is refrigerator?
 - e) Define free path and mean free path of a gas molecule?
- Q.3 Write short note on any two of the following. 08**
- a) Obtain the Clausius expression for mean free path.
 - b) Derive an expression for work done in isothermal process.
 - c) Write a note on heat engine?
- Q.4 Answer any two of the following. 08**
- a) What is magneto-caloric effect? Describe experimental set up for adiabatic demagnetization of paramagnetic substance.
 - b) Explain change in entropy in free expansion of gas.
 - c) Write a note on air conditioning.
- Q.5 Answer any one of the following. 08**
- a) What is diesel cycle? Obtain an expression for efficiency of Diesel engine.
 - b) Show that $PV^\gamma = \text{constant}$ for adiabatic process.

**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
MICROBIOLOGY (Paper – III)
Microbial Metabolism and Cultivation (22221220)**

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) The secondary structure of protein consists _____.
a) α helix
b) β sheets
c) β Turns
d) All of the above
- 2) The enzyme which is secreted either in the absence or presence of substrate is called as _____ enzyme.
a) Inducible
b) Constitutive
c) Isozymes
d) Ribozymes
- 3) The organic or metalloorganic substance required for enzyme activity is _____.
a) Coenzyme
b) Cofactor
c) Apoenzyme
d) Inhibitor
- 4) _____ agar is an example of Differential medium.
a) Starch
b) Nutrient
c) MacConkeys
d) Potato dextrose
- 5) The microorganism, which use atmospheric CO_2 as carbon source and organic compound as source of energy is known as _____.
a) Photoautotroph
b) Chemoautotroph
c) Chemoorganotroph
d) Photoheterotroph
- 6) _____ nitrogenous base is absent in the Deoxyribose nucleic acid.
a) Adenine
b) Guanine
c) Thymine
d) Uracil
- 7) _____ is the end product of glycolysis after breakdown of glucose.
a) Pyruvic acid
b) Lactic acid
c) Malic acid
d) Citric acid
- 8) _____ RNA is called adaptor and small RNA.
a) Messenger
b) Ribosomal
c) Transfer
d) Sense

- Q.2 Define any four of the following. 08**
- a) Define synthetic and semi-synthetic media.
 - b) Define cofactor.
 - c) Define catabolism.
 - d) What is free energy?
 - e) Define extracellular and intracellular enzyme?
 - f) Enlist the types of RNA along their role.
- Q.3 Write short note on any two of the following. 08**
- a) Discuss in brief structural level of classification of protein.
 - b) Discuss in detail fates of pyruvate.
 - c) Describe in detail methods of pure culture.
- Q.4 Answer any two of the following. 08**
- a) Describe in detail classification of microorganism on the basis of energy and nutrition.
 - b) Define active site. Explain in detail induced fit hypothesis.
 - c) Define homopolysacchride. Explain in detail structure and function of homopolysacchride.
- Q.5 Answer any one of the following. 08**
- a) Give a detailed account on EMP pathway. Add a note on its energetics.
 - b) Describe in detail Waston crick model of DNA.

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**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
PHYSICS (Paper - IV)
Electricity, Magnetism and Basic Electronics (22221206)**

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

08

- 1) The time constant (T) of L-R circuit is _____.
a) LR
b) R/L
c) L/R
d) LR^2
- 2) The reciprocal of impedance is _____.
a) reactance
b) admittance
c) susceptance
d) conductance
- 3) Unit of figure of merit (K) of a Ballistic galvanometer is _____.
a) mA/mm
b) mm/mA
c) mm/mV
d) mm/mC
- 4) In magnetostatics, magnetic field generated by steady current is given by _____.
a) Biot-Savart's law
b) Lenz's law
c) Faraday's law
d) Ohm's law
- 5) Semiconductors have _____ temperature coefficient of resistance.
a) positive
b) zero
c) negative
d) logarithmic
- 6) If β of a transistor is 99, then its α is _____.
a) 0.99
b) 0.98
c) 0.099
d) 9.9
- 7) The expression for quality factor in case of series resonant circuit is _____.
a) $Q = \omega_0 L$
b) $Q = \omega_0 C$
c) $Q = \frac{\omega_0 L}{R}$
d) $Q = \omega R$

- 8) The junction barrier potential difference for a silicon diode is of the order of ____.
- | | |
|----------|----------|
| a) 0.3 V | b) 0.7 V |
| c) 1 V | d) 1.5 V |

Q.2 Answer any four of the following. 08

- a) Define the term admittance.
- b) State Biot - Savart's law.
- c) In CE amplifier, $I_B = 10 \mu\text{A}$. Find I_c , if $\beta = 80$.
- d) Define ripple factor.
- e) Define self-inductance of a coil.

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

- a) Damping in galvanometer.
- b) Filter circuit.
- c) Relation between α and β .

Q.4 Answer any two the following. 08

- a) Explain the working of CE transistor amplifier.
- b) Explain construction and working of Ballistic Galvanometer.
- c) Explain working of positive and negative clipper.

Q.5 Answer any one of the following. 08

- a) With neat circuit diagram, explain Owen's bridge.
- b) Derive an expression for growth of charge containing a resistance, a capacitor and a source of constant e.m.f. E in series.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
MICROBIOLOGY (Paper – IV)
Applied Microbiology (22221221)**

Day & Date: Thursday, 20-11-2025
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

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

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

- 1) SPC Stands for _____.
 a) Single Plate Count b) Sample plate Count
 c) Standard Plate Count d) Standard Pseudomonas Count
- 2) _____ Test is used to check the acid producing ability of test microorganism.
 a) Indole Test b) Methyl Red test
 c) Voges-Proskauer Test d) Citrate Utilization Test
- 3) Sedimentation is enhanced by addition of _____ at treatment plant.
 a) Aluminium Sulphate b) Ammonium Sulphate
 c) Chlorine d) Ammonium Citrate
- 4) _____ is not a type of disease.
 a) Epidemic b) Sporadic
 c) Endemic d) Inoculation
- 5) _____ agent is used for disinfection of water.
 a) Chlorine
 b) Calcium or Sodium hypochloride
 c) Chloramines
 d) All of the above
- 6) The period after entry of pathogen in host and before development of sign and symptoms is called as _____.
 a) Pathogenicity b) Virulence
 c) Incubation Period d) Etiology
- 7) Inactivated bacterial toxins are called as _____.
 a) Vaccine b) Antibody
 c) Toxoid d) Heptane

- 8) BOD Stands for _____.
a) Bacteriological Oxygen Demand
b) Biological Oxygen Demand
c) Biochemical Oxygen Demand
d) Bacteriological Oxygen Density

Q.2 Answer any four of the following. 08

- a) Define Epidemic Disease and Give Example?
- b) Write in short about opportunistic pathogen?
- c) Define Medical Microbiology?
- d) Define Sewage?
- e) Define Coliforms?

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

- a) Write in details about indicators of fecal pollution of water?
- b) Write in short preventive and control measures of water and food borne diseases?
- c) Differentiate between Morbidity rate and Mortality rate?

Q.4 Answer any two of the following. 08

- a) Describe in short any four types of infection?
- b) Describe in short the sources of contamination of water?
- c) Write in short about municipal water purification Process through filtration and disinfection?

Q.5 Answer any one of the following. 08

- a) Write in detail about modes of transmission of disease?
- b) Describe in detail about Treatment of Sewage?

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**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
STATISTICS (Paper – III)
Descriptive Statistics - II (22221211)**

Day & Date: Friday, 21-11-2025
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 & well labelled diagrams wherever necessary.
4) Use of Calculator allowed

Q.1 Fill in the blanks by choosing correct alternatives. 08

- 1) If all the points of a scatter diagram lie on a straight line falling from left upper corner to the right bottom corner, the correlation is called _____.
 a) Zero correlation
 b) Perfect negative correlation
 c) Perfect positive correlation
 d) High degree of positive correlation
- 2) Numerical value of correlation coefficient (r) can never be _____.
 a) Greater than unity
 b) Less than unity
 c) Greater than zero
 d) None
- 3) If the sum of squares of the difference between 10 ranks of two series is 33. then the rank correlation coefficient is _____.
 a) 0.80
 b) 0.67
 c) 0.967
 d) 0.725
- 4) The idea of regression was given by _____.
 a) Karl Pearson
 b) R.A. Fisher
 c) Sir Francis Galton
 d) none of these
- 5) If both the regression lines are perpendicular to each other we say that _____.
 a) There is perfect correlation between X and Y.
 b) There is no correlation between X and Y.
 c) There is positive correlation between X and Y.
 d) There is a perfect correlation between X and Y.
- 6) The regression coefficient of the regression line of X on Y $5X = 3Y + 108$ is _____.
 a) $\frac{3}{5}$
 b) 0.6
 c) either (a) or (b)
 d) none of these

- 7) One of the limitations in the construction of index number is _____.
a) the choice of the type of average
b) choice of investigators
c) choice of variables to be studied
d) all the above
- 8) Laspeyre's index formula uses the weights of the _____.
a) base year
b) current year
c) average of the weights of a number of years
d) None of the above

Q.2 Answer any four of the following. 08

- a) Define positive correlation with suitable example.
b) If Karl Pearson's coefficient of correlation between X and Y is 0.85, standard deviation of Y is 5 and variance of X is 64. Find covariance between X and Y.
c) Define the two regression coefficients.
d) Given $b_{yx} = 1.6$, $\text{Cov}(X, Y) = 256$, Find $V(X)$.
e) Define Laspeyre's price index number.

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

- a) Write a short note on index number. Write a note on Cost of living index number.
b) What is the effect of change of origin and scale on covariance?
c) The equations of two regression lines are $3X + 2Y - 26$ and $6X + Y = 31$.
Find i) Means of X and Y ii) Coefficient of correlation between X and Y.

Q.4 Answer any two of the following. 08

- a) Explain the concept of lines of regression.
b) Write short note on scatter diagram.
c) Write a note on Cost of living index number.

Q.5 Answer any one of the following 08

- a) Derive the formula for acute angle between two regression lines.
b) Derive the formula for Spearman's rank correlation coefficient.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
ZOOLOGY (Paper – III)
Comparative Anatomy of Vertebrates (22221232)**

Day & Date: Friday, 21-11-2025
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

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

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

- 1) Presence of sweat gland is the character of _____ skin.
 - a) Birds
 - b) Mammals
 - c) Amphibians
 - d) Reptiles
- 2) Four chambered heart is found in _____ animal of reptile class.
 - a) Snake
 - b) Crocodile
 - c) Calotes
 - d) Frog
- 3) _____ is the permanent and functional kidney in higher vertebrates.
 - a) Acheonephros
 - b) Pronephros
 - c) Mesonephros
 - d) Metanephros
- 4) _____ helps fish to maintain buoyancy and their depth and during swimming.
 - a) air bladder
 - b) placoid scales
 - c) gills
 - d) tympanum
- 5) The _____ is made up by the scapula and paired clavicles.
 - a) Sternum
 - b) femur
 - c) pelvic girdle
 - d) pectoral girdle
- 6) Two-chambered heart with single circulation found in _____.
 - a) rat
 - b) fish
 - c) crocodile
 - d) pigeon
- 7) The _____ is a food storage organ of alimentary canal.
 - a) esophagus
 - b) stomach
 - c) pharynx
 - d) Pancreas
- 8) _____ is the structural and functional unit of kidney.
 - a) Neuron
 - b) Necron
 - c) Nephron
 - d) Microvilli

- Q.2 Answer any four of the following. 08**
- a) Write functions of integument.
 - b) Write on use of swim bladder in fish.
 - c) What is archeonephros.
 - d) Write on fish heart.
 - e) Write on type of glands present in skin of frog.
- Q.3 Write short note on any two of the following. 08**
- a) Describes pectoral girdle in rat.
 - b) Write brief account on respiratory organ gills in fish.
 - c) Discuss the difference between pronephros and metanephros.
- Q.4 Answer any two of the following. 08**
- a) Write on comparative characters of brain in fish and brain in mammals.
 - b) Write on comparative difference in stomach of scoliodon and mammal.
 - c) Discuss structure of alimentary canal in pigeon.
- Q.5 Answer any one of the following. 08**
- a) Write an account on comparative structure of heart of calotes (Reptile) and rat (Mammal).
 - b) Discuss the structure of skin of Scoliodon and Rat.

Seat No.	

Set P

**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
STATISTICS (Paper – IV)
Discrete Probability Distribution (22221212)**

Day & Date: Saturday, 22-11-2025
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 & well labelled diagrams wherever necessary.
4) Use of Calculator allowed

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

08

- 1) If $P(x) = x(2 - x)$ $x = 0, 1, 2$
 $\quad \quad \quad = 0$ $\quad \quad \quad$ otherwise
 Then $P(X = 1) = \underline{\hspace{2cm}}$.
 a) 0 b) $\frac{1}{2}$
 c) 1 d) None of these
- 2) The mean & variance of a discrete r.v. X are given by 0 & 4 respectively.
 The value of $E(X^2 + X + 6)$ is $\underline{\hspace{2cm}}$.
 a) 10 b) 6
 c) 4 d) None of these
- 3) The probability generating function of a discrete random variable is
 affected by change of $\underline{\hspace{2cm}}$.
 a) origin b) origin and scale
 c) scale d) cannot be determined
- 4) A random variable takes two values x_1 and x_2 with probabilities p and q .
 then random variable X follow $\underline{\hspace{2cm}}$.
 a) Bernoulli distribution b) Two-point distribution
 c) One point distribution d) Discrete uniform distribution
- 5) The p.g.f of Binomial distribution with parameters (n, p) is $\underline{\hspace{2cm}}$.
 a) $q + ps$ b) $q + ps^n$
 c) $p + qs^n$ d) $(q + ps)^n$
- 6) What is the approximate distribution for binominal if n is very large and p
 is very small?
 a) Hypergeometric b) Geometric
 c) Poisson d) Uniform

- 7)** Suppose X has a geometric distribution with probability of success 0.3 and that of failure 0.7 on each observation. The mean and variance of X are _____.
 a) 0.3, 0.21 b) 3.33, 2.79
 c) 1.43, 0.61 d) 2.33, 7.77
- 8)** Negative binomial distribution $NB(k, p)$ reduces to geometric distribution when k equal to _____.
 a) 0 b) 1
 c) ∞ d) None of these

Q.2 Answer the following. (Any Four)

- Define median of r.v. X .
- Define p. g. f. of r.v. X .
- Define one point distribution.
- Define binomial distribution.
- Define Poisson distribution.

08

Q.3 Write short note. (Any Two)

- a)** A r.v. X has following probability distribution.
- | | | | | |
|----------|---------------|---------------|----------------|----------------|
| X : | 0 | 1 | 2 | 3 |
| $P(x)$: | $\frac{1}{6}$ | $\frac{1}{2}$ | $\frac{3}{10}$ | $\frac{1}{30}$ |
- Find $E(X)$ and $V(X)$
- b)** Find mean and variance of Bernoulli distribution.
- c)** If the p.g.f. of X is given by $p_X^{(S)} = \frac{3s(s+1)}{10}$
Find mean and variance of X .

08

Q.4 Answer the following. (Any Two)

- Find mean and variance of Binomial distribution.
- Define geometric distribution. Find its p.g.f.
- Find the recurrence relation for probability of negative binomial distribution.

08

Q.5 Answer the following. (Any One)

- a)** A discrete random variable X assumes values $-3, -2, 0, 2$ and 3
 $P(X = -3) = P(X = -2)$
 $P(X = 2) = P(X = 3)$
 $P(X > 0) = P(X < 0) = P(X = 0)$
 Obtain:
 1) p.m.f. of X .
 2) The distribution function of X .
 3) Median of X .
- b)** Find p.g.f. of Poisson distribution. Hence find its mean and variance.

08

Set P

**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
ZOOLOGY (Paper – IV)
Developmental Biology of Vertebrates (22221233)**

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

- 1) Nutritive material present in egg is called as _____.
a) Yolk b) Dutoplasm
c) Both a and b d) Only a
- 2) Viral and bacterial infection of placenta is known as _____.
a) Syphilis b) Placentitis
c) Dermatitis d) Appendicitis
- 3) The physiological connection between the mother and developing embryo in mammals is known as: _____.
a) Placenta b) Amnion
c) Uterus d) Fallopian tube
- 4) In telolecithal egg the yolk is concentrated towards _____ Poles.
a) Animal pole
b) Vegetal pole
c) Both a and b
d) Distributed throughout cytoplasm
- 5) Egg of bird is of _____.
a) Homolecithal b) Microlecithal
c) Telolecithal d) Centrolecithal
- 6) What type of placenta is found in humans?
a) Diffuse placenta b) Zonary placenta
c) Discoid placenta d) Cotyledonary placenta
- 7) The process of formation of egg is called as _____.
a) Spermatogenesis b) Mitosis
c) Oogenesis d) None of these

- 8)** Which factor contributes to the formation of fraternal (non-identical) twins?
- a) Shared placenta
 - b) Genetic predisposition
 - c) Fertilization of two separate eggs
 - d) In vitro fertilization

- Q.2 Answer the following. (Any Four) 08**
- a) Megalecithal egg
 - b) Spermatogenesis
 - c) Causes of miscarriage
 - d) Apoptosis
 - e) Totipotency

- Q.3 Write short notes on (Any Two) 08**
- a) Describe types of eggs.
 - b) Types of cleavage.
 - c) Describe gastrulation in frog.

- Q.4 Answer the following. (Any Two) 08**
- a) Describe ultrastructure of ovum.
 - b) Hormonal regulation of Metamorphosis in tadpole
 - c) Describe types of twins in human with characteristic features.

- Q.5 Answer the following. (Any One) 08**
- a) Give a detailed account on types of placenta on the basis of histology.
 - b) Write an account of principles and applications of ultrasound in human embryology.

Set P

**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
MATHEMATICS (Paper – III)
Geometry (22221223)**

Max. Marks: 40

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

08

- 1) $r = a$ represent equation of _____.
a) circle
b) parabola
c) Ellipse
d) Straight line
- 2) The polar point (r, θ) lies on _____.
a) x-axis
b) Initial line
c) y-axis
d) z-axis
- 3) The Cartesian equation of $r = a \cos \theta$ is _____.
a) $x^2 + y^2 = 1$
b) $x = y$
c) $x^2 + y^2 = ax$
d) $x - y = 2$
- 4) The number of obituary constants in the eqⁿ $ax + by + cz + d = 0$ is _____.
a) One
b) two
c) Zero
d) three
- 5) The intercept on the Z-axis of the plane $x + y + 2z = 2$ is _____.
a) 4
b) 3
c) 2
d) 1
- 6) The intercept on the x-axis of the plane $3x + 4y + 6z = 12$ is _____.
a) 1
b) 2
c) 4
d) 3
- 7) Centre of the phase $x^2 + y^2 + z^2 + 6x + 4y + 8z + 25 = 0$ is _____.
a) (3,2,4)
b) (-3,-2,-4)
c) (-3,2,4)
d) (3,2,-4)
- 8) The two equations $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$ and $lx + my + nz = p$ taken together represent a _____.
a) Circle
b) Plane
c) Line
d) None of these

Q.2 Attempt any four of the following. 08

- Transform the equation $2x^2 + 4xy + 5y^2 - 4x - 22y + 7 = 0$ to parallel axis through the point $(-2, 3)$.
- Find the transformation equations if the co-ordinate axes are rotated through an angle $\theta = 90^\circ$.
- If $a=6$, $b=2$, $c=3$ are direction Ratios of a line then find their direction cosines.
- Write the formula for angle between two planes $a_1x + b_1y + c_1z + d_1 = 0$ and $a_2x + b_2y + c_2z + d_2 = 0$.
- Find the equation of sphere in Diameter form.

Q.3 Attempt any two of the following. 08

- Find the equation of tangent plane to the sphere $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$.
- Find the equation of plane in Normal form with figure.
- Identify the conic given by the equation $x^2 + xy + y^2 + x + y - 1 = 0$.

Q.4 Attempt any two of the following. 08

- By the rotation of the axes through an angle θ , the expression $ax + by$ becomes $a^1x^1 + b^1y^1$. Then prove that $a^2 + b^2$ is an invariant.
- Find the equation of plane passing through the three non-collinear points.
- Find the equation of sphere described on A $(2, -3, 1)$ & B $(3, -1, 2)$ as extremities of a diameter.

Q.5 Attempt any one of the following. 08

- By the rotation of axes the expression $ax^2 + 2hxy + by^2$ becomes $a^1x^2 + 2h^1x^1y^1 + b^1y^2$ then show that $a + b$ and $ab - h^2$ are invariants.
- Find the perpendicular distance of a point P (x, y, z) from the plane $lx + my + nz = p$.
Also find the perpendicular distance of the point P $(2, 3, 4)$ from the plane $3x - 6y + 2z + 11 = 0$.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
BOTANY (Paper – III)
Plant Ecology (22221202)**

Day & Date: Monday, 24-11-2025
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

Instructions: 1) All questions are compulsory.
2) All questions carry equal marks.
3) Figures to the right indicate full marks.
4) Draw neat & labelled diagrams wherever necessary.

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

- 1) The term ecology was first used by _____ scientist.
 - a) Odum
 - b) Haeckel
 - c) Sharma
 - d) Reiter
- 2) Presence of sunken stomata is characteristic of feature of _____.
 - a) Mesophyte
 - b) Hydrophyte
 - c) Xerophyte
 - d) All of these
- 3) _____ is the most important Abiotic factor.
 - a) Light
 - b) Plant
 - c) animals
 - d) none of these
- 4) The green plants are the _____.
 - a) Tertiary consumers
 - b) secondary consumers
 - c) Producers
 - d) Consumers
- 5) The succession beginning in aquatic environment is called as _____ Succession.
 - a) Hydrarch
 - b) Xerarch
 - c) Mesarch
 - d) none of these
- 6) In grassland ecosystem the pyramid of number is always _____.
 - a) Inverted
 - b) Arrowhead
 - c) Cross
 - d) Upright
- 7) _____ means formation of vertical layers by different life forms existing in the plant community.
 - a) Growth forms
 - b) Stratification
 - c) Zonation
 - d) none of these

- 8) In _____ type of relationship both the species are benefit.
- a) Neutralism
 - b) Competition
 - c) Mutualism
 - d) both b & c

Q.2 Answer any four of the following. 08

- a) Define the plant ecology.
- b) What are sciophytes?
- c) Enlist the Abiotic factors
- d) What is mean by secondary succession?
- e) What is plant density?

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

- a) Comment Water as climatic factor.
- b) What are the quantitative characters of the plant community?
- c) Comment on producer.

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

- a) Explain the hydrosere
- b) Describe the Aquatic ecosystem.
- c) Describe the level of Organization.

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

- a) What is the ecological pyramid? Describe the pyramids of Biomass?
- b) Describe soil as edaphic factor.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
MATHEMATICS (Paper - IV)
Differential Equations (22221224)**

Day & Date: Tuesday, 25-11-2025
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 Select the correct alternative of the following. **08**

- 1) The homogeneous differential equation $Mdx + Ndy = 0$ can be reduced to a variable separable form by using the substitution _____.
 - a) $x - y = u$
 - b) $xy = u$
 - c) $y = ux$
 - d) None of these
- 2) The solution of the differential equation $\sqrt{1-x^2} dy + \sqrt{1-y^2} dx = 0$ is _____.
 - a) $\sin^{-1} x + \cos^{-1} x = c$
 - b) $\sin^{-1} x + \sin^{-1} y = c$
 - c) $\cos^{-1} x + \sin^{-1} y = c$
 - d) $(1-x^2)(1-y^2) = c$
- 3) The differential equation $Mdy + Ndx = 0$ is an exact iff _____.
 - a) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$
 - b) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$
 - c) $\frac{\partial^2 M}{\partial x^2} = \frac{\partial^2 N}{\partial y^2}$
 - d) $\frac{\partial^2 M}{\partial y^2} = \frac{\partial^2 N}{\partial x^2}$
- 4) The integrating factor of the equation $(1+x^2)\frac{dy}{dx} + 2xy = \frac{1}{1+x^2}$ is _____.
 - a) x^2
 - b) e^{x^2}
 - c) $\frac{1}{(1+x^2)}$
 - d) $(1+x^2)$
- 5) $\frac{1}{D^3}(x^3) =$ _____.
 - a) $3!$
 - b) $\frac{x^5}{60}$
 - c) $\frac{x^4}{12}$
 - d) $\frac{x^3}{3}$

- 6) The general solution of $D^2(D - 2)y = 0$ is $y = \underline{\hspace{2cm}}$.
- a) $(C_1 + C_2x) + C_3e^{2x}$ b) $(C_1 + C_2x)e^{2x} + C_3$
 c) $C_1 + C_2x + C_3x^2$ d) $C_1 + C_2x + C_3e^{-2x}$
- 7) $\frac{1}{D^2+a^2} \sin ax = \underline{\hspace{2cm}}$.
- a) $-\frac{x^2}{2} \sin ax$ b) $\frac{x^2}{2} \cos ax$
 c) $-\frac{x}{2a} \sin ax$ d) $\frac{-x}{2a} \cos ax$
- 8) The particular integral of the differential equation $(D^2 + SD + 6)y = e^x$ is $\underline{\hspace{2cm}}$.
- a) $\frac{e^x}{12}$ b) $\frac{-e^x}{12}$
 c) $\frac{e^x}{11}$ d) None of these

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

- a) Write the working rule to solve the exact differential equation
 $Mdx + Ndy = 0$
- b) Solve $x\sqrt{1-y^2} dx + y\sqrt{1-x^2} dy = 0$
- c) Define Bernoulli's differential equation.
- d) Solve: $(D^4 + 2D^3 + D^2)Y = 0$
- e) Find the particular integral for the differential equation
 $(D - 2)(D - 2)(D + 1)y = e^{5x}$

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

- a) Define homogeneous differential equations and explain how they can be solved.
- b) With usual notation prove that
 $(D - \alpha)(D - \beta)y = (D - \beta)(D - \alpha)y$
- c) Solve $(D^2 - 3D + 2)y = \cos 3x$

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

- a) Solve $[y(1 + \frac{1}{x}) + \cos y]dx + [x(1 - \sin y) + \log y]dy = 0$
- b) Obtain particular integral for $f(D)y = e^{ax}$ when $f(a) \neq 0$
- c) Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^{2x} \sin 2x$

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

a) Define non homogeneous differential equation and explain how they can be solved.

b) With usual notation prove that

$$\frac{\cos ax}{f(D^2)} = \frac{\cos ax}{f(-a^2)}, \text{ if } f(-a^2) \neq 0$$

and hence solve

$$\frac{d^3 y}{dx^3} - y = \cos 2x$$

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
BOTANY (Paper – IV)
Taxonomy of Angiosperms (22221203)**

Day & Date: Tuesday, 25-11-2025
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) Bentham & Hookers system of classification is based on ____ characters
 - a) Phylogenetic
 - b) Genetic
 - c) Biochemical
 - d) Morphological
- 2) The origin of Royal Botanical Gardens is in _____.
 - a) America
 - b) Japan
 - c) Australia
 - d) Kew
- 3) Family Caesalpiniaceae belongs to series _____.
 - a) Apetalae
 - b) Gamopetalae
 - c) calyciflorae
 - d) Polemoniales
- 4) _____ among the following is one of the member of family liliaceae.
 - a) Aloe
 - b) Asparagus
 - c) Allium
 - d) All of above
- 5) Artificial system of classification was introduced by _____.
 - a) Benthum
 - b) Calvin
 - c) Linnaeus
 - d) Adanson
- 6) Lead Botanical Garden was established by _____ university.
 - a) Mumbai
 - b) Pune
 - c) Kolhapur
 - d) Solapur
- 7) Infundibulum type of corolla is characteristic feature of family _____.
 - a) Liliaceae
 - b) Amaranthaceae
 - c) Solanaceae
 - d) Caesalpiniaceae
- 8) Arrangement of leaves on stem is called as _____.
 - a) Placentation
 - b) Phytoremedation
 - c) Phyllotaxy
 - d) Aestivation

- Q.2 Answer the following. (Any Four) 08**
- a) Draw a well labeled diagram of any two aestivations.
 - b) What is herbarium.
 - c) Give the merits of Bentham & Hookers system of classification.
 - d) Enlist types of inflorescence
 - e) Enlist categories used for classification of plants.
- Q.3 Write short note. (Any Two) 08**
- a) Give distinguishing characters of family Liliaceae.
 - b) J. C. Bose Botanical garden.
 - c) Bionomial nomenclature.
- Q.4 Answer the following. (Any Two) 08**
- a) Describe steps involved in herbarium preparation.
 - b) Describe vegetative & reproductive characters of family Amaranthaceae.
 - c) What are aims & objectives of taxonomy.
- Q.5 Answer the following. (Any One) 08**
- a) Describe principles of ICBN.
 - b) Describe Lead Botanical Garden.

Set P

**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
ELECTRONICS (Paper – III)
Semiconductor Devices (22221226)**

Day & Date: Wednesday, 26-11-2025
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 Multiple choice questions:

08

- 1) A trivalent impurity has ____ valence electrons.
a) 2
b) 3
c) 4
d) 5
- 2) The forward voltage drop across silicon diode is about _____.
a) 7 V
b) 0.3 V
c) 3 V
d) 0.7 V
- 3) A doped semiconductor is known as _____ semiconductor.
a) Intrinsic
b) extrinsic
c) Pure
d) isolated
- 4) The current flowing through JFET is due to _____.
a) Majority carriers
b) minority carriers
c) recombination of electrons and holes
d) all of these
- 5) In _____ semiconductor electrons are the majority charge carriers.
a) N-type
b) P-type
c) Both a & b
d) S- type
- 6) The emitter of a transistor is _____ doped.
a) Lightly
b) moderately
c) Heavily
d) all of these
- 7) Diac has number of junctions is equal to _____.
a) 1
b) 2
c) 3
d) 4

- 8)** Zener diode is normally used as _____.
 a) an oscillator b) voltage regulator
 c) an amplifier d) Rectifier

Q.2 Answer any four of the following. 08

- List applications of Varactor diode.
- List applications of MOSFET.
- What is Intrinsic Semiconductor?
- If $I_E=2\text{mA}$ & $\alpha=0.98$, Calculate I_C ?
- A typical transistor has $\beta=97$. Calculate the value of α .

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

- LED.
- SCR.
- p-Type Semiconductor.

Q.4 Answer any two of the following. 08

- Write a note on varactor diode.
- Explain static & dynamic resistance of Diode.
- Describe the formation of PN junction.

Q.5 Answer any one of the following. 08

- Explain input and output characteristics of a transistor in CE configuration.
- Explain Structure and operation of n-channel JFET.

Set	P
1	1
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89	1
90	1
91	1
92	1
93	1
94	1
95	1
96	1
97	1
98	1
99	1
100	1

**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
PHYSICAL GEOGRAPHY (Paper – III)
Human Geography I (22221235)**

Day & Date: Wednesday, 26-11-2025
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) _____ is the study of relationship of human groups and society with physical environment.

a) Physical	b) Human
c) Commercial	d) Economic
- 2) _____ states that ‘Stop and Go Determinism’.

a) Griffith Taylor	b) Miss Ellen Sample
c) Fredrick Ratzel	d) Huntington
- 3) Whenever the cephalic index is between 78.6 to 82.5, then it is known as _____ head.

a) _Dolichocephalic	b) Mesocephalic
c) _Brachycephalic	d) None of them
- 4) Generally medial epicanthic eyes of human beings mostly found in _____ race in the world.

a) Negroid	b) Caucasoid
b) Mongoloid	d) None of them
- 5) _____ state of India having nearly 99 dialects.

a) Tripura	b) Assam
c) Arunachal Pradesh	d) Nagaland
- 6) Om and Swastik are two symbols of _____.

a) Hinduism	b) Judaism
c) Islam	d) Sikhism
- 7) Nanded, Amritsar, Anandpurusaheb and Nanaksaheb are the holistic places of _____ found in the world.

a) Hinduism	b) Judaism
c) Jainism	d) Sikhism

- 8)** Mahavir Jain was the founder of _____.
 a) Hinduism b) Judaism
 c) Jainism d) Sikhism

Q.2 Answer any four of the following. 08

- a) Give the name of all major languages spoken in the World.
- b) State the region of Islam religious.
- c) Give the name of religious wise holistic books.
- d) Physical characteristics of eskimo.
- e) Give the divisions of Jainism, Muslim, Christianity religious.
- f) Characteristics of Sino-Tibetan language family.

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

- Explain the basis of racial classification.
- Describe the socio-economic condition of naga.
- State the spatial distribution of major languages in the world.

Q.4 Answer any two of the following. 08

- a) Explain the branches of human geography.
- b) Give the types of races by Griffith Taylor.
- c) Explain the various language families in the world.

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

- a) Define human geography and state its nature, scope and importance.
- b) State the various religious group in the world and explain any one of them in detail.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
GEOLOGY (Paper – III)
STRUCTURAL GEOLOGY (22221214)**

Day & Date: Wednesday, 26-11-2025
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

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

Q.1 Multiple choice questions**08**

- 1) In _____, older rocks are surrounded by younger formations.
 - a) Outlier
 - b) Inlier
 - c) Columnar
 - d) Strike
- 2) Which of the following is example of fold mountain?
 - a) Sahyadri
 - b) Satpuda
 - c) Himalaya
 - d) Vindhyan
- 3) Geological time gap or break is represented by _____.
 - a) Faults
 - b) Unconformity
 - c) Folds
 - d) Joints
- 4) Angle between Fault plane and vertical surface is called _____.
 - a) Dip
 - b) Hade
 - b) Heave
 - d) Throw
- 5) Which of the following is not type of fault?
 - a) strike- slip
 - b) step
 - c) Graben
 - d) columnar
- 6) Symmetrical fold represent _____ axial planes
 - a) Convex
 - b) concave
 - c) Inclined
 - d) vertical
- 7) Which of the following instrument is used to study attitude of rocks in field?
 - a) Seismometer
 - b) Brunton compass
 - c) Ammeter
 - d) contact Goniometer
- 8) True dip is always _____ to strike.
 - a) Inclined
 - b) vertical
 - c) Parallel
 - d) perpendicular

- Q.2 Answer any four of the following. 08**
- a) What are Joints?
 - b) Draw labelled diagram of Isoclinal fold.
 - c) What is Strike?
 - d) Define Structural Geology.
 - e) Draw labelled diagram illustrating Strike and Dip.
- Q.3 Write short note on any two of the following. 08**
- a) Strike & Dip Joints.
 - b) Columnar Joints.
 - c) Angular unconformity.
- Q.4 Answer any two of the following. 08**
- a) Explain Horst and Graben faults.
 - b) Draw labelled diagrams of Bedding and Diagonal Joints.
 - c) Distinguish between Anticline and Syncline folds.
- Q.5 Answer any one of the following. 08**
- a) Define Faults. Describe Normal and Reverse faults.
 - b) Define Unconformity. Describe Disconformity and Non-conformity.

Seat No.	

Set	P

B.Sc. (Plain) (Semester - II) (New/Old) (CBCS)
Examination: October/November - 2025
ELECTRONICS (Paper – IV)
Digital Electronics (22221227)

Day & Date: Thursday, 27-11-2025
 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) PIPO in shift register stands for _____.
 a) Paper in paper out b) paper in parallel out
 c) parallel in paper out d) Parallel in parallel out
- 2) Demultiplexer 1:8 requires _____ number of AND gates.
 a) 8 b) 2
 c) 6 d) 4
- 3) Race around condition is observed in _____ flip flop.
 a) R-S b) J-K
 c) D d) T
- 4) _____ is priority encoder IC.
 a) 7447 b) 74147
 b) 7490 d) 7495
- 5) J-K flip flop will toggle when J= _____ and K= _____.
 a) J=0, K=1 b) J=1, K=0
 c) J=0, K=0 d) J=1, K=1
- 6) TTL stands for _____.
 a) Transistor Transistor Logic
 b) Transistor Transformer Logic
 c) Transformer Transformer Logic
 d) Transformer Transistor Logic
- 7) Maximum counts for three-bit counter is _____.
 a) 3 b) 6
 c) 8 d) 9
- 8) R-S flip flop remains same when _____.
 a) $R + S = 1$ b) $R = 0, S = 1$
 c) $R = S = 0$ d) $R = 1, S = 1$

- Q.2 Answer any four of the following. 08**
- a) Give any two differentiating points between multiplexer and demultiplexer.
 - b) Draw the timing diagram of MOD 5 counter.
 - c) Define Fan in and Fan Out for TTL NAND Gate.
 - d) What is combination of counter?
 - e) List the types of shift register?
- Q.3 Write short note on any two of the following. 08**
- a) Master slave JK flip flop.
 - b) 1:4 demultiplexer.
 - c) TTL NAND Gate.
- Q.4 Answer any two of the following. 08**
- a) Explain 3 to 8 decoder.
 - b) Explain Common anode seven segment display along with decoder driver.
 - c) Explain SISO shift register.
- Q.5 Answer any one of the following. 08**
- a) Explain construction and working of decade counter using IC 7490 with its necessary truth table and timing diagram.
 - b) Explain construction and working of 8:1 multiplexer along with its necessary truth table.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
PHYSICAL GEOGRAPHY (Paper – IV)
Human Geography II (22221236)**

Day & Date: Thursday, 27-11-2025
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 options. 08

- 1) The major concentration of population in the world is found in ____ region.
 - a) Plain
 - b) Plateau
 - c) Mountain
 - d) Valley
- 2) The proportion of male and female population is called as _____.
 - a) Age composition
 - b) Fertility
 - c) Sex ratio
 - d) Mortality
- 3) The theory of _____ was put forward by Thomson and Notestein.
 - a) Industrial location
 - b) Demographic Transition
 - c) Continental Drift
 - d) None of these
- 4) _____ is the main occupation of the rural settlements,
 - a) Industry
 - b) Trade
 - c) Transport
 - d) Agriculture
- 5) Slums and pollution are _____ problem.
 - a) Rural
 - b) Urban
 - c) Rural-Urban fringe
 - d) None of these
- 6) Main function of Nagpur, Bhusawal and Manmad urban centres _____.
 - a) Transportation
 - b) Education
 - c) Trade
 - d) Defence
- 7) _____ is an important plantation crop in the world.
 - a) Maize
 - b) Wheat
 - c) Rice
 - d) Tea

- 8) _____ is the physical factors affect on agriculture.
- | | |
|------------|-----------------|
| a) Capital | b) Land holding |
| c) Climate | d) Market |

Q.2 Answer any four of the following. 08

- a) Define density of population.
- b) Write any two factors of affecting on the age structure.
- c) What is Sex Ratio?
- d) Define rural Settlement.
- e) Write the two types of Agriculture.

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

- a) Characteristics of Urbanization.
- b) Hypothesis of demographic-transition theory.
- c) Compact rural settlement.

Q.4 Answer any two of the following. 08

- a) Explain any four patterns of rural settlement.
- b) Explain the physical problems of Indian Agriculture.
- c) State the stages of demographic transition theory.

Q.5 Answer any one of the following. 08

- a) Explain the factors affecting on the distribution of world population.
- b) Explain the Problems of urban settlement.

Set P

**B.Sc. (Plain) (Semester - II) (New/Old) (CBCS) Examination:
October/November - 2025
GEOLOGY (Paper – IV)
CRYSTALLOGRAPHY (22221215)**

Day & Date: Thursday, 27-11-2025
Time: 03:00 PM To 05:00 PM

Max. Marks: 40

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

Q.1 Multiple choice questions:

08

- 1) Cubic crystal system shows _____ crystallographic axes.

a) 1	b) 3
c) 4	d) 2
- 2) The angle between adjacent faces is called _____ angle.

a) strike	b) dip
c) Interfacial	d) none of these
- 3) In hexagonal crystal system _____ axes are vertical.

a) 1	b) 2
c) 3	d) 4
- 4) Triclinic system shows _____ planes and axes of symmetry.

a) 5	b) 7
c) 9	d) None
- 5) A substance having well developed faces, edges, interfacial angles with perfect atomic structure is called _____.

a) mineral	b) rock
c) joint	d) crystal
- 6) Cube has _____ equal faces.

a) 2	b) 4
c) 6	d) 8
- 7) Basal pinacoid cuts _____ axis.

a) Vertical	b) horizontal
c) Inclined	d) All the above
- 8) Which one of the following is used to measure interfacial angle?

a) Clinometer	b) brunton compass
c) contact goniometer	d) voltmeter

- Q.2 Answer any four of the following. 08**
- a) Define crystal.
 - b) What are holohedral and hemihedral forms?
 - c) Define parameters.
 - d) What is axis of symmetry?
 - e) What are interfacial angles?
- Q.3 Write short note on any two of the following. 08**
- a) Basal pinacoid.
 - b) Index system of miller.
 - c) Galena type form of cubic system.
- Q.4 Answer any two of the following. 08**
- a) Describe the tetragonal crystal system.
 - b) Describe the form beryl type of hexagonal system.
 - c) Describe the forms of barite types in orthorhombic system.
- Q.5 Answer any one of the following. 08**
- a) Describe monoclinic crystal system.
 - b) Explain the crystallographic axes of each crystal system.

Seat No.	

Set **P**

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

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

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
2) Draw neat labelled 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**

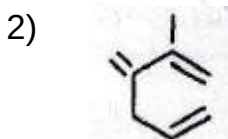
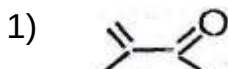
- 1) In Benzoin condensation product formed is _____.
 a) α -hydroxyl ketone b) β -hydroxyl ketone
 c) γ -hydroxyl ketone d) δ -hydroxyl ketone
- 2) Example of dicarboxylic acid is _____.
 a) cinnamic acid b) benzoic acid
 b) citric acid d) succinic acid
- 3) Number of σ -bonds in acetone is _____.
 a) 9 b) 8
 c) 7 d) 6
- 4) In Ziesel's gravimetric estimation of $-OCH_3$ group, absorption flasks contain _____.
 a) alc. HNO_3 solution b) alc. $NaNO_3$ solution
 b) alc. $AgCl$ solution d) alc. $AgNO_3$ solution
- 5) According to Woodward - Fieser rules exocyclic double bond increases λ_{max} by _____.
 a) 30 nm b) 18 nm
 c) 10 nm d) 5 nm
- 6) Phthalimide is prepared by distillation of _____ with ammonia.
 a) Cinnamic acid b) Phthalic acid
 c) Benzoic acid d) Oxalic acid
- 7) Medicinal use of diethyl ether is _____.
 a) Anaesthetic b) anti-inflammatory
 c) Antipyretic d) antimalaria

- 8) Glycerol is the example of _____ alcohol.
- a) Monohydric b) dihydric
c) Trihydric d) tetrahydric

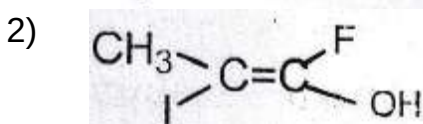
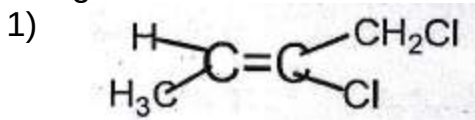
Q.2 Answer the following. (Any Four)

08

- a) Write the reaction when phenol reacts with acetyl chloride.
b) How will you prepare mono chloro acetic acid by HVZ reaction?
c) Write the preparation reaction of anisole from diazomethane.
d) Calculate $\lambda_{\max}$ values for following structures.



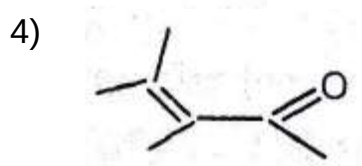
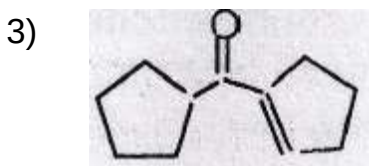
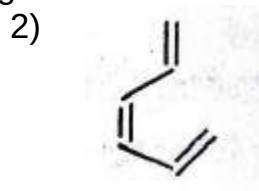
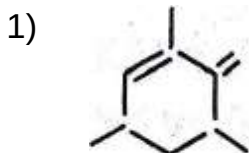
- e) Write uses of cinnamic acid.
f) Assign E and Z nomenclature for following compounds.



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

08

- a) Calculate $\lambda_{\max}$ values for following structures.



- b) Write types of electronic transitions.
c) How will you prepare acrylic acid from acrolein and dehydration of β -hydroxyl propionic acid?

Q.4 Answer the following. (Any Two)

08

- a) Write note on configuration of ketoxime.
b) When 1.38×10^{-5} kg of methoxy compound having molecular formula C_7H_8O is subjected to Zeisel's method produced 4.164×10^{-5} kg of AgI. Calculate the percentage and number of methoxy group per molecule.
c) Explain conformational analysis of ethane with energy profile diagram.

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

- a)** Explain mechanism of nucleophilic additions to carbonyl group and write mechanism of Benzoin condensation.
- b)** Write with example monohydric, dihydric and trihydric phenols. Explain the Claisen rearrangement reaction.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November - 2025
COMPUTER SCIENCE (Paper - V)
Data Structure (22221320)**

Day & Date: Tuesday, 04-11-2025
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 Multiple Choice questions.

08

- 1) Which data structure is needed to convert infix notation to postfix notation?
 - a) Tree
 - b) Branch
 - c) Stack
 - d) Queue
- 2) What is AVL tree?
 - a) a tree which is unbalanced and is a height balanced tree
 - b) a tree which is balanced and is a height balanced tree
 - c) a tree with atmost 3 children
 - d) a tree with three children
- 3) What is the value of the postfix expression 6 3 2 4 + -*?
 - a) 74
 - b) -18
 - c) 22
 - d) 40
- 4) Which of the following is not the type of queue?
 - a) Priority queue
 - b) Circular queue
 - b) Single ended queue
 - d) Ordinary queue
- 5) The data structure required for Breadth First Traversal on a graph is?
 - a) Array
 - b) Stack
 - c) Tree
 - d) Queue
- 6) The node in the linked list contains two node pointers is called ____ linked list.
 - a) Singly
 - b) Singly-doubly
 - c) Doubly or double
 - d) Circular
- 7) The node that does not have any incoming edges but it has outgoing edges then it is called _____.
 - a) source node
 - b) sink node
 - c) cyclic node
 - d) acyclic node

- 8) A data structure in which elements can be inserted or deleted at/from both ends but not in the middle is?
- a) Priority queue
 - b) Dequeue
 - c) Circular queue
 - d) Queue

Q.2 Answer any four of the following. 08

- a) What is ADT?
- b) What is priority queue? What are the types of it?
- c) What is degree of node?
- d) What is graph?
- e) What is minimum spanning tree?

Q.3 Answer any two of the following. 08

- a) Explain application of stack.
- b) Explain Breadth First Traversal algorithm.
- c) Explain tree traversal method.

Q.4 Answer any two of the following. 08

- a) Write a program which check entered expression is valid or not.
- b) What is Queue? Explain types of queue.
- c) Differentiate Stack and Queue

Q.5 Answer any one of the following. 08

- a) What is sorting? Write a program for bubble sort.
- b) Write a program for single linear linked list for following operation
 - i) Create
 - ii) Insert
 - iii) Remove
 - iv) Count

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November - 2025
CHEMISTRY (Paper – VI)
Inorganic Chemistry (22221331)**

Day & Date: Thursday, 06-11-2025
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 equations wherever necessary.
4) Use of logarithmic table and calculator is allowed.
(At. Wts : H = 1, C = 12, O = 16, Na = 23, Cl = 35.5)

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

- Coordination bond is _____ bond.
 - weak
 - double
 - semipolar
 - van der waal's
- Secondary valency of Co in $[Co(NH_3)_4Cl_2]Cl$ is _____.
 - 6
 - 4
 - 0
 - 2
- The chelating agents must have at least _____ donor groups.
 - 2
 - 4
 - 0
 - Less than 2
- EDTA is a _____ dentate chelating agent.
 - bi
 - mono
 - tri
 - hexa
- _____ is lewis acid.
 - NH_3
 - H_2O
 - CN^-
 - BF_3
- Al^{+3} is _____.
 - hard acid
 - soft acid
 - soft base
 - hard base
- The first transition element is _____.
 - Sc
 - Cr
 - Fe
 - Ni
- The hybridization in inner orbital octahedral complex is _____.
 - sp^3d^2
 - d^2sp^3
 - $d^2s^2p^3$
 - d^3sp^3

- Q.2 Answer any four of the following. 08**
- a) Why $KMnO_4$ is colored in nature?
 - b) Explain d-d transition.
 - c) Define hard and soft acid with suitable example.
 - d) Give the different types of Lewis bases.
 - e) Define coordination sphere with suitable example.
 - f) Draw the inner and outer spheres of $[CoCl_3 \cdot 5NH_3]$ complex.
- Q.3 Write short note on any two of the following. 08**
- a) What is coordinate bond? Give mechanism of formation of coordinate bond with suitable example.
 - b) What are the basic structural requirements for stability of metal chelate?
 - c) Explain the oxidation state of transition elements.
- Q.4 Answer any two of the following. 08**
- a) Write the limitations of HSAB principle.
 - b) Distinguish between metal chelate and metal complex.
 - c) Explain postulates of Werner's theory.
- Q.5 Answer any one of the following. 08**
- a) Give name, atomic symbol and electronic configuration of 4d transition elements.
 - b) On the basis of VBT, explain the formation of $[NiCl_4]^{-2}$ and $[Ni(CN)_4]^{-2}$.

Seat No.	

Set P

**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November - 2025
COMPUTER SCIENCE (Paper – VI)
Software Engineering (22221321)**

Day & Date: Friday, 07-11-2025
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 Multiple choice question.

08

- 1) What is Software Engineering?
 - a) Designing a software
 - b) Testing a software
 - c) Application of engineering principles to the design a software
 - d) None of the above
- 2) Which two models doesn't allow defining requirements early in the cycle?
 - a) Waterfall & RAD
 - b) Prototyping & Spiral
 - c) Prototyping & RAD
 - d) Waterfall & Spiral
- 3) Quality Management is known as _____.
 - a) SQA
 - b) SQI
 - c) SQM
 - d) SQA and SQM
- 4) Which one is not a risk management activity?
 - a) Risk assessment
 - b) Risk generation
 - c) Risk control
 - d) None of the mentioned
- 5) What is a Functional Requirement?
 - a) specifies the tasks the program must complete
 - b) specifies the tasks the program should not complete
 - c) specifies the tasks the program must not work
 - d) All of the mentioned
- 6) A description of each function presented in the DFD is contained in a _____.
 - a) data flow
 - b) process specification
 - c) control specification
 - d) data store
- 7) The modification of the software to match changes in the ever changing environment, falls under which category of software maintenance?
 - a) Corrective
 - b) Adaptive
 - c) Perfective
 - d) Preventive

- 8) In which step of SDLC actual programming of software code is done?
- a) Development and Documentation
 - b) Maintenance and Evaluation
 - c) Design
 - d) Analysis

Q.2 Answer any four of the following. 08

- a) What is the purpose of DFD?
- b) Write any 2 benefits of prototyping.
- c) Write the steps of traditional approach to implementation.
- d) Write the different types of system maintenance.
- e) What do you mean by feasibility study?
- f) What are the different fact finding techniques?

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

- a) Write the design principles of output.
- b) Distinguish between System Analysis and System Design.
- c) Explain Black box testing.

Q.4 Answer any two of the following. 08

- a) What is Data Dictionary? Explain the various content of DD.
- b) What is Flowchart? State the principles of flowcharting.
- c) Draw an ER-Diagram for College Admission System.

Q.5 Answer any one of the following. 08

- a) What is Decision table? Explain its types with example.
- b) Draw a CLD and First Level DFD for Library System.

Set P

**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November - 2025
PHYSICS Paper-V
General Physics and Sound (22221304)**

Max. Marks: 40

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

08

- 1) Curl ($\text{grad } \phi$) = _____.
a) Maximum
b) 1
c) 0
d) minimum
- 2) The gradient of scalar function is _____ rate of change of function in space.
a) Minimum
b) maximum
c) slow
d) constant
- 3) In general, the motion of gyroscope consist of _____.
a) only Precession
b) Rotation & Precession
c) Rotation only
d) Rotation, Precession & Nutation
- 4) The critical velocity of disc of radius 30 cm rolling over a horizontal surface is _____.
a) 140 m/s
b) 1.40 m/s
c) 140 cm/s
d) 1400 cm/s
- 5) Bending moment of beam is directly proportional to _____.
a) Modulus of rigidity
b) radius of curvature
c) Young's modulus
d) Moment of inertia
- 6) If height of liquid in rotation viscometer is increased, the rotation torque will be _____.
a) decreased
b) increased
c) same
d) no affected
- 7) The viscosities of two liquids may be compared with the help of _____.
a) Searle's Viscometer
b) Ostwald's Viscometer
c) Rotation Viscometer
d) Rankin's Viscometer

- 8)** Decay of sound energy in hall is _____.
 a) Linear b) Exponential
 c) Constant d) Zero

Q.2 Answer any four of the following. 08

- What is Precession?
- What is cantilever?
- Define Bending moment.
- What are the applications of Oswald's viscometer?
- What is scalar triple product?
- State significance of curl.

Q.3 Attempt any two of the following. 08

- Explain vector triple product.
- Write a note on Gyroscope.
- What are factors affecting on acoustics?

Q.4 Answer any two of the following. 08

- Explain the Searl's viscometer method of determining the coefficient of viscosity.
- Explain Sabine's experimental work and obtain expression for reverberation time.
- A horizontal iron bar of length 2 m is fixed at one end and loaded at free end with a mass of 2 kg. What is the depression produced if the bar has depth and breadth each equal to 10^{-2} m?

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

- a) Obtain an expression for time period of Gyrostatic Pendulum.
- b) Define divergence of vector field and give physical significance of divergence of vector.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November - 2025
BIO-CHEMISTRY (Paper - I)
Biomolecules (22221306)**

Day & Date: Monday, 10-11-2025
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) Glycolipids does not contains _____.
 a) phosphoric acids b) glycol
 c) fatty acids d) oxalic acids
- 2) _____ is not a classified form of conjugated proteins.
 a) Lipoproteins b) Complete proteins
 c) Metalloproteins d) Glycoproteins
- 3) _____ is not a lipid.
 a) Protein b) fats
 c) oils d) waxes
- 4) Xylulose is the example of _____.
 a) pentose b) hexose
 c) triose d) tetrose
- 5) Ninhydrin test is positive for _____.
 a) triglycerides b) α -amino acids
 c) phospholipids d) reducing sugar
- 6) _____ is not a factor responsible for the denaturation of proteins.
 a) Charge b) pH change
 c) organic change d) Heat
- 7) Glycosidic bond is present in _____.
 a) glucose b) glyceraldehyde
 c) xylose d) sucrose
- 8) _____ is produced with the combination of apoenzyme and coenzyme.
 a) Holoenzyme b) prosthetic group
 c) enzyme substrate complex d) enzyme product complex

- Q.2 Answer the following (Any Four) 08**
- a) What are complex proteins?
 - b) Write the two functions of r-RNA.
 - c) Write biochemical role of pantothenic acid.
 - d) Write two chemical properties of amino acids.
 - e) Define enzymes.
 - f) Write the deficiency disorders of riboflavin.
- Q.3 Write short notes (Any Two) 08**
- a) Write note on derived lipids.
 - b) Write note on albumin & globulin.
 - c) Write structures of glucose, xylose, isomaltose and sucrose.
- Q.4 Answer the following (Any Two) 08**
- a) Write the reactions of monosaccharides.
 - b) Explain pl and ninhydrin reaction.
 - c) Write structure & functions of triglyceride.
- Q.5 Answer the following (Any One) 08**
- a) Write the structure, biochemical role and deficiency disorder of thiamine.
 - b) What are nucleic acids? Write distinction between DNA and RNA.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November – 2025**

PLANT PROTECTION (Paper - V)

Major Crops and Methods of Integrated Plant Protection (22221312)

Day & Date: Monday, 10-11-2025
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.
4) Use of log table and calculator is allowed.

Q.1 Multiple choice questions:

08

- 1) Jawar crop is taken in _____ season.
 - a) Rabbi
 - b) Kharip
 - c) Summer
 - d) None of these
- 2) Brinjal belongs to family _____.
 - a) Rosaceae
 - b) Leguminosae
 - c) Verbenaceae
 - d) Solanaceae
- 3) Botanical name of sugarcane is _____.
 - a) *Acacia anandifolia*
 - b) *A. Catechu*
 - c) *Seccharum obbicularum*
 - d) *Solanum nigrum*
- 4) Botanical name of rose is _____.
 - a) *Mimosa pudica*
 - b) *Rosa indica*
 - c) *Gladiolus sp.*
 - d) *Gossypium sp.*
- 5) Use of fertilizers _____ enhancing the fertility of soil.
 - a) Cow dung
 - b) Litter
 - c) Only stratus
 - d) Sulphur
- 6) _____ organism are used to control pathogenic diseases.
 - a) *Aspergillus niger*
 - b) *Trichoderma viridae*
 - c) *Fusarium oxysporum*
 - d) *Alternaria sp.*
- 7) Chemicals are used to control insect are known as _____.
 - a) Bactericides
 - b) Insecticides
 - c) Nematicides
 - d) Fungicides
- 8) Legal control of transfer disease or debris from one country place to another known as _____.
 - a) Resistance
 - b) Quarantine
 - c) Disease management
 - d) None of these

- Q.2 Answer the following. (Any Four) 08**
- a) Definition Biofertilizer.
 - b) What is Shaking?
 - c) What is crop bagging?
 - d) What is netting?
 - e) What is soil solarization?
 - f) Write on – nematicides.
- Q.3 Attempt the following. (Any Two) 08**
- a) Fungicides
 - b) Role of organic farming in agriculture
 - c) Resistant varieties
- Q.4 Answer the following. (Any Two) 08**
- a) Explain in brief biological control of insect pests.
 - b) Write on – bactericides.
 - c) What are physical barriers.
- Q.5 Answer the following. (Any One) 08**
- a) Give the crop identification, soil type, tillage, seed rate & spacing, intercultural operations, fertilizers, irrigation, yield & economic importance of Tur.
 - b) Give the crop identification, soil type, tillage, seed rate & spacing, intercultural operations, fertilizers, irrigation, yield & economic importance of Jawar.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November - 2025
PHYSICS (Paper - VI)
Electronic Devices and Applications (22221305)**

Day & Date: Tuesday, 11-11-2025
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.
4) Use of logarithmic table and calculator is allowed.

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

- 1) A positive voltage feedback circuit introduces _____ phase shift.
 - a) 0°
 - b) 90°
 - c) 180°
 - d) 270°
- 2) In Hartley oscillator, if the value of L is connected four times, the frequency of oscillation is _____.
 - a) Increased 2 times
 - b) Decreased 4 times
 - c) Increased 4 times
 - d) Decreased 2 times
- 3) In a P-channel FET, the charge carriers are _____.
 - a) Electrons
 - b) holes
 - c) Both electrons and holes
 - d) none of these
- 4) The device that exhibits negative resistance region is _____.
 - a) diac
 - b) triac
 - c) Transistor
 - d) UJT
- 5) In toggle mode of J-K flip-flop, both J and K inputs must be _____.
 - a) Low
 - b) high
 - c) compliment of each other
 - d) none of these
- 6) _____ is a circuit that can remain in either state indefinitely.
 - a) Counter
 - b) Flip-Flop
 - c) adder
 - d) subtrctor
- 7) An ideal voltage regulator has a voltage regulation of _____.
 - a) 1
 - b) 100
 - c) 50
 - d) 0
- 8) The part of CRT which is used to produce a focused beam is _____.
 - a) Electron gun
 - b) deflecting system
 - c) glass envelope
 - d) fluorescent screen

- Q.2 Answer any four the following. 08**
- a) What is transistor biasing?
 - b) Define intrinsic stand- off ratio.
 - c) What is Barkhausen criterion for oscillations?
 - d) If the d.c.output voltage of 400V with no load attached to power supply but decreases to 300 v at full load, find percentage voltage regulation.
 - e) Write uses of CRO.
 - f) Define differential amplifier.
- Q.3 Attempt any two of the following. 08**
- a) Explain how FET works as VVR.
 - b) Write a note on half adder.
 - c) Calculate the oscillation frequency for Hartley oscillator circuit. Given the circuit values: $L_1 = 750\mu H$, $L_2 = 750 \mu H$ $M = 75 \mu H$ and $C = 150_p F$.
- Q.4 Answer any two of the following. 08**
- a) Draw a circuit diagram of Phase shift oscillator and explain its working.
 - b) Explain the operation of transistor series voltage regulator with neat circuit diagram.
 - c) State and prove De Morgan's theorems.
- Q.5 Answer any one of the following. 08**
- a) Explain two- stage RC coupled transistor amplifier with advantage and disadvantage.
 - b) Give the principle, construction and working of CRT.

Seat No.	

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**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November – 2025
BIO-CHEMISTRY (Paper - II)
Biochemical Techniques (22221307)**

Day & Date: Wednesday, 12-11-2025
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) _____ is the data retrieval tool.

a) MGD	b) GDB
c) OMIM	d) NCBI
- 2) Detectors used in gas chromatography generally work on the principle of _____.

a) optical rotation	b) ionization
c) fluorescence	d) dissociation
- 3) In electrophoresis, DNA will migrate towards _____.

a) anode or negative electrode
b) anode or positive electrode
c) cathode or negative electrode
d) cathode or positive electrode
- 4) The molecules with _____ elute first during elution of gel filtration chromatography.

a) larger size	b) smaller size
c) negative charge	d) high affinity
- 5) Effect of the electrophoresis can be minimized by _____.

a) increasing buffer concentration of electrolyte
b) applying high voltage
c) passing more current
d) applying low voltage
- 6) Agarose gel electrophoresis is used for electrophoretic separation of _____.

a) nucleic acids	b) amino acids
c) fatty acids	d) Proteins
- 7) _____ is not a variant of BLAST.

a) BLASTX	b) BLASTP
c) TBLASTNX	d) BLASTN

- 8) Liberman Burchard test is used for detection of _____.
a) lipid b) cabohydrates
c) proteins d) cholesterol**

Q.2 Answer any four of the following. 08

- Define electrophoresis.
- What is transmittance and absorbance?
- What is blotting technique?
- How gel plates are prepared?
- What is database similarity searching?
- Define iodine number.

Q.3 Answer any two of the following. 08

- Write technique of agarose gel electrophoresis.
- Explain saponification value for lipids.
- Explain principle and technique of thin layer chromatography.

Q.4 Answer any two of the following. 08

- a) Write note on NCBI and GDB.
- b) Explain orcinol method for nucleic acids.
- c) Write important applications & advantages of high pressure liquid chromatography.

Q.5 Answer any one of the following. 08

- Define specific absorbance, Explain in detail for spectrophotometer.
- Explain southern and northern blotting technique.

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**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November – 2025
PLANT PROTECTION (Paper - VI)
Crop Diseases and Their Management (22221313)**

Day & Date: Wednesday, 12-11-2025
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

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

Q.1 Multiple choice questions.

08

- 1) The ability of pathogen to cause the disease is known as _____.
a) Pathogenesis b) Pathogenicity
c) Immunity d) Susceptibility
- 2) _____ Diseases spreads throughout entire plant body.
a) Localised b) Systemic
c) Epidemic d) Sporadic
- 3) A sooty or charcoal- like powdery mass is _____.
a) Rust b) Smut
c) Scab d) Blotch
- 4) _____ disease is classified on the basis of symptoms.
a) Infectious b) Non- infectious
c) Chlorosis d) None of these
- 5) Causal organism of Grain smut of jowar is _____.
a) *Sphacelotheca sorghi* b) *Xanthomonas citri*
c) MLOS d) *Hibiscus I*
- 6) *Phakospora pachyrrhiza* is causal organism of _____ host plant.
a) Groundnut b) Soybean
c) Okra d) Cucurbit
- 7) Keeping inoculated micro-organisms on suitable medium at particular temperature and time is process called as _____.
a) Isolation b) Infection
c) A&B d) Incubation
- 8) The entry of plants, plant parts and their products is conditioned, regulated and restricted at national and international levels through _____.
a) National Act b) International Act
c) Quarantine Act d) None of these

- Q.2 Answer the following. (Any Four) 08**
- a) Etiology.
 - b) Infection.
 - c) Diseases.
 - d) Write the causal organism of Rust of Soybean.
 - e) Mention any two symptoms of viral disease of okra plant.
 - f) Mention factors affecting to infection.
- Q.3 Write Short Notes (Any Two) 08**
- a) Methods of inoculation.
 - b) Control measures of Downy mildew of Graps.
 - c) Kotch's Postulates.
- Q.4 Answer the following. (Any Two) 08**
- a) Give an account on classification of plant diseases.
 - b) Write on Assessment of diseases in crop plant.
 - c) Describe the Little leaf of Brinjal.
- Q.5 Answer the following. (Any One) 08**
- a) Write the Principles of plant disease management.
 - b) Describe in details about Grain smut of jawar.

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**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November - 2025
STATISTICS (Paper – V)
Probability Distributions (22221308)**

Day & Date: Thursday, 13-11-2025
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) Use of Calculator is allowed.

Q.1 Choose the correct alternatives. 08

1) Let the joint probability mass function of two random variables X and Y be

$$P(x, y) = \frac{1}{25} (x^2 + y^2); x = 1, 2, y = 0, 1, 2$$

Then $P(X = 2, Y = 2)$ is _____.

a) $\frac{1}{25}$	b) $\frac{2}{25}$
c) $\frac{8}{25}$	d) $\frac{1}{4}$

2) If X and Y are independent random variables then _____.

a) $\text{Corr}(X, Y) > 0$	b) $\text{Corr}(X, Y) < 0$
c) $\text{Corr}(X, Y) = 0$	d) None of these

3) Which of the following is a continuous random variable?

- | |
|--|
| a) Blood group of a randomly chosen person |
| b) Gender of a newly born baby |
| c) Rainfall (in mm) at a particular place |
| d) Monthly attendance of a randomly chosen student |

4) If X is a continuous random variable with p.d.f. $f(x)$ then $E\left(\frac{1}{x}\right)$ is used to find _____

a) Arithmetic Mean	b) Geometric Mean
c) Harmonic Mean	d) None of these

5) If X is a continuous r.v., then $P(X \leq Q_1)$ is _____.

a) $\frac{3}{4}$	b) $\frac{1}{4}$
c) $\frac{1}{2}$	d) 1

- 6)** Joint p. d. f. of (X,Y) is
 $f(x,y) = 4xy$; $0 < x,y < 1$ then $P(0 < x < 0.5, 0 < y < 0.5)$ is _____
- | | |
|----------|----------|
| a) 0.625 | b) 0.125 |
| c) 0.25 | d) 0.50 |
- 7)** Which of the following is equal to $\text{Var}(3Y - 2X)$?
- | |
|---|
| a) $-12\text{Cov}(X,Y) + 9\text{Var}(Y) + 4\text{Var}(X)$ |
| b) $12\text{Cov}(X,Y) + 9\text{Var}(Y) - 4\text{Var}(X)$ |
| c) $-6\text{Cov}(X,Y) + 9\text{Var}(Y) + 4\text{Var}(X)$ |
| d) $6\text{Cov}(X,Y) + 9\text{Var}(Y) - 4\text{Var}(X)$ |
- 8)** The m.g.f. of the random variable X having p.d.f.
- $$f(x) = \begin{cases} x & ; 0 < x < 1 \\ 2-x & ; 1 < x < 2 \\ 0 & ; \text{otherswise} \end{cases}$$
- | | |
|------------------------------|------------------------------|
| a) $\frac{(e^t - 1)^2}{t^2}$ | b) $\frac{(e^t + 1)^2}{t^2}$ |
| c) $\frac{(e^t - 1)^2}{t}$ | d) $\frac{(e^t - 1)}{t}$ |

Q.2 Answer the following. (Any Four)

08

- Define marginal probability distribution of X , where X is discrete random variable.
- Define bivariate expectation in case of discrete bivariate random variables (X, Y)
- Define probability density function of a continuous random variable X .
- Define arithmetic mean of a continuous r.v. X .
- Define conditional variance of X given $Y = y$ in case of continuous random variables (X, Y) .
- Define covariance in case of continuous random variable (X, Y) .

Q.3 Write Short Notes. (Any Two)

08

- a)** Let X and Y be discrete random variable such that
 $P(X = 0) = \frac{1}{4}, P(X = 1) = \frac{3}{4}, P(Y = 1/X = 1) = \frac{3}{4}, P(Y = 0/X = 0) = \frac{7}{8}$
 Find $P(X = 0), P(Y = 1)$
- b)** Let X be a random variable with pdf
 $f(x) = \begin{cases} \frac{1}{6}; & -3 < x < 3 \\ 0; & \text{otherwise} \end{cases}$ then find the pdf of $Y = 2X^2 - 3$
- c)** Let X and Y have the joint probability density function
 $f(x, y) = \begin{cases} kxy; & 0 < x < 4, 1 < y < 5 \\ 0; & \text{otherwise} \end{cases}$
 Find:
 i) The value of k
 ii) Marginal density function of X and Y

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

- a) Let (X, Y) be two dimensional continuous random variables, State and prove addition theorem on expectation.
- b) Define moment generating function. Prove that m.g.f. of sum of two independent random variable is equal to product of their m.g.f.
- c) Let (X, Y) have the joint density function

$$f(x, y) = \begin{cases} 2e^{-x}e^{-2y} & ; \quad 0 < x < \infty, 0 < y < \infty \\ 0 & ; \quad \text{otherwise} \end{cases}$$
 Verify whether X and Y are independent.

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

- a) Let X and Y be two discrete random variables with joint probability distribution function

$$p(x, y) = \begin{cases} \frac{(x+1)(y+2)}{54} & ; \quad x = 0, 1, 2 ; y = 0, 1, 2 \\ 0 & ; \quad \text{otherwise} \end{cases}$$

What is $E[X/Y = 2]$?**OR**

- b) The joint probability density function of X and Y is given by

$$f(x, y) = \begin{cases} \frac{6}{7} \left(x^2 + \frac{xy}{2} \right) & ; \quad 0 < x < 1, 0 < y < 2 \\ 0 & ; \quad \text{otherwise} \end{cases}$$

Find :-

- Marginal density function of X
- Marginal density function of Y
- Conditional density function of Y given $X = x$
- Conditional expectation Y given $X = x$

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**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November – 2025
GEO-CHEMISTRY (Paper - I)
Introduction to Geochemistry (22221328)**

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

- General formula of alkenes is _____.
a) C_nH_{2n+2} b) C_nH_{2n}
c) C_nH_{2n-2} d) C_nH_{2n-1}
- The mathematical equation of Gibb's phase rule is _____.
a) $P + F = C + 2$ b) $P + F = C + 3$
c) $P + F = C$ d) $P = F$
- In ionic compounds the number of oppositely charged ions surrounded the central ion is called as _____.
a) co-ordination number b) covalent number
c) central number d) valence number
- In Tyndall effect, colloidal particles absorb _____ colours out of seven colours.
a) 6 b) 5
c) 4 d) 3
- Mineralogical phase rule is not valid in _____.
a) Open system b) Close system
c) Partially open system d) None of the above
- In a mixture of two miscible liquids are there, then number of phases are _____.
a) 1 b) 2
c) 3 d) 4
- In a compound C = 9.98%. H = 0.84%, Cl = 89.18%, then percentage of oxygen is _____.
a) 1.02% b) 11.82%
c) 10.16% d) 0%

- 8)** In sulphur system, all curve areas are _____.
 a) bivariant b) monovariant
 c) trivariant d) tetravariant

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

- What is coordination number?
- Define dispersed phase and dispersed medium.
- Write the molecular formula of butyne and ethane.
- Write the atomic weights of oxygen and carbon.
- Define component with example.
- Write structures of naphthalene and cyclopentane.

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

- Explain for clay minerals as colloids.
- State and explain Goldschmidt's mineralogical phase rule.
- An aliphatic alcohol contains 52.4 % carbon, 13.05% hydrogen. Determine its empirical formula.

Q.4 Answer the following (Any Two) 08

- Define true equilibrium, metastable equilibrium, polymorphism and transition temperature.
- Write note on the states of matter and the crystalline state
- Write homologues series of alkanes and alkenes up to 10 carbon atoms.

Q.5 Answer the following (Any One) 08

- Explain electrical and mechanical properties of colloids.
- Explain lattice energy of crystals and explain structure of cesium chloride with coordination number, unit cell and stoichiometry.

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Set **P**

**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November – 2025
ZOOLOGY (Paper – V)
Cell Biology (22221322)**

Day & Date: Friday, 14-11-2025
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.

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

- 1) In _____ cell the nucleus is of primitive nature, without nuclear membrane and nucleolus.

a) Prokaryotic	b) Eukaryotic
c) Algae	d) Protista
- 2) _____ is abundantly present in animal plasma membrane.

a) Sugars	b) Cholesterol
c) Galactolipids	d) Sulpholipids
- 3) In muscle contraction _____ has important role.

a) Lysosomes	b) Golgi apparatus
c) Smooth ER	d) Rough ER
- 4) Lysosomes contains _____ enzymes.

a) Synthesis	b) Transferases
c) Polymerase	d) Hydrolytic
- 5) _____ plays a role in the formation of acrosome during spermatogenesis.

a) Golgi Complex	b) Mitochondria
c) ER	d) Intermediate Filaments
- 6) In multicellular organisms _____ involved in providing mechanical strength to cells.

a) Microtubules	b) Intermediate Filaments
c) Microfilaments	d) Mitochondria
- 7) Histones are made up of _____.

a) Glycine	b) Lysine and Proline
c) Lysine and Arginine	d) Arginine and Asparagine
- 8) Ribosome biogenesis takes place in _____.

a) Plasma Membrane	b) Nuclear Envelope
c) Smooth ER	d) Nucleolus

- Q.2 Answer the following (Any Four) 08**
- a) Examples of prokaryotic cell
 - b) Antiport
 - c) Functions of Golgi apparatus
 - d) Microfilaments
 - e) Nucleolus
 - f) Significance of Meiosis
- Q.3 Write short notes (Any Two) 08**
- a) Ultrastructure of Eukaryotic Cell
 - b) Describe Fluid Mosaic model of Plasma Membrane.
 - c) Write structure and Functions of ER
- Q.4 Answer the following (Any Two) 08**
- a) Structure and functions of Microtubules.
 - b) Nucleosomes
 - c) Types of chromosomes
- Q.5 Answer the following (Any One) 08**
- a) Describe ultrastructure of Mitochondria and add a note on it's function
 - b) Define Cell cycle. Describe phases of Mitosis with neat labelled diagram.

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**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November - 2025
STATISTICS (Paper – VI)
Statistical Methods - I (22221309)**

Day & Date: Saturday, 15-11-2025
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 Choose the correct alternatives from the options.

08

- 1) The multiple correlation coefficient lies between _____.
a) -1 to 1 b) 0 to 1
c) $-\infty$ to ∞ d) 0 to ∞
- 2) A sample consist of _____.
a) all units of the population b) 50 % units of the population
c) 5 % units of the population d) any fraction of the population
- 3) In trivariate study the correlation between two variables when the third variable held constant is called as _____.
a) simple correlation b) partial correlation
c) multiple correlation d) multiple regression
- 4) Which one of the following rate is obtained for a segment of a population?
a) crude death rate b) standardised death rate
c) vital index d) specific death rate
- 5) The number of possible samples of size n from a population of N units by using SRSWOR is _____.
a) N^n b) $\binom{N}{n}$
c) $n!$ d) None of these
- 6) If $N.R.R. < 1$ then we interpret that _____.
a) increase in population b) reduction in population
c) constancy in population d) all the above
- 7) The residual $X_{1.23}$ is called as residual of order _____.
a) 0 b) 1
c) 2 d) 3

- 8) Simple random sample can be drawn with the help of _____.
 a) random number tables b) lottery method
 c) drawing chits d) all the above

Q.2 Answer the following (Any Four)

08

- Define CBR.
- Define population and sample.
- Write the plane of regression equation of X_1 on X_2 and X_3 .
- State-variance of sample mean in case of SRSWOR.
- Define A.S.F.R.
- Define residual.

Q.3 Write short notes (Any Two)

08

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

Q.4 Answer the following (Any Two)

08

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

Q.5 Answer the following (Any One)

08

- Derive the equation of the least square plane of regression equation of X_1 on X_2 and X_3 .
- With usual notations, prove that

$$var(\bar{y}_n)_{wor} = \frac{N - n}{Nn} S^2$$

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**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November - 2025
METEOROLOGY (Paper – II)
General Meteorology (22221327)**

Day & Date: Monday, 17-11-2025
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.

O.1 Multiple choice questions.

08

- 1) In the earth's atmosphere argon (Ar) content is about _____.
a) 78
b) 21
c) 1
d) 0.03
- 2) Which of the following is not the region of infrared (IR) radiations?
a) UV visible
b) near infrared
c) mid infrared
d) far infrared
- 3) The frame of reference associated with spinning body is _____.
a) unaccelerated
b) accelerated
c) stationary
d) stable
- 4) Two locations on the earth, separated by 20 meters, have a pressure difference of 400 millibar. The pressure gradient between them will be _____.
a) 0.05
b) 8000
c) 380
d) 20
- 5) Which of the following force is responsible for formation of cyclones?
a) Coriolis
b) Colombian
c) electromagnetic
d) electromotive
- 6) Output voltage of a photovoltaic cell is _____.
a) Direct Current (D.C.)
b) Alternating Current (A.C.)
c) Varying Current (V.C.)
d) Displacement Current
- 7) The man-made satellite which has been launched in orbit round the Earth is known as _____ satellite.
a) Natural
b) Artificial
c) Natural or Artificial
d) None of the above

- 8)** Man extracts energy from the nature in the form of _____.
 a) anergy b) Intermediate energy
 c) raw energy d) Secondary energy

Q.2 Answer the following (Any Four) 08

- What are properties of radiations?
- What are adverse effects of depletion of ozone in the stratosphere?
- What is a pseudo force?
- State Buys-Ballots law.
- A photovoltaic cell has open circuit voltage of 0.45 V and short circuit current of 0.1 A. Calculate ideal power of the cell.
- A force of 5 N displaces a body by 3 meters. Calculate the work done.

Q.3 Attempt the following (Any Two) 08

- Explain nature of radiations.
- What is pressure gradient force?
- What is a polar orbiting satellite?

Q.4 Answer the following (Any Two) 08

- Write short note on 'Tephigram.'
- Explain The Earth's rotational deflective force (Coriolis force).
- Describe various sciences and energy science.

Q.5 Answer the following (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.	

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**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November – 2025
GEO-CHEMISTRY (Paper - II)
Introduction to Solar System and Geo-Sphers (22221329)**

Day & Date: Monday, 17-11-2025
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.
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) Siderites consist essentially of _____.
a) Nickle - iron alloy b) Nickel-iron alloy and silicates
c) Silicates only d) Silicates and graphite
- 2) The chlorinate of the sea water is referred as:
a) Total amount in grams of chloride in 1 kg of sea water.
b) Total amount in grams of chloride and bromide in 1 kg of sea water
c) Total amount in grams of chloride, bromide and iodine in 1 kg of sea water
d) Total amount in grams of chloride and carbonates in 1 kg of sea water.
- 3) The mantle consists mainly of _____.
a) Granitic rocks b) Basaltic rocks
c) Ultramafic rocks d) Gabbroic rocks
- 4) The concentration of CO₂ in the atmosphere is gradually increasing due to burning of _____.
a) coal, b) Petroleum,
c) fossil fuel, d) all of these
- 5) Chondrites are consisting primarily of:
a) Olivine only b) Pyroxene only
c) Olivine and/or pyroxene d) Iron and Nickle
- 6) Which of the following contains roughly 80% of the Earth's atmosphere?
a) Troposphere b) Stratosphere
c) Mesosphere d) Thermosphere
- 7) Elements which readily-form ions with an outermost 8-electron shell are:
a) Siderophile b) Chalcophile
c) Lithophile d) Atmosphere

- 8) In the primeval atmosphere, at the first stage of its evolution _____ was major constituent.
- a) CH₄
 - b) N₂
 - c) O₂
 - d) None of these

Q.2 Answer the following (Any Four) 08

- a) Who coined the concept of geochemical classification of the elements?
- b) Names the major constituents of Atmosphere.
- c) Name the geochemical elements which have the affinity towards sulphides.
- d) What is pyrolite?
- e) Names the major elements of cosmic abundance of elements.
- f) What is the composition of troilite?

Q.3 Write short notes (Any Two) 08

- a) Zonal structure of the earth.
- b) Composition of variable constituents of Atmosphere.
- c) Cosmic abundance of elements.

Q.4 Answer the following (Any Two) 08

- a) Describe in brief gains and losses of elements in the oceanic water.
- b) Explain the primary differentiation of elements.
- c) Discuss the structure and composition of lower mantle?

Q.5 Answer the following (Any One) 08

- a) Explain in brief geochemical classification of the elements.
- b) Define meteorite. Explain in detail the different types of Meteorites.

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**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November – 2025
ZOOLOGY (Paper – VI)
Principles of Ecology (22221323)**

Day & Date: Monday, 17-11-2025
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**

- The ratio of number of birth to the size of population is called as _____.
 - Mortality
 - Fecundity
 - Natality
 - Specificity
- Variations in the ecosystem within the specific geographical region is known as _____.
 - genetic diversity
 - species diversity
 - ecosystem diversity
 - clade diversity
- The primary succession, developing in an aquatic environment such as ponds and lakes is known as _____.
 - community
 - hydrarch
 - ecosystem hot spots
 - marine zones
- _____ is considered an abiotic factor since it is mostly made up of small particles of rock mixed with decomposed organic matter and provide nutrients to plants.
 - carbon
 - Light
 - water
 - Soil
- A _____ ecosystem is a freshwater ecosystem with consistently flowing water that moves downhill, such as in rivers, streams.
 - lotic
 - Lentic
 - destrict
 - tropical forest
- _____ is a type of ecological relationship between two organisms where one organism benefits from the association without affecting the other.
 - Mutualism
 - Commensalism
 - Parasitism
 - antagonism
- Which of the following in pond ecosystem occupy in the producer level.
 - Hydrilla
 - Snail
 - Fish
 - fish hawk

- 8) _____ is relationship between two different organisms of different species in which one organism gets benefits & other gets harmed or sometimes killed.
- a) Morphism
 - b) Commensalism
 - c) Mutualism
 - d) Parasitism

Q.2 Answer the following (Any Four) 08

- a) Define Mortality in population.
- b) Write on intraspecific association 'Groupism'.
- c) Write on scope of ecology.
- d) Define Biodiversity.
- e) Define 'Community'.
- f) Define Food chain.

Q.3 Attempt the following (Any Two) 08

- a) Discuss ecological pyramid of energy.
- b) Describe Life Table in population ecology.
- c) Write interspecific association Mutualism with one example.

Q.4 Answer the following (Any Two) 08

- a) Write on desert ecosystem.
- b) Write on importance of biodiversity and reasons to loss of biodiversity.
- c) Write on Genetic diversity.

Q.5 Answer the following (Any One) 08

- a) Explain in detail effect of abiotic factors Temperature and Light on animals life.
- b) Describe in detail grassland ecosystem.

Set	P

**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November – 2025
MATHEMATICS (Paper – V)
Differential Calculus (22221316)**

Day & Date: Tuesday, 18-11-2025
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 Select the correct alternatives from the options.

08

- Polar subtangent for the curve $\frac{l}{r} = 1 + e \cos \theta$ is _____.
a) $\frac{l}{e} \cos \theta$
b) $\frac{l}{e} \sin \theta$
c) $\frac{e \cos \theta}{l}$
d) $\frac{e \sin \theta}{l}$
- Which of the following formula is incorrect?
a) $\frac{dx}{ds} = \sin \psi$
b) $\frac{dy}{ds} = \sin \psi$
c) $\frac{dx}{ds} = \cos \psi$
d) $\frac{dy}{ds} = \tan \psi$
- Radius of curvature $\sqrt{x} + \sqrt{y} = 1$ at $(\frac{1}{4}, \frac{1}{4})$ is _____.
a) $\frac{1}{2}$
b) $\frac{1}{\sqrt{2}}$
c) $\sqrt{2}$
d) 2
- The polar tangential formula for the radius of curvature is _____.
a) $\rho = p + (\frac{dp}{d\psi})^2$
b) $\rho = p^2 + (\frac{d^2p}{d\psi^2})$
c) $\rho = p + \frac{d^2p}{d\psi^2}$
d) $\rho = p^2 + (\frac{dp}{d\psi})^2$
- If u, v are function of x, y then jacobian of u, v with respect to x, y is a determinant of order _____.
a) 4
b) 3
c) 2
d) n
- If $u = x + y - a - b; v = ab - bx - ay$ then $\frac{\partial(uv)}{\partial(xy)} =$ _____.
a) $a - b$
b) $b - a$
c) $\frac{1}{a-b}$
d) $\frac{1}{b-a}$

- 7)** A function $f(x, y)$ has an extreme value at (a, b) then _____.
 a) $AC - B^2 > 0$ b) $AC - B^2 < 0$
 c) $AC - B^2 = 0$ d) All of above
- 8)** The maximum value of $\sin x + \cos x$ is _____.
 a) 2 b) $\sqrt{2}$
 c) 1 d) -1

Q.2 Answer the following. (Any Four)

08

- Find equation of tangent at (a, a) to the curve $x^2y^3 = a^5$.
- Find radius of curvature at any point $s = c \log \sec \psi$.
- If $u = x^2 - y^2$ and $v = xy$ then find $\frac{\partial(u,v)}{\partial(x,y)}$.
- If $u = \frac{x+y}{1-xy}$ and $v = \tan^{-1}x + \tan^{-1}y$ find $\frac{\partial(u,v)}{\partial(x,y)}$.
- Investigate the maximum and minimum value of function $f(x) = 2x^3 - 15x^2 + 36x + 10$
- Write formula for length of subtangent and length of subnormal.

Q.3 Attempt the following. (Any Two)

08

- Show that the subnormal at any point of a parabola $y^2 = 4ax$ is constant length and subtangent varies as the abscissa of the point of contact.
- Find radius of curvature at any point on the curve $y = \cosh(x/c)$
- Show that maximum value of $\left(\frac{1}{x}\right)^x$ is $e^{1/e}$

Q.4 Attempt the following. (Any Two)

08

- a)** If $x = e^u \cos v$, $y = e^u \sin v$ then show that $\frac{\partial(xy)}{\partial(uv)} \times \frac{\partial(uv)}{\partial(xy)} = 1$
- b)** Find radius of curvature of cartesian equation of curve $y = f(x)$
- c)** Show that for the curve $r = ae^{b\theta^2}$, $\frac{\text{Polar Subnormal}}{\text{Polar Subtangent}} \propto \theta^2$

Q.5 Attempt the following. (Any One)

08

- a)** If u, v, w are function of three variable x, y, z having first order partial derivative exists and x, y, z are function of p, q, r having first order partial derivatives exists then show that $\frac{\partial(uvw)}{\partial(x,y,z)} \times \frac{\partial(x,y,z)}{\partial(p,q,r)} = \frac{\partial(uvw)}{\partial(p,q,r)}$
- b)** Explain Lagrange's method of undermined multipliers to determine extreme value of $u = f(x, y, z)$ subject to condition of $\phi(x, y, z) = 0$. Also find minimum value of $x^2 + y^2 + z^2$ when $x + y + z = 3a$.

Seat No.	

Set P

**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November – 2025
BOTANY (Paper – V)
Plant Anatomy (22221302)**

Day & Date: Wednesday, 19-11-2025
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 and labeled diagrams and give equations wherever necessary.

Q.1 Choose the correct alternatives. (MCQ)

08

- 1) The intercalary meristem is responsible for increase in _____.
a) Height of internode b) Width of internode
c) Both d) None of these
- 2) The Histogen theory was proposed by _____.
a) Hofmeister b) Nageli
c) Hanstein d) Schmidt
- 3) Anomalous Secondary growth is found in _____.
a) Annona b) Sunflower
c) Pinus d) *Dracaena*
- 4) _____ are lignified simple cells.
a) Tracheids b) Collenchyma
c) Sclereids d) Vessels
- 5) The scattered vascular bundles are found in _____ stem.
a) Monocotyledonous b) Dicotyledonous
c) Both d) None of these
- 6) Secondary cortex is derived from _____.
a) Protoderm b) Intercalary meristem
c) Procambium d) Phellogen
- 7) Sieve tubes are found in _____.
a) Meristem b) Phloem
c) Xylem d) Parenchyma
- 8) In square stem the mechanical tissues are present at _____.
a) Center b) Corners
c) Lateral side d) Apex

- Q.2 Answer the following (Any Four) 08**
- a) Write a short note on Tunica-corpus theory.
 - b) What are the functions of parenchyma?
 - c) Give the functions of vascular cambium.
 - d) Define Periderm.
 - e) Define Lenticel.
 - f) Give the functions of stomata.
- Q.3 Attempt the following (Any Two) 08**
- a) Give the Classification of meristem based on origin.
 - b) What are the components of xylem tissue.
 - c) Give the characteristic feature of palisade tissue.
- Q.4 Answer the following (Any Two) 08**
- a) Give the Structure and function of parenchyma.
 - b) Give the Internal structure of monocotyledonous stem.
 - c) Describe in brief the development, structure, and functions of periderm.
- Q.5 Answer the following (Any One) 08**
- a) Describe the anomalous secondary growth in Bignonia stem
 - b) Describe in brief the secretory tissue system.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November – 2025
MATHEMATICS (Paper - VI)
Laplace Transform (22221317)**

Day & Date: Thursday, 20-11-2025
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

- Instructions:** 1) All questions are compulsory.
2) Draw neat and labeled diagrams 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 Select the correct alternatives from the options. **08**

- 1) If $L\{F(t)\} = f(p)$ then $L\{t^2 F(t)\} = \underline{\hspace{2cm}}$.
- a) $(-1)^2 \frac{d}{dp} f(p)$ b) $(-1)^2 \frac{d^2}{dp^2} f(p)$
c) $\frac{d^3}{dp^3} f(p)$ d) $(-1)^3 \frac{d}{dp} f(p)$
- 2) $L\{\sin 4t\} = \underline{\hspace{2cm}}$.
- a) $\frac{4}{p^2+16}$ b) $\frac{4}{p^2+4}$
c) $\frac{p}{p^2+16}$ d) $\frac{p}{p^2+4}$
- 3) The final value theorem is $\underline{\hspace{2cm}}$.
- a) $\lim_{t \rightarrow 0} F(t) = \lim_{p \rightarrow \infty} PL\{F(t)\}$ b) $\lim_{t \rightarrow \infty} F(t) = \lim_{p \rightarrow 0} PL\{F(t)\}$
c) $\lim_{t \rightarrow 0} F(t) = \lim_{p \rightarrow 0} PL\{F(t)\}$ d) $\lim_{t \rightarrow \infty} F(t) = \lim_{p \rightarrow \infty} PL\{F(t)\}$
- 4) $1 * 1 * 1 * \dots * 1$ (n times) = $\underline{\hspace{2cm}}$.
- a) $\frac{t^{n+1}}{(n-1)!}$ b) $\frac{t^n}{(n-1)!}$
c) $\frac{t^{n-1}}{(n-1)!}$ d) $\frac{t^{n+1}}{(n+1)!}$
- 5) $L^{-1}\left\{\frac{1}{p^2-a^2}\right\} = \underline{\hspace{2cm}}$.
- a) $\frac{\sinh at}{2a}$ b) $\frac{\sinh at}{a}$
c) $\frac{\sin at}{a}$ d) $\cos at$

- 6)** $L^{-1}\left\{\frac{1}{p^4}\right\} = \underline{\hspace{2cm}}.$
- a) $\frac{t^2}{6}$ b) $\frac{t^4}{6}$
- c) $\frac{-t^3}{6}$ d) $\frac{t^3}{6}$
- 7)** If $y(x, t)$ is a function of x and t , then $L\left\{\frac{\partial y}{\partial t}\right\} = \underline{\hspace{2cm}}.$
- a) $p\bar{y}(x, p) - y(x, 0)$ b) $p\bar{y}(x, p) + y(x, 0)$
- c) $p\bar{y}(x, 0) - y(x, 0)$ d) $p\bar{y}(x, p) + \bar{y}(x, p)$
- 8)** If $L\{F(t)\} = f(p)$ then $L\{F''(t)\} = \underline{\hspace{2cm}}.$
- a) $PL\{F(t)\} - F(0)$
- b) $P^3L\{F(t)\} - P^2F(0) - PF'(0) - F''(0)$
- c) $P^2L\{F(t)\} - PF(0) - F'(0)$
- d) $P^2L\{F(t)\} + PF(0) - F'(0)$

Q.2 Answer the following. (Any Four)

08

- Find $L\{\sin t \cos t\}$
- Find $L\left\{\frac{e^{at}-1}{a}\right\}$
- Find $L^{-1}\left\{\frac{1}{p^2-6p+10}\right\}$
- Find $L^{-1}\left\{\frac{1}{p^{7/2}}\right\}$
- Solve $\frac{d^2y}{dt^2} + y = 0$ under the condition that $y = 1, \frac{dy}{dt} = 0$ when $t = 0$
- If $y(x, t)$ is a function of x and t then prove that $L\left\{\frac{\partial y}{\partial x}\right\} = \frac{d\bar{y}}{dx}$ where $L\{y(x, t)\} = \bar{y}(x, p)$

Q.3 Attempt the following. (Any Two)

08

- Solve $(D^2 - 2D + 2)y = 0$, $y = Dy = 1$, when $t = 0$
- Find $L^{-1} \left\{ \log \frac{p+3}{p+2} \right\}$
- If $L\{F(t)\} = f(p)$ and $G(t) = \begin{cases} F(t-a); & t > a \\ 0 & ; t < a \end{cases}$
Then prove that $L\{G(t)\} = e^{-ap} f(p)$

Q.4 Answer the following. (Any Two)

08

- Using convolution theorem find $L^{-1}\left\{\frac{1}{(p+1)(p-2)}\right\}$
- Find $L\{7e^{2t} + 9e^{-2t} + 5 \cos t + 7t^3 + 5 \sin 3t + 2\}$.
- Solve $y'' + y = \cos t$ with initial condition $y(0) = 0 = y'(0)$

Q.5 Answer the following. (Any One)

08

a) State and prove convolution theorem for inverse Laplace transform.

b) i) If $L\{F(t)\} = f(p)$ then prove that $L\{F(at)\} = \frac{1}{a}f\left(\frac{p}{a}\right)$

ii) Find $L\{e^{-t}(3 \sinh 2t - 5 \cosh 2t)\}$

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**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November – 2025
BOTANY (Paper – VI)
Plant Metabolism (22221303)**

Day & Date: Friday, 21-11-2025
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.
- 4) Use of logarithmic table and calculator is allowed.

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

- 1) The supply of inorganic elements from the soil to the plants is known as _____.
a) Nutrition
b) Mineral nutrition
c) Respiration
d) Osmosis
- 2) Lock and key hypothesis was proposed by _____.
a) Kuhen
b) Summer
c) Fischer
d) Koshland
- 3) _____ is the macro-element.
a) Fe
b) Mn
c) Zn
d) K
- 4) _____ is a fruit ripening hormone.
a) IAA
b) Ethylene
c) GA
d) CCC
- 5) The symbiotic Nitrogen fixing root nodule bacteria are _____.
a) *Rhizopus*
b) *Rhizobium*
c) *Rhizoctonia*
d) *Rhizoclonium*
- 6) The general formula of carbohydrate is _____.
a) $(CH_2O)_n$
b) $(C_4H_2O)_n$
c) $(C_6H_{10}O)_n$
d) $(C_2H_2O)_n COOH$
- 7) Enzymes are _____ in nature.
a) Carbohydrates
b) fats
c) Proteins
d) lipids
- 8) Sucrose is a _____.
a) Monosaccharide
b) disaccharide
c) Polysaccharide
d) triose sugar

- Q.2 Answer the following (Any Four) 08**
- a) Define Enzyme.
 - b) What is biological nitrogen fixation?
 - c) Define Microelements.
 - d) State any two roles of Manganese.
 - e) Define plant growth regulators.
 - f) Define Monosaccharides.
- Q.3 Attempt the following (Any Two) 08**
- a) Explain role of Nitrogen.
 - b) Write a note on physiological role of auxin.
 - c) State the properties of monosaccharides.
- Q.4 Answer the following (Any Two) 08**
- a) Write a note on Nitrogen Cycle.
 - b) State the properties of enzymes.
 - c) State the physiological role of Cytokinines.
- Q.5 Answer the following (Any One) 08**
- a) Explain in brief biological nitrogen fixation.
 - b) State the properties of disaccharides.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November - 2025
ELECTRONICS (Paper – V)
Electronic Circuits (22221318)**

Day & Date: Saturday, 22-11-2025
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) The ripple factor of centre tapped full wave rectifier is _____.
a) 0.483 b) 0.406
c) 0.812 d) 1.21
- 2) The basic purpose of Zener diode is _____.
a) rectify the AC voltage b) regulate output voltage
c) remove ripple d) control current
- 3) When transistor is used as an amplifier, it is operated in _____ region.
a) cut-off b) active
c) saturation d) none of these
- 4) _____ biasing circuit provides the best stabilization of operating point.
a) base resistor bias b) collector feedback bias
c) potential divider bias d) None of the above
- 5) Emitter follower circuit is also called as _____ amplifier.
a) common emitter b) common base
c) common source d) common collector
- 6) In case of CE amplifier the phase difference between input and output is _____.
a) 0° b) 270°
c) 90° d) 180°
- 7) Gain of the amplifier _____ with negative feedback.
a) decreases b) Increases
c) remain same d) none of these
- 8) In Hartley oscillator the _____ tapped tank circuit is used.
a) resistor b) transformer
c) inductor d) capacitor

- Q.2 Answer the following (Any Four) 08**
- a) Draw the circuit diagram of Zener as a voltage regulator
 - b) What is biasing? What are its types?
 - c) What is multistage amplifier? Why it is required?
 - d) What is mean by feedback? Give their types.
 - e) What is Barkhausen criterion for sustained oscillations?
- Q.3 Write short notes (Any Two) 08**
- a) Explain the working of bridge rectifier.
 - b) Explain the basic action of transistor as an amplifier.
 - c) Explain in brief the working of two stage DC coupled amplifier.
- Q.4 Answer the following (Any Two) 08**
- a) Derive the expression for gain of the amplifier with negative feedback.
 - b) Explain working of Wien bridge oscillator.
 - c) In a Colpitt's oscillator $C_1 = 200 \text{ pF}$ and $C_2 = 50 \text{ pF}$. Calculate the value of Inductance L for producing oscillations at 1 MHz
- Q.5 Answer the following (Any One) 08**
- a) Explain Phase shift oscillator. Determine frequency of oscillation
If $R = 1K\Omega$ and $C = 0.1\mu F$.
 - b) Explain Class-B push pull and complimentary symmetric amplifier.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November – 2025
GEOGRAPHY (Paper – V)
Climatology (22221324)**

Day & Date: Saturday, 22-11-2025
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 map stencil is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given bellows. 08

- 1) _____ is the scientific study of Earth's climate, which is typically defined as weather conditions averaged over a period of at least 30 years
 - a) Soil
 - b) Climatology
 - c) Geomorphology
 - d) Oceanography
- 2) A _____ is a perfect balance between incoming heat (insolation) absorbed by the earth and outgoing heat (terrestrial radiation) escaping it in the form of radiation.
 - a) Temperature
 - b) Heat Budget
 - c) Rainfall
 - d) Moist
- 3) Earth's atmosphere is primarily composed of Argon (Ar) approximately _____ of the atmosphere by volume.
 - a) 0.9%
 - b) 0.5%
 - c) 0.7%
 - d) 0.3%
- 4) The Köppen climate classification system, developed by Wladimir Köppen, categorizes global climates into _____ main types.
 - a) Three
 - b) Two
 - c) Five
 - d) Four
- 5) The word "climatology" is derived from the _____ words "klima" (meaning "slope" or "latitude") and "-logia" (meaning "study of" or "science of").
 - a) Roman
 - b) Indian
 - c) Latin
 - d) Greek
- 6) _____ are found in the upper levels of the atmosphere, near the tropopause.
 - a) Heat Budget
 - b) Insolation
 - c) Volcano
 - d) Jet streams

- 7) A _____ is a seasonal shift in wind patterns, often causing distinct wet and dry seasons, primarily associated with tropical regions and the Indian Ocean.
- a) Heat Budget
 - b) Insolation
 - c) Monsoon
 - d) Jet streams
- 8) _____ is the bottom layer of the atmosphere.
- a) Mesosphere
 - b) Stratospheres
 - c) Troposphere
 - d) Exosphere

Q.2 Answer the following (Any Four) 08

- a) State the elements of weather
- b) State the Koppen's climatic classification types
- c) Define the Planetary wind
- d) Define the Humidity
- e) Definition of Climatology
- f) Definition of monsoon

Q.3 Attempt the following (Any Two) 08

- a) Heat Budget.
- b) Precipitation.
- c) Composition of Atmosphere.

Q.4 Answer the following (Any Two) 08

- a) Describe the factors affecting on Insolation.
- b) Explain the temperature of inversion.
- c) Describe the forces affecting on winds.

Q.5 Answer the following (Any One) 08

- a) Explain the structure of Atmosphere.
- b) Explain Koppen's climatic classification in brief.

Seat No.	

Set P

**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November – 2025
GEOLOGY (Paper - V)
Mineralogy (22221310)**

Day & Date: Monday, 24-11-2025
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 diagrams wherever necessary.

Q.1 Multiple choice questions.

08

- 1) Which mineral shows twinkling property?
 - a) Orthoclase
 - b) Quartz
 - c) Olivine
 - d) Calcite
- 2) Chemical composition of crystallized quartz is _____.
 - a) SiO_2
 - b) CaCO_3
 - c) Fe_2O_3
 - d) None of these
- 3) Relief in minerals under microscope can be expressed as _____.
 - a) High
 - b) Moderate
 - c) Low
 - d) All of these
- 4) Agate is amorphous variety of _____.
 - a) Quartz
 - b) Mica
 - c) Olivine
 - d) Garnet
- 5) Which of the following mineral is isotropic in nature?
 - a) Garnet
 - b) Biotite
 - c) Muscovite
 - d) Olivine
- 6) Repeated twinning is shown by _____.
 - a) Orthoclase
 - b) Plagioclase
 - c) Microcline
 - d) Calcite
- 7) Which of the following is luster of Diamond?
 - a) Pearly
 - b) Adamantine
 - c) Silky
 - d) Vitreous
- 8) Augite mineral belongs to _____ group.
 - a) Pyroxene
 - b) Mica
 - c) Felspathoid
 - d) Amphibole

- Q.2 Answer the following (Any Four) 08**
- a) Give two names of Mica group minerals.
 - b) What is Mineral?
 - c) What is Isotropism?
 - d) Define Streak of Minerals.
 - e) Define Polarized light.
- Q.3 Write Short Notes on: (Any Two) 08**
- a) Pleochroism with example.
 - b) Physical and Chemical properties of Calcite.
 - c) Lower assembly of Petrological Microscope
- Q.4 Answer the following (Any Two) 08**
- a) Explain Optical properties of Olivine mineral.
 - b) Define luster. Describe any two types of lusters.
 - c) Draw diagrams of Crystallized, Crystalline, crypto-crystalline and Amorphous forms.
- Q.5 Answer the following (Any One) 08**
- a) Describe Physical properties, chemical composition, Occurrence of Orthoclase and Plagioclase minerals.
 - b) Describe Physical properties, chemical composition and optical properties of Hornblende mineral.

Seat No.	

Set P

**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November – 2025
MICROBIOLOGY (Paper – V)
Bacterial Cytology, Physiology and Metabolism (22221314)**

Day & Date: Monday, 24-11-2025
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 Multiple choice questions.

08

- 1) All cells divide at same time in _____ culture.
 - a) Continuous
 - b) Stationary
 - c) Synchrony
 - d) Diauxic
- 2) The energy content of high energy bond of ATP is _____ Kcal.
 - a) -7.5
 - b) -7.3
 - c) -4.7
 - d) -7.8
- 3) The heat resistant factor in bacterial endospore is _____.
 - a) Ca dipicolinate
 - b) DAP
 - c) Ribosome
 - d) Peptidoglycan
- 4) The magnetosomes contain chain of _____ particles.
 - a) Ferrite
 - b) Nitrite
 - c) Magnetite
 - d) Sulfite
- 5) The growth phase where the number of organisms increases exponentially is called the _____ phase.
 - a) Lag
 - b) Log
 - c) Stationary
 - d) Death
- 6) The transport which takes place against concentration gradient is called _____.
 - a) Passive transport
 - b) Active transport
 - c) Facilitated transport
 - d) Simple diffusion
- 7) Swelling of cell due to hypotonic solution is known as _____.
 - a) Plasmolysis
 - b) Shrinking
 - c) Bursting
 - d) Plasmolysis
- 8) The enzymes of _____ are responsible for breakdown of bonds.
 - a) Transferases
 - b) Oxidoreductases
 - c) Lyases
 - d) Ligases

- Q.2 Answer the following (Any Four) 08**
- a) Enlist components of electron transport chain.
 - b) Transferases.
 - c) Oligodynamic effect.
 - d) Examples of thermophiles.
 - e) Define: Chemotaxis.
 - f) Define: Facilitated diffusion.
- Q.3 Write short notes (Any Two) 08**
- a) Synchronous growth.
 - b) ED pathway.
 - c) Non-cyclic photophosphorylation.
- Q.4 Answer the following (Any Two) 08**
- a) Effect of pH on growth of Microorganism.
 - b) Describe the structure of flagella.
 - c) Write in detail about the effect of substrate concentration on enzyme activity.
- Q.5 Answer the following (Any One) 08**
- a) Describe sporulation process in bacteria.
 - b) Write an essay on classification of enzymes.as per IUB.

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

Day & Date: Tuesday, 25-11-2025
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.
- 4) Use of log table and calculator is allowed.

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

- 1)** 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
- 2)** _____ is called as squaring circuit.
a) Multivibrator b) Schmitt's trigger
c) Oscillator d) Amplifier
- 3)** Clamper circuit inserts _____ in ac.
a) ac b) cc
c) dc d) None of these
- 4)** Nonlinear wave shaping circuit gives wave shape to _____ wave
a) square b) triangular
c) sawtooth d) sine
- 5)** Period of oscillation of particular sweep with UJT depends upon _____.
a) supply voltage Vbb b) time constant
c) temperature d) all of these
- 6)** Terminal no 6 of IC 555 is _____.
a) threshold b) control
c) discharge d) trigger
- 7)** Differentiator is also called as _____ circuit.
a) Low pass b) high pass
c) band pass d) band stop
- 8)** If $t_{on} = 100 \text{ ms}$ and $T_{off} = 100 \text{ ms}$ then duty cycle is _____.
a) 5% b) 10%
c) 50% d) 100%

- Q.2 Answer the following (Any Four) 08**
- a) Draw the pin configuration with their names of IC 555
 - b) If $UTP = 1.7V$ and $LTP = 0.6V$ calculate hysteresis voltage.
 - c) List the general features of Time base signals.
 - d) What is the condition of good integrator?
 - e) Give formulae for on time and off time of switching transistor.
- Q.3 Write short notes (Any Two) 08**
- a) Diode as series positive and negative clipper.
 - b) Symmetrical triggering method of bistable multivibrator.
 - c) Construction and working of UJT as relaxation oscillator.
- Q.4 Answer the following (Any Two) 08**
- a) Explain astable multivibrator using gates.
 - b) Explain RC differentiator with input as sine and square wave.
 - c) Explain mono stable multi vibrator using IC 555 with formulae of gate width and wave forms.
- Q.5 Answer the following (Any One) 08**
- a) Explain construction and working of Schmitts trigger along with its hysteresis curve
 - b) Explain construction and working Miller integrator along with wave forms.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November – 2025
GEOGRAPHY (Paper – I)
Geography of India (22221325)**

Day & Date: Tuesday, 25-11-2025
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

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

Q.1 Choose and write a correct from given four alternatives.**08**

- 1) _____ states of India has the longest sea coast.
a) Arunachal Pradesh b) Tamil Nadu
c) Gujarat d) Maharashtra
- 2) _____ state of India Guru Shikhar peak is located
a) Arunachal Pradesh b) Rajasthan
c) Gujarat d) Maharashtra
- 3) _____ soil is related to the term of Regur.
a) Laterite Soil b) Black Cotton Soil
c) Red Soil d) Deltaic Alluvial Soil
- 4) In Indian _____ state has highest density of population
a) Arunachal Pradesh b) Rajasthan
c) Bihar d) Maharashtra
- 5) In Orissa, Iron ores is located in _____ district.
a) Mayurbhanj b) Chandrapur
c) Koraput d) Bhubaneswar
- 6) Minerals are _____ types of resources
a) Natural b) Inexhaustible
c) Exhaustible natural d) Artificial
- 7) Petroleum is found under the _____.
a) Sedimentary rocks b) Water
c) Sand d) Coke
- 8) _____ is the following crops is an example of rabbi crops.
a) Bajara b) Cotton
c) Rice d) Wheat

- Q.2 Answer the following (Any Four) 08**
- a) Define the concept of Soil
 - b) Define the concept of religion
 - c) Define the concept mineral resources
 - d) Define the concept of Tribe
 - e) Define the concept of age and sex composition
- Q.3 Write short notes (Any Two) 08**
- a) Sugarcane distribution in India
 - b) Industrial development
 - c) Growth of population in India
- Q.4 Answer the following (Any Two) 08**
- a) Explain the distribution of population of India on the basis of religion
 - b) Explain the Coal production of India
 - c) Explain the types of Soil in India
- Q.5 Answer the following (Any One) 08**
- a) Explain the Physiographic division of India
 - b) Explain the types of Natural vegetation

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Set P

**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November – 2025
GEOLOGY (Paper – VI)
Igneous Petrology (22221311)**

Day & Date: Wednesday, 26-11-2025
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

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

Q.1 Multiple choice questions.

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) subhedral
 - d) None of these
- 8) The first product of continuous reaction relation in magma is _____.
 - a) Olivine
 - b) Pyroxene
 - c) plagioclase
 - d) quartz

- Q.2 Answer the following (Any Four) 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 short notes (Any Two) 08**
- a) Describe the sill and laccoliths.
 - b) Describe hypabyssal igneous rock.
 - c) Describe the glass and crystals.
- Q.4 Answer the following (Any Two) 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 the following (Any One) 08**
- a) Describe structures of igneous rock.
 - b) Describe the assimilation process in magma.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - III) (New) (CBCS) Examination:
October/November – 2025
MICROBIOLOGY (Paper – VI)
Fundamentals of Bacterial Genetics (22221315)**

Day & Date: Wednesday, 26-11-2025
Time: 09:00 AM To 11:00 AM

Max. Marks: 40

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

Q.1 Rewrite the following sentences by selecting correct answer from given alternatives. 08

- 1) DNA repair system working in presence of light is called _____.
 a) Dark repair mechanism b) Sun repair
 c) Enzymatic repair d) Photoreactivation
- 2) Meselson and Stahl's experiment proved the _____ mode of DNA replication.
 a) Conservative b) Semiconservative
 c) Nonconservative d) Continuous
- 3) Genetic code is _____ in nature.
 a) Triplet b) Singlet
 c) Doublet d) Pentagon
- 4) Thymine-Thymine dimer is produced after exposing cell to _____.
 a) Alkylating agents b) Nitrous acid
 c) U.V. rays d) Acridine dyes
- 5) _____ are extrachromosomal genetic material of cell _____.
 a) Genes b) Plasmids
 c) Exons d) Genome
- 6) DNA polymerase is an important enzyme required for DNA _____.
 a) Replication b) Transfer
 c) Breakdown d) Joining
- 7) _____ developed replica plate technique.
 a) Lederberg and Tatum
 b) Griffith
 c) E. Lederberg and J. Lederberg
 d) Hershy and Chase

8) Polypeptide chain synthesis from mRNA molecule is called ____.

- a) Transcription
b) Transfection
c) Transduction
d) Translation

Q.2 Answer the following (Any Four)

08

- What is silent mutation?
- What is Genotype?
- What is Transcription?
- What is function of 'R' plasmids?
- What is induced mutation?
- What are the base analogues?

Q.3 Attempt the following (Any Two)

08

- a) Genetic code.
- b) Properties of plasmids.
- c) Replica plate technique.

Q.4 Answer the following (Any Two)

08

- Describe Dark repair mechanism.
- Give the mechanism of DNA replication.
- Describe Griffith experiment.

Q.5 Answer the following (Any One)

08

- Describe in detail structure and forms of DNA.
- Describe in detail mutations caused by mutagenic agents.

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**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November – 2025
CHEMISTRY (Paper – VII)
Physical Chemistry (22221444)**

Day & Date: Monday, 03-11-2025
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.
(At. Wt. H=1, C=12, O=16, N=14, Na=23, Ag=108, Cl=35.5)

Q.1 Choose the most correct alternative of the following and rewrite the sentences. **08**

- 1) If the transport number of anion is 0.50, then T. N. of cation is _____.
a) 0.50
b) 0.25
c) 1.25
d) 1.75
- 2) The equation, $K = \frac{c_1}{\sqrt{c_2}}$ indicates that the solute is _____ in the second solvent.
a) Normal
b) dissociated
c) associated
d) solvated
- 3) Which of the following solid is amorphous in nature?
a) Sugar
b) plastic
c) Diamond
d) ice
- 4) Which of the following is sparingly soluble salt?
a) BaSO_4
b) PbSO_4
c) AgCl
d) all of these
- 5) The _____ extraction is more efficient.
a) Single
b) double
c) Multiple
d) none of these
- 6) The entropy of perfectly crystalline substance at absolute 0K is _____.
a) Infinite
b) Zero
c) non-zero
d) all of these
- 7) The sum of the transport numbers of cation and anion must be _____.
a) One
b) Two
c) Zero
d) Fractional

8) Which of the following is completely soluble salt?

- a) BaSO_4
- b) PbSO_4
- c) AgCl
- d) NaCl

Q.2 Answer the following. (Any Four)

08

- a) Define Weiss and Miller indices.
- b) State Kohlrausch law.
- c) How is entropy change determined in fusion of solid?
- d) State third law of thermodynamics.
- e) Define the terms:
 - a) Specific conductance
 - b) Equivalent conductance
- d) Explain the terms:
 - a) Plane of symmetry.
 - b) Axis of symmetry.

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

08

- a) Discuss the various factors that influence the transport number.
- b) Write note on theory of extraction
- c) Define entropy. Give its the physical significance.

Q.4 Answer the following. (Any Two)

08

- a) State and explain Nernst distribution law. What are its limitations?
- b) Obtain the entropy change in mixing of gases.
- c) Give different applications of Kohlrausch law. How it may be applied to determine the ionic product of water.

Q.5 Answer the following. (Any One)

08

- a) Describe moving boundary method to determine the transport number of ion.
- b) Give a full account of crystal structure of NaCl on the basis of Bragg's equation.

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**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November – 2025
COMPUTER SCIENCE (Paper - VII)
Core Java (22221429)**

Day & Date: Monday, 03-11-2025
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)** Which keyword is used to import a package from the Java API library?
a) Import b) package
c) getlib d) lib
- 2)** When does method overloading is determined?
a) At run time b) At compile time
c) At coding time d) At execution time
- 3)** Which of these are types of multitasking?
a) Process based b) Thread based
c) Process and Thread based d) None of these
- 4)** Which of these packages contain all the collection classes?
a) java.lang b) java.util
c) java.net d) java.aw
- 5)** _____ methods deletes all the elements from invoking collection.
a) Clear() b) Reset()
c) Delete() d) Refresh()
- 6)** Exception is found in which package in java.
a) java b) java.util
c) java.io d) java.lang
- 7)** Which method is used to find the length of a string in Java?
a) getSize () b) size ()
c) length () d) getLength ()
- 8)** Which of these method of FileReader class is used to read characters from a file?
a) Read () b) Scan f ()
c) Get () d) Get Integer ()

- Q.2 Answer the following. (Any Four) 08**
- a) Define constructor in Java.
 - b) Write Use of finally block.
 - c) What is final class?
 - d) What is abstract class?
 - e) What is Thread?
 - d) List out different data types in java.
- Q.3 Write short notes on the following. (Any Two) 08**
- a) What is Access specifier? Explain with example.
 - b) Write a program which can implement method of hashtable.
 - c) Explain structure of java program.
- Q.4 Answer the following. (Any Two) 08**
- a) Write a program which can implement multilevel inheritance.
 - b) Differentiate while and do while loop.
 - c) Explain different Thread methods.
- Q.5 Answer the following. (Any One) 08**
- a) Describe throw and throws with example.
 - b) Write a program which can implement multiple interface.

Seat No.	

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

Day & Date: Tuesday, 04-11-2025

Max. Marks: 40

Time: 12:00 PM To 02:00 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 log table and calculator is allowed.
 (At. Wt.: H=1, C=12, O=16, N=23, Cl=35.5)

Q.1 Choose the correct alternatives from given option.**08**

- 1) Titrand is _____.
 a) Substance being Titrated
 b) Known concentration of substance
 c) Both a and b
 d) none of these
- 2) The process of dispersing gel to form sol is called as _____.
 a) Precipitation
 b) Peptisation
 c) Coagulation
 d) Nucleation
- 3) BaSO_4 is example of _____ precipitate.
 a) Amorphous
 b) crystalline
 c) semicrystalline
 d) none of these
- 4) In Haber's Process good yield of ammonia is expected at _____.
 a) low Temperature and high Pressure
 b) high Temperature and high Pressure
 c) both a and b
 d) low Temperature and low Pressure
- 5) Bauxite ore is _____.
 a) FeCO_3
 b) $\text{Al}_2\text{O}_3, 2 \text{H}_2\text{O}$
 c) Fe_2O_3
 d) $\text{Al}(\text{OH})_3$
- 6) Roasting is _____ process.
 a) Oxidation
 b) Reduction
 c) both a and b
 d) none of these
- 7) Cast Iron contain _____ % of Carbon.
 a) 92%
 b) 2.5 to 5%
 c) 3 to 3.5%
 d) 5 to 6%

- 8)** Phenolphthalein in acid solution becomes _____.
a) colorless b) colour
c) pink colour d) none of these

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

- Write the structure of Phenolphthalein Indicator.
- Define the term Acidimetry and Alkalimetry.
- What is precipitate? Give the types of physical nature of precipitate.
- Write the chemical composition of mineral of Iron oxide.
- What is Flux?
- Define the term Catalyst. Name the catalyst and promoter in Haber's process.

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

- Distinguish between Calcination and Roasting.
- Role of organic precipitant in Gravimetric analysis.
- Gelatinous precipitate.

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

- What is Ostwald's acid base indicator theory for colour change interval?
- Explain the synthesis of sulphuric acid (H_2SO_4) by contact process.
- Write a short note on Froth floatation process.

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

- What is Neutralization curve? Explain the choice of an indicator for titration between weak acid and strong base with help of neutralization curve.
- What is the meaning of reduction of ore? Give different method of reduction. Discuss chemical reduction method.

Seat No.	

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**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November – 2025
COMPUTER SCIENCE (Paper – VIII)
DBMS Using Oracle (22221430)**

Day & Date: Tuesday, 04-11-2025
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 question.

08

- 1) DBMS helps achieve _____.
 a) Data independence b) Centralized control of data
 c) Neither (a) nor (b) d) Both (a) and (b)
- 2) Logical design of database is called _____.
 a) Database Instance b) Database Snapshot
 c) Database Schema d) All of the above
- 3) In _____, we have a strict parent-child relationship only.
 a) hierarchical databases b) network databases
 c) object-oriented databases d) relational databases
- 4) The _____ constraint can only be applied at column level.
 a) Foreign key b) Primary key
 c) Not null d) None of Above
- 5) Which of the following is used to denote the selection operation in relational algebra?
 a) Pi (Greek) b) Sigma (Greek)
 c) Lambda (Greek) d) Omega (Greek)
- 6) Which of the following keyword is used to call a standalone procedure?
 a) RUN b) START
 c) EXECUTE d) NONE OF THESE
- 7) Which of the following is the correct syntax for creating an explicit cursor?
 a) Cursor_ name IS column name;
 b) CURSOR cursor_name IS SELECT_statement;
 c) cursor_name CURSOR IS SELECT_statement;
 d) CURSOR cursor_name IS column_name;
- 8) If a schedule is equivalent to a serial schedule, it is called as a _____.
 a) Serializable schedule b) Equivalent schedule
 c) Committed schedule d) None of the mentioned

- Q.2 Answer the following. (Any Four) 08**
- a) What is a transaction?
 - b) What is meant by concurrency control?
 - c) Define the term: a) Tuple b) Domain
 - d) What is deadlock?
 - e) What is Normalization?
 - d) What is Schedule?
- Q.3 Write short notes on the following. (Any Two) 08**
- a) Differentiate between PL/SQL Function and Procedure.
 - b) Explain ACID properties of transaction.
 - c) Explain Aggregate function with example.
- Q.4 Answer the following. (Any Two) 08**
- a) Explain Generalization with example.
 - b) What is View? Write the steps to Create, Update and Drop view?
 - c) What is sub query? Explain its type with example
- Q.5 Answer the following. (Any One) 08**
- a) What is Join? Explain types of Join with example.
 - b) Explain timestamp based concurrency control protocol.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November – 2025
PHYSICS (Paper - VII)
Geometrical, Physical and Fiber Optics (22221405)**

Day & Date: Thursday, 06-11-2025
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 correct alternatives from the following.**08**

- 1) Michelson's interferometer used to determination of _____.
 a) wavelength of light b) refractive index
 c) thickness of thin film d) all A, B and C
- 2) Plane of polarization and plane of vibrations are mutually _____.
 a) parallel b) perpendicular
 c) antiparallel d) inclined at 45°
- 3) The basic principle of optical fibre is _____.
 a) refraction b) reflection
 c) total internal reflection d) diffraction
- 4) For negative doubly refracting crystals _____.
 a) $VE > V_0$ b) $VE < V_0$
 c) $VE = V_0$ d) $VE = V_0 = 0$
- 5) Optical fibers are better use in _____.
 a) radar system b) electrical wiring
 c) communication system d) computer system
- 6) Newton's formula for an optical system is _____.
 a) $x_1/x_2 = f_1 f_2$ b) $f_1/f_2 = x_1/x_2$
 c) $x_1 x_2 = f_1/f_2$ d) $x_1 x_2 = f_1 f_2$
- 7) Lagrange's law for magnification is given by _____.
 a) $\mu_1 h_1 \tan \theta_1 = \mu_2 h_2 \tan \theta_2$ b) $\mu_1 h_1 \sin \theta_1 = \mu_2 h_2 \sin \theta_2$
 c) $\mu_1 h_1 \tan \theta_1 = \mu_2 h_2 \sin \theta_2$ d) $\mu_1 h_1 \tan \theta_2 = \mu_2 h_2 \sin \theta_1$
- 8) If the wave length difference is $0.5 \text{ \AA}$ and have mean wave length $5000 \text{ \AA}$ then R.P. of an optical instrument is _____.
 a) 100 b) 500
 c) 1000 d) 10000

- Q.2 Answer the following. (Any Four) 08**
- a) What is double refraction of light in crystal?
 - b) What are the two main types of optical fibers?
 - c) Define resolving power of grating and prism.
 - d) Define lateral and angular magnification of an optical system.
 - e) State any two applications of Michelson's interferometer.
 - f) Define specific rotation of optical active substance.
- Q.3 Answer the following. (Any Two) 08**
- a) Write down the construction of Michelson's interferometer with neat ray diagram.
 - b) Distinguish between spectral resolution and geometrical resolution.
 - c) Explain construction and principle of optical fiber.
- Q.4 Attempt the following: (Any Two) 08**
- a) What is diffraction? Explain the construction of Fresnel's half period zone.
 - b) Describe construction and working of F-P interferometer with neat diagram.
 - c) The sodium D lines of mean wavelength $5893\text{\AA}$ is a doublet having wavelengths $\lambda_1 = 5890\text{\AA}$ and $\lambda_2 = 5896\text{\AA}$. Find the minimum number of lines necessary for a grating to resolve this doublet in the first order.
- Q.5 Answer the following. (Any One) 08**
- a) What is Polarization? Describe construction and working of Nicol's prism with neat ray diagram.
 - b) Explain graphical construction of image of lens system and obtain Newton's formula.

Set P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November – 2025
BIO-CHEMISTRY (Paper - III)
Nutrition and Metabolism (22221408)**

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

- Enzymes for oxidation are present in _____.
 - Nucleus
 - cytosol
 - Mitochondria
 - golgi apparatus
- One mole of ATP on hydrolysis gives _____ kcal energy.
 - 3.8
 - 8.3
 - 3.7
 - 7.3
- Name of pyrimidine base which is found in RNA is _____.
 - thymine
 - uracil
 - adenine
 - guanine
- Decarboxylation of amino acids requires _____ cofactor.
 - NAD
 - FAD
 - PLP
 - lipolic acid
- Body regulates acid base balance by maintaining its blood pH _____.
 - 6.4
 - 7.4
 - 8.4
 - 9.4
- During which condition, beta oxidation is stimulated?
 - Well fed condition
 - Starvation
 - Both
 - None of the above
- _____ acid is a starting substrate for tricarboxylic acid cycle reaction.
 - acetic
 - citric
 - oxalic
 - pyruvic
- Transamination reaction involves transfer of amino group from amino acid to _____ acid.
 - δ - keto
 - β - keto
 - α - keto
 - γ - keto

- Q.2 Answer any four of the following. 08**
- a) Define deamination.
 - b) What is respiratory quotient?
 - c) What do you mean by lipid metabolism?
 - d) What are Sources of the atoms in the pyrimidine?
 - e) What is Glycolysis?
 - d) What is Mitochondrial respiration?
- Q.3 Write short notes on any two of the following. 08**
- a) Write note on ethanol fermentation.
 - b) Explain biosynthesis of palmitic acid.
 - c) Write note on exergonic reactions.
- Q.4 Answer any two of the following. 08**
- a) Write note on Urea cycle.
 - b) Explain chemiosmotic coupling hypothesis.
 - c) Write note on fate of pyruvate.
- Q.5 Answer any one of the following 08**
- a) Write note on biosynthesis and degradation of pyrimidines.
 - b) Write note on mechanism of electrolyte balance and acid base balance in body.

Set	P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November – 2025
PLANT PROTECTION (Paper – VII)
Introduction to Weeds Non Insect pests (22221417)**

Max. Marks: 40

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

08

- 1) Crop quality reduced due to increase of _____.
a) Litters b) Minerals
c) Fertilizers d) Weeds
- 2) *Cynadon dactylon* is a _____ Weed.
a) Manocot b) Dicot
c) Poisonous d) Sticky
- 3) Aghada is a vernacular name of _____.
a) *Portulaca oleracec* b) *Acacia catecha*
c) *Amaranthus spinosus* d) *Parathenium hystenpoms*
- 4) _____ is a dicot weed.
a) *Cyperus rotunous* b) *Cynadon dactylon*
c) *Parathenium hystenpoms* d) None of these
- 5) Field sanitation means _____.
a) Keeping the field clean by removing weeds.
b) Spraying of detergents on weeds.
c) Spraying of perfumes on weeds.
d) Spraying of insecticides on weeds.
- 6) Weedicides are used to control _____.
a) Crop plant growth b) Unwanted plant growth
c) Tall plant growth d) None of these.
- 7) Mites control made by dusting of _____.
a) Sodium powder b) BHC Powder
c) Boron powder d) Chlorine powder
- 8) Nylon nets are used to protect fruits of _____.
a) Neem b) *Xanthium*
c) Pomegranates d) Citrus

- Q.2 Answer any four of the following. 08**
- a) Define Weeds.
 - b) What are poisonous weeds?
 - c) What is biological control.
 - d) What are snails?
 - e) What are nematodes?
- Q.3 Write short notes on any two of the following. 08**
- a) Perennial Weeds.
 - b) Ploughing.
 - c) Write on nature of damage & management caused by birds.
- Q.4 Answer any two of the following. 08**
- a) Give the losses caused by weeds.
 - b) Give the classification of weeds based on crop association.
 - c) Give the properties, mode of action and use of 2,4-D
- Q.5 Answer any one of the following 08**
- a) Give the gross morphology, reproduction, ecology, dispersal & management of *parthenium hysterophorus*.
 - b) Give the properties , mode of action , formulations & use Mira->1

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**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November - 2025
PHYSICS (Paper - VIII)
Modern Physics (22221406)**

Max. Marks: 40

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

08

- 1) Mass energy equivalence is expressed as _____.
a) $E = mc$
b) $E^2 = mc^2$
c) $E = mc^2$
d) $E = m^2c$
- 2) The special theory of relativity was developed by _____.
a) Lorentz
b) Newton
c) Galileo
d) Einstein
- 3) A mass of 100 gm is moving with a velocity of 10 m/s. The De-Broglie wavelength is given by _____ ($h = 6.62 \times 10^{-34}$ Js)
a) 66.62×10^{-34} m
b) 6.62×10^{-34} m
c) 13.24×10^{-34} m
d) 1.32×10^{-34} m
- 4) The theory of matter waves was proposed by _____.
a) Einstein
b) Compton
c) De-Broglie
d) Newton
- 5) In Compton scattering the wavelength of scattered radiation _____.
a) Increases
b) Decreases
c) Remains same
d) become zero
- 6) m_j can have _____ values, from $-j$ to $+j$ excluding zero
a) $2j+1$
b) $2j-1$
c) $j(j+1)$
d) $j+1$
- 7) Spin quantum number associated with single electron is _____.
a) Zero
b) One
c) one half
d) Two
- 8) What is charge on X-rays?
a) Positive & Negative
b) Positive
c) Negative
d) No Charge

- Q.2 Answer any four of the following. 08**
- a) Define inertial frame of reference.
 - b) Define group velocity and particle velocity.
 - c) Define Compton effect.
 - d) State any two properties of X-rays.
 - e) State Zeeman effect.
 - d) State Hund's rule.
- Q.3 Attempt any two of the following. 08**
- a) Obtain Bohr's quantum conditions on the basis of matter waves.
 - b) Describe in details principle, construction and working of Coolidge tube for the production X-rays.
 - c) Derive the expression for variation of length with velocity.
- Q.4 Answer any two of the following. 08**
- a) Derive the relation for De-Broglie wavelength.
 - b) Explain in detail on LS coupling and JJ coupling.
 - c) Discuss experimental arrangement to verify Compton effect.
- Q.5 Answer any one of the following 08**
- a) Explain various quantum numbers associated with vector atom model.
 - b) Derive the expression for variation of mass with velocity.

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**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November – 2025
BIO-CHEMISTRY (Paper - IV)
Molecular Biochemistry & Diseases (22221409)**

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

- 1) Insulin hormone is formed in _____.
a) liver
b) kidney
c) small intestine
d) pancreas
- 2) Which of the following is not a medium for transfer of HIV?
a) urine
b) genital secretions
c) breast milk
d) blood
- 3) pBR322 vector contains genes for resistance to antibiotics _____.
a) doxorubicin and rifampicin
b) penicillin and streptomycin
c) azithromycin and ciprofloxacin
d) ampicillin and tetracyclin
- 4) Insulin is a _____ hormone.
a) Polypeptide
b) tripeptide
c) dipeptide
d) mono peptide
- 5) Specific activity is the enzyme activity per _____ of protein.
a) kilogram
b) gram
c) microgram
d) milligram
- 6) For cleavage of DNA type II, endonuclease requires _____.
a) Fe^{2+}
b) Mg^{2+}
c) Ca^{2+}
d) Mn^{2+}
- 7) Immunity induced by vaccine is _____ type of immunity.
a) natural active
b) artificial active.
c) natural passive
d) artificial passive
- 8) In acute phase the body responses to HIV infection within _____.
a) 1 to 2 years
b) 1 to 2 weeks
c) 3 to 6 years
d) 3 to 6 weeks

- Q.2 Answer any four of the following. 08**
- a) What is phagocytosis?
 - b) Define retinopathy.
 - c) What is turnover number?
 - d) What is acquired immunity?
 - e) What are constitutive genes?
 - f) Write two applications of genetic engineering.
- Q.3 Write short notes on any two of the following. 08**
- a) Explain Gene cloning technique.
 - b) Write note on immunological abnormalities in AIDS.
 - c) Write note on irreversible and competitive enzyme inhibition.
- Q.4 Answer any two of the following. 08**
- a) Write derivation of Michaelis-Menten equation for single substrate.
 - b) Write structure of IgG. What is pinocytosis?
 - c) Explain transmission of HIV.
- Q.5 Answer any one of the following 08**
- a) What are metabolic effects of insulin? write mechanism of action of insulin.
 - b) Write note on constitutive & inducible genes.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November – 2025
PLANT PROTECTION (Paper – VIII)
Insect Pests and Their Management (22221418)**

Day & Date: Friday, 07-11-2025
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) The use of legislative restriction to control pests is called: _____.
 a) plant quarantine b) Plant law
 c) Plant enclosure d) Plant protection
- 2) _____ legs and _____ wings present in insect body.
 a) 3 pairs & 2 pairs b) 2pairs & 3 pairs
 c) 3 pairs & 3pairs d) 2 pairs& 2pairs
- 3) Developmental stage from birth to adult is called _____.
 a) Gametogenesis b) Metamorphosis
 c) Homogenises d) Evolution
- 4) Insect body divided into _____ parts.
 a) 3 b) 6
 c) 2 d) 4
- 5) 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
- 6) _____ is type of mouth part of insects.
 a) Head b) thorax
 c) Abdomen d) Mandible
- 7) _____ is an alternate host of pod borer.
 a) Cotton b) Castor
 c) Cowpea d) all of these
- 8) Rice belongs to the family _____.
 a) Gramineae b) Legumineae
 c) Musaceae d) Brasicaceae

- Q.2 Answer any four of the following. 08**
- a) Mention nature control measures of insect pest management.
 - b) Write the host plants of stem borer.
 - c) Mention two name of stored grain insect pest.
 - d) Write any two chemical pest control.
 - e) Write the life cycle phases of insect pest.
 - f) Draw a well labelled diagram of typical insect.
- Q.3 Write short notes on any two of the following. 08**
- a) Mark of identification.
 - b) Repellents.
 - c) Control measures of trips of rose plant.
- Q.4 Answer any two of the following. 08**
- a) Describe in details about pulse beetle.
 - b) Give an account on Woolly aphids of sugarcane
 - c) General characters of typical insect pest.
- Q.5 Answer any one of the following 08**
- a) Write the principles and control measures of insect pest control.
 - b) Give an account on classification of insect pest.

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2	1
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**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November – 2025
STATISTICS Paper-VII
Continuous Probability Distributions (22221411)**

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 Choose the correct alternatives from the options. 08

- 1) If $X \sim N(\mu, \sigma^2)$, then $P(\mu - \sigma < X < \mu + \sigma)$ is _____.
a) 0.9545 b) 0.6827
c) 0.9973 d) None of these.
- 2) If $X \sim U[2, 4]$ then $P(X = 2)$ is _____.
a) 0.5 b) 0.05
c) 0.3 d) 0
- 3) Which of the following distributions satisfies memory less property _____.
a) Gamma distribution b) Normal distribution
c) Exponential distribution d) None of these
- 4) If $X \sim t_n$ distribution then $E(X)$ is _____.
a) 0 b) n
c) 1 d) none of these
- 5) If X has chi-square variate with n d. f. then $E(X)$ is _____.
a) n b) 2n
c) 1 d) 2
- 6) If $t \sim t_n$ then distribution of t^2 is _____ distribution.
a) $F_{1,n}$ b) F_{n_1}, n_2
c) t_n d) None of these
- 7) Let the r. v. X have exponential distribution with parameter $\frac{1}{\theta}$, then $E(X)$ is _____.
a) θ^2 b) θ
c) $1/\theta$ d) $1/\theta^2$

- 8) If $X \sim N(0,1)$ and $Y \sim \chi_n^2$, X and Y are independent r.v. then distribution of $\frac{x}{\sqrt{Y/n}}$ is ____.
- a) Chi-square with n d. f. b) Student's T-distribution
c) F_{n_1}, n_2 d) None of these

Q.2 Answer any four of the following. 08

- a) Write definition of $\exp(\theta)$ distribution.
b) Write definition of beta distribution of first kind.
c) Write definition of Snedecor's F-distribution.
d) Write definition of $N(\mu, \sigma^2)$ distribution.
e) If $X \sim N(2, 4)$ then state mean and variance of X .

Q.3 Attempt any two of the following questions. 08

- a) Find mean of $U[a, b]$ distribution.
b) If $X \sim \beta_{II}(m, n)$, then find distribution of $\frac{1}{x}$.
c) Find mode of chi-square distribution with $nd.f.$

Q.4 Attempt any two of the following. 08

- a) Find C.D.F. of $\exp(\theta)$ distribution.
b) If $X \sim N(\mu, \sigma^2)$ then find distribution of $Y = aX + b$.
c) State and prove lack of memory property of exponential distribution.

Q.5 Attempt any one of the following 08

- a) If $X \sim G(\alpha, \lambda_1)$ and $Y \sim G(\alpha, \lambda_2)$ and X & Y are independent variates then find distribution of $\frac{x}{x+y}$.
b) Derive the pdf of chi-square distribution with $nd.f.$

Set P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November – 2025
GEO-CHEMISTRY (Paper - III) (22221441)
Principles of Geochemistry**

Day & Date: Saturday, 08-11-2025
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) The taste of acids is _____.
a) sour
b) sweet
c) tasteless
d) salty
- 2) Chemical equilibrium is _____ in nature.
a) static
b) dynamic
c) mechanic
d) electric
- 3) _____ are the most abundant organic-rich sedimentary rock.
a) Coals.
b) amines
c) alcohols
d) aldehydes
- 4) In irreversible reaction arrow used to show the reaction is _____.
a) $\rightleftharpoons$
b) $\rightarrow$
c) $\rightarrow$
d) $\leftrightarrow$
- 5) Petroleum is mixture of _____.
a) nitro group
b) amino group
c) hydro carbons
d) none of these
- 6) _____ is the strong base.
a) HNO_3
b) HCl
c) NaOH
d) H_2SO_4
- 7) At equilibrium, $\Delta G =$ _____.
a) one
b) two
c) zero
d) three
- 8) According to Arrhenius theory, base is a substance which gives _____ ion in water.
a) OH^-
b) H^-
c) H^+
d) Cl^-

Q.2 Answer any four of the following. 08

- a) State Le chatelier's rule.
- b) What is radioactive isotopes?
- c) Write two examples of igneous rocks.
- d) Write formula for naphthalene and cyclopropane.
- e) What is law of mass action?
- f) Define acids according to Bronsted-Lowry theory.

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

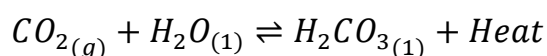
- a) Explain elements of geochemical thermodynamics.
- b) Explain hydrolysis of NH_4Cl and hydrolysis of Na_2CO_3
- c) Show that $\text{pH} + \text{pOH} = 14$

Q.4 Answer any two of the following. 08

- a) Define base by Arrhenius theory and write examples of strong acids and strong bases.
- b) Write note on isotope geochemistry.
- c) Write note on radiogenic isotopes.

Q.5 Answer any one of the following 08

- a) Explain the effect of temperature, pressure and concentration for the reaction-



- b) Write note on black shell and carbon compound as a reducing agent.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November – 2025
ZOOLOGY (Paper – VII) (22221432)
Fundamentals of Bio chemistry**

Day & Date: Saturday, 08-11-2025
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) _____ example of bioelements.

a) Carbon	b) Cobalt
c) Bromine	d) Aluminium
- 2) Which of the following is the simplest form of carbohydrates?

a) Carboxyl groups	b) Aldehyde and ketone groups
c) Alcohol and Carboxyl groups	d) Hydroxyl groups and hydrogen groups
- 3) Essential fatty acids are _____.

a) Linoleic acid	b) Arachidonic acid
c) Linolenic	d) All of these
- 4) The simplest amino acid is _____.

a) Tyrosine	b) Asparagine
c) Glycine	d) Alanine
- 5) Alpha helix and beta sheets is the common _____ structure of protein.

a) Primary	b) Secondary
c) Tertiary	d) Quaternary
- 6) Building blocks of nucleic acids are _____.

a) Nucleotides	b) Nucleosides
c) Amino acids	d) Histones
- 7) Which of the following vitamins help in blood clotting?

a) Vitamin A	b) Vitamin B
c) Vitamin C	d) Vitamin K
- 8) The nature of an enzyme is _____.

a) Lipid	b) Vitamin
c) Protein	d) Carbohydrates

- Q.2 Answer any four of the following. 08**
- a) Significance of CO₂.
 - b) Monosaccharides.
 - c) Purine and Pyrimidine bases.
 - d) mRNA.
 - e) Vitamin D.
- Q.3 Write short notes on any two of the following. 08**
- a) Explain properties of enzymes.
 - b) Biological significance of protein.
 - c) Describe classification of amino acids.
- Q.4 Answer any two of the following. 08**
- a) Describe r RNA and t RNA
 - b) Explain difference between saturated and unsaturated fatty acids.
 - c) Explain mechanism of enzyme action.
- Q.5 Answer any one of the following 08**
- a) Describe types of DNA and give significance of DNA
 - b) Explain classification of vitamins.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November – 2025
STATISTICS (Paper – VIII)
Statistical Methods - II (22221412)**

Day & Date: Monday, 10-11-2025
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 Choose the correct alternatives from the options.**08**

- 1) A critical region is a _____.
 - a) region of rejection for H_0
 - b) region of acceptance for H_0
 - c) region of rejection for either H_0 or H_1
 - d) none of these
- 2) Secular trend in time series is of nature _____.
 - a) increasing
 - b) decreasing
 - c) Stagnant
 - d) All the above
- 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 true leads to _____.
 - a) type-I error
 - b) type-II error
 - c) both type-I error & type-II error
 - d) none of the type of error.
- 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 proportions tested by using _____ test
 - a) t
 - b) Z – test
 - c) F – test
 - d) χ^2 – test

- 7)** A r. v. X is such that $E(X) = 3$ and $E(X^2) = 13$, then least value for $P(|X - 3| < 4)$ is ____.
- a) 0.25 b) 0.5
c) 0.35 d) 0.75
- 8)** Which of the following is not a small sample test?
- a) t – test b) χ^2 – test
c) F – test d) Z – test

Q.2 Answer any four of the following.

08

- Define simple and composite hypotheses.
- State components of time series.
- State Central Limit Theorem.
- Type-I and Type-II errors.
- A r. v. X is such that $E(X) = 4$ and $V(X) = 9$, then find upper bound for $P(|X - 4| < 6)$.

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

08

- Describe the moving average method.
- State the procedure to test equality of two normal populations when population variance is known.
- A symmetric dice is thrown 600 times. Find the lower bound for the probability of getting 80 to 120 sixes.

Q.4 Answer any two of the following.

08

- Describe the procedure of testing specified value of population correlation coefficient.
- Discuss the importance and utility of time series analysis in various fields.
- Suppose X is $\exp(1)$ r. v. then find least value for $P(|X - 1| < 2)$.

Q.5 Answer any one of the following

08

- State and prove central limit theorem.
- 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

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November – 2025
METEOROLOGY (Paper – IV)
Meteorological Instruments (22221439)**

Day & Date: Monday, 10-11-2025
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 log table and calculator is allowed

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

- 1) While measuring rainfall it is assumed that the
 - a) the rainfall is non-uniform over the given region or city.
 - b) the rainfall is uniform over the given region or city.
 - c) the rainfall is non-uniform over the observatory.
 - d) the rainfall is uniform over the observatory only.
- 2) _____ scale is commonly used for temperature measurements in school and college laboratories.
 - a) Centigrade
 - b) Fahrenheit
 - c) Rankin
 - d) absolute
- 3) Which of the following statement is correct?
 - a) atmospheric pressure is measured using radiometer
 - b) atmospheric pressure is measured using anemograph
 - c) atmospheric pressure is measured using barometer
 - d) atmospheric pressure is measured using hygrometer
- 4) Which of the following instrument is not portable?
 - a) hair hygrometer
 - b) thermometer
 - c) six's thermometer
 - d) Fortin's barometer
- 5) A flowing wave of air, moving hither and thither indefinitely is called as _____.
 - a) Climate
 - b) Atmosphere
 - c) Weather
 - d) Wind
- 6) In cup anemometer the cups rotate due to _____.
 - a) Torque
 - b) Force
 - c) temperature difference
 - d) wind difference
- 7) Heat stored in water vapor is _____.
 - a) Specific heat
 - b) Latent heat
 - c) Absolute heat
 - d) Relative heat

- 8) Which of the following devices can be used to detect radiant heat?
- a) Liquid thermometer
 - b) Six's maximum and minimum thermometer
 - c) Ether thermoscope
 - d) Constant volume air thermometer

Q.2 Answer any four of the following. 08

- a) The automatic siphon gauge experiences five tips during a three-hour rainfall. Calculate the total rainfall in millimeters.
- b) Calculate atmospheric pressure in mb if reading of Fortin's barometer is 29.9 inch. (Given: density of mercury= 13.6 g/cc)
- c) How is atmospheric pressure measured using Fortin's barometer?
- d) What is an anemometer?
- e) What are advantages of cup anemometer over Hooke's anemometer?
- f) What is humidity?

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

- a) Draw neat labelled diagram of mercury barometer.
- b) Write a short note on the air foil wind vane.
- c) Explain the construction and working of dry and wet bulb thermometers.

Q.4 Answer any two of the following. 08

- a) With neat diagram explain construction and working of float gauge.
- b) Draw neat, labelled diagram of Aneroid barometer.
- c) With neat diagram explain construction and working of Hooke's anemometer.

Q.5 Answer any one of the following 08

- a) With neat diagram explain construction and working of mercury thermometer.
- b) What is a thermocouple? Discuss variation of thermo e. m. f. in a thermocouple. For a Fe-Cu thermocouple, the inversion temperature is 480 °C. Calculate its neutral temperature.

Seat No.	

Set P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November – 2025
GEO-CHEMISTRY (Paper - IV)
Chemistry of the Earth (22221442)**

Day & Date: Monday, 10-11-2025
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 log table and calculator is allowed.
(At. Wts.: H=1, C=12, O=16, N=14, Na=23, Cl=35.5)

Q.1 Fill in the blanks with correct answer from given option. 08

- 1) _____ mineral has an Si: Al ratio about 2:1, form in neutral or slightly alkaline environment from ferromagnesium, calcic feldspar minerals and especially volcanic ash.

a) Kaolinite	b) Illite
c) Montmorillonite	d) Chlorite
- 2) _____ bonding is the force of attraction between valence electrons and the metal atoms.

a) Ionic	b) Covalent
c) Metallic	d) Hydrogen
- 3) The most susceptible mineral to chemical weathering is _____.

a) Na-Plagioclase	b) Talc
c) Ca-Plagioclase	d) Quartz
- 4) Pyroxene mineral convert to _____ mineral by oxidation and hydration.

a) Kaolinite	b) Smectite
c) Goethite	d) Calcite
- 5) According to Goldsmith, clay mineral is classified as _____.

a) Resistates	b) Hydrolysates
c) Oxidates	d) Evaporates
- 6) An alpha particles is same as ?

a) A helium nucleus	b) A hydrogen nucleus
c) A proton	d) A positron
- 7) Which one of the following meteorite is known as siderites ?

a) Iron meteorites	b) Iron-stony meteorites
c) Stony meteorites	d) Metallic meteorites

- 8) According to the cosmic abundance which of the following element is abundant_____
- | | |
|------------|-------------|
| a) Iron | b) Carbon |
| c) Silicon | d) Hydrogen |

Q.2 Answer any four of the following. 08

- a) Define Isotropism.
- b) Which is the first solid to separate from sea water by evaporation under natural condition:
- c) Name the two types of clay structure.
- d) Give two methods of radioactive dating used to determine the age older rocks.
- e) The transformation from parent rock to soil is generally accompanied by:
- f) Define trace elements.

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

- a) Geochemical cycle.
- b) Silicate structure.
- c) Carbon dating method.

Q.4 Answer any two of the following. 08

- a) Explain the factors affecting the rate of formation of soil with neat labeled diagram.
- b) Write short note on Geochronology.
- c) Describe in detail Physicochemical system of the earth.

Q.5 Answer any one of the following 08

- a) Explain in brief formation, structure and types of clay minerals with suitable diagram.
- b) Define colloids. Explain the its types and colloidal processes in the geological system.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November – 2025
ZOOLOGY (Paper – VIII)
Physiology Control & Coordination (22221433)**

Day & Date: Monday, 10-11-2025
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) _____ of the following blood cells play an important role in blood clotting.

a) Thrombocytes	b) Neutrophils
c) Leucocytes	d) Erythrocytes
- 2) The Islets of Langerhans are found in _____.

a) Stomach	b) alimentary canal
c) Pancreas	d) Liver
- 3) How are impulse transmitted from one neuron to another?

a) Through intracellular junctions
b) Through tight junctions
c) Through gap junctions
d) Through synapses.
- 4) Group of cells having similar structure and function is called _____.

a) Cell	b) Tissue
c) Organ	d) System
- 5) Which of the following gland which can be classified as an endocrine as well as exocrine gland?

a) Thyroid	b) Thymus
c) Pancreas	d) Pituitary
- 6) The pars intermedia secrete _____ hormone.

a) MSH	b) FSH
c) LH	d) GH
- 7) Gonadotropin-releasing hormone directly stimulates pituitary gland to release _____.

a) LH	b) FSH
c) Both LH & FSH	d) Estrogen

8) Which of the following secrete the hormone estrogen & progesterone

- _____.
- a) Ovary
 - b) Pineal glands
 - c) Testes
 - d) Adrenal gland

Q.2 Answer any four of the following.

08

- a) Connective tissue.
- b) RBCs.
- c) Estrogen.
- d) Role of Salivary gland.
- e) Pancreas.

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

08

- a) Oral contraceptive pills.
- b) Ultrastructure of skeletal muscle
- c) Oestrous cycle.

Q.4 Answer any two of the following.

08

- a) IVF.
- b) Thyroid gland.
- c) Ultrastructure of neuron.

Q.5 Answer any one of the following

08

- a) Describe histology of mammalian ovary.
- b) Explain pituitary gland and its hormones.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November - 2025
MATHEMATICS (Paper – VII)
Differential Equations (22221423)**

Day & Date: Tuesday, 11-11-2025
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 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 $P = \log(Px - y)$ is _____.
 - a) $y = cx - e^{-c}$
 - b) $y = cx + e^c$
 - c) $y = cx - e^c$
 - d) $y = cx + e^{-c}$

- 3) If $1 - P + Q = 0$ then one solution of the equation $\frac{d^2y}{dx^2} + P \frac{dy}{dx} + Qy = 0$ is _____.
 - a) $y = e^x$
 - b) $y = e^{-x}$
 - c) $y = x$
 - d) $y = x^2$

- 4) The one solution of the equation $\frac{d^2y}{dx^2} - \frac{3}{x} \frac{dy}{dx} + \frac{3y}{x^2} = 0$ is _____.
 - a) $y = e^x$
 - b) $y = e^{-x}$
 - c) $y = x$
 - d) $y = x^2$

- 5) The homogeneous linear equation $x^n \frac{d^ny}{dx^n} + c_1 x^{n-1} \frac{d^{n-1}y}{dx^{n-1}} + \dots + c_{n-1} \cdot x \frac{dy}{dx} + c_n Y = X(x)$ can be reduced to linear equation with constant coefficients by using substitution _____.
 - a) $x = \log z$
 - b) $x = e^z$
 - c) $x = \frac{1}{z}$
 - d) $x = z^2$

- 6) The equation $(4 + 3x)^2 \frac{d^2y}{dx^2} + 5(4 + 3x) \frac{dy}{dx} + 6y = x$ is _____.
 - a) homogeneous linear equation
 - b) reducible to homogeneous linear equation
 - c) Linear differential equation with constant coefficients
 - d) Clairaut's equation

- 7)** One of the solutions of the differential equation $\frac{dx}{yz} = \frac{dy}{zx} = \frac{dz}{xy}$ is _____.
- a) $x^2 + y^2 = c_1$ b) $x^2 - y^2 = c_1$
- c) $x + y = c_1$ d) $x - y = c_1$
- 8)** The differential equation of the form $Pdx + Qdy + Rdz = 0$,
(where P, Q, R are functions of x, y, z) are called _____.
- a) Simultaneous equation
b) Total differential equation
c) Homogeneous linear equation
d) Clairaut's equation

Q.2 Answer any four of the following.

08

- Define Clairaut's equation and explain the method of solving it.
- Solve $x^2 p^2 + 3xyp + 2y^2 = 0$
- Solve $x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} - 4y = 0$
- Test the condition of integrability for the differential equation $y^2 dx - z dy + y dz = 0$
- Solve $\frac{dx}{x(y-z)} = \frac{dy}{y(z-x)} = \frac{dz}{z(x-y)}$
- Find the one solution of the complementary function of the equation $\frac{d^2 y}{dx^2} - (2 - \frac{1}{x}) \frac{dy}{dx} + (1 - \frac{1}{x}) y = 0$

Q.3 Attempt any two of the following.

08

- a)** Explain the method of solving differential equation
- $$(a + bx)^n \frac{d^n y}{dx^n} + c_1(a + bx)^{n-1} \frac{d^{n-1} y}{dx^{n-1}} + \dots + c_{n-1}(a + bx) \frac{dy}{dx} + c_n y = X$$
- where $c_1, c_2, \dots, c_n$ are constant & X is a function of x only.
- b)** Solve $2x \, dx + 2y \, dy + (x^2 + y^2 + e^z)dz = 0$
- c)** Explain how to solve the second order differential equation
- $$\frac{d^2 y}{dx^2} + P \frac{dy}{dx} + Qy = R \text{ (where } P, Q \text{ and } R \text{ are functions of } x \text{ only) when}$$
- one solution belonging to complementary function is known.

Q.4 Answer any two of the following.

08

- Solve $x^2 \frac{d^2 y}{dx^2} - 3x \frac{dy}{dx} + 4y = x$
- Solve $y = -px + p^2$
- Find the necessary condition for the integrability of the differential equation $Pdx + Qdy + Rdz = 0$ where P, Q and R are functions of x, y, z .

Q.5 Answer any one of the following.

a) i) Solve $\frac{dx}{z} = \frac{dy}{-z} = \frac{dz}{z^2 + (x+y)^2}$

ii) Solve $\frac{a \, dx}{bc \, (y-z)} = \frac{b \, dy}{ca \, (z-x)} = \frac{c \, dz}{ab \, (x-y)}$

- b)** Explain the method of solving the equation $\frac{d^2y}{dx^2} + P \frac{dy}{dx} + Qy = R$ (where P, Q, R are functions of x) by removal of the first order derivative by changing the dependent variable.

Set	P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November - 2025
BOTANY (Paper – VII)
Plant Physiology (22221402)**

Day & Date: Tuesday, 11-11-2025
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 diagrams and give equations wherever necessary.

Q.1 Multiple choice questions.

08

- 1) The plants which require longer exposure to light than their critical period is known as _____.
a) Long day plant b) Short day plant
c) Day neutral plant d) None of these
- 2) Vernalization is the process of _____ treatment.
a) High temperature b) Low temperature
c) Light d) Dark
- 3) Glycolysis occurs in _____.
a) Chloroplast b) Mitochondria
c) Cytosol d) Peroxisoma
- 4) _____ is called power house of cell.
a) Mitochondria b) Chloroplast
c) Ribosome d) Golgi comlex
- 5) _____ is a product of anaerobic respiration in plants.
a) Malic acid b) Pyruvate
c) Ethanol d) Lactose
- 6) Translocation of Organic contains occur through _____.
a) Xylem b) Phloem
c) Fibers d) All of these
- 7) Photorespiration take place in _____.
a) Chloroplast b) Mitochondria
c) Peroxisomes d) All of these
- 8) The plant produce organic contain into the leaves called as _____.
a) Source b) Sink
c) Xylem d) None of these

- Q.2 Answer any four of the following. 08**
- a) Define Translocation in phloem.
 - b) Draw well labelled structure of chloroplast.
 - c) Define the anaerobic respiration in plant.
 - d) Define devernalization.
 - e) Give chemical reaction of photosynthesis
 - f) Define photorespiration.
- Q.3 Attempt any two of the following. 08**
- a) Explain the Crassulacean Acid Metabolism Pathway.
 - b) Describe the structure of Mitochondria.
 - c) Explain the SDP & LDP.
- Q.4 Answer any two of the following. 08**
- a) Describe the Symplastic transport & apoplastic Transport.
 - b) Write a note on glycolysis.
 - c) Explain the C4 Cycle.
- Q.5 Answer any one of the following 08**
- a) Write a note on mass flow hypothesis.
 - b) Explain the role of phytochrome pigment.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November – 2025
MATHEMATICS (Paper – VIII)
Abstract Algebra – I (22221424)**

Day & Date: Wednesday, 12-11-2025
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 most correct alternative:**08**

- 1) For Euler's ϕ function $\phi(100) = \underline{\hspace{2cm}}$
 - a) 10
 - b) 20
 - c) 30
 - d) 40
- 2) The number of subgroups of Z_{11} are $\underline{\hspace{2cm}}$.
 - a) 1
 - b) 2
 - c) 3
 - d) 5
- 3) The product of g.c.d and l.c.m. of 9 and 15 is $\underline{\hspace{2cm}}$.
 - a) 135
 - b) 153
 - c) 105
 - d) 125
- 4) If the equation $(1\ 2)x = (1\ 2\ 3)$ in S_3 , then $x = \underline{\hspace{2cm}}$.
 - a) $(2\ 3)$
 - b) $(1\ 2)$
 - c) $(1\ 3)$
 - d) $(3\ 1)$
- 5) The order of Q is $\underline{\hspace{2cm}}$.
 - a) 0
 - b) 1
 - c) finite
 - d) infinite
- 6) The order of the quotient group $\frac{Z_{18}}{\langle 6 \rangle}$ is $\underline{\hspace{2cm}}$.
 - a) 3
 - b) 5
 - c) 6
 - d) 8
- 7) If a and b are integers with $b > 0$ then there exist unique integers q and r such that $a = bq + r$ with $\underline{\hspace{2cm}}$.
 - a) $0 \leq r < b$
 - b) $0 \leq r < q$
 - c) $0 \leq r \leq p$
 - d) $0 \leq r \leq q$
- 8) The value of $[3] \odot [4]$ in Z_5 $\underline{\hspace{2cm}}$.
 - a) $[2]$
 - b) $[4]$
 - c) $[0]$
 - d) $[3]$

Q.2 Answer any four of the following. 08

- a) Let $G = Z_6$. Is the element 2 a generator of G ? Justify your answer.
- b) Determine the right cosets of $\langle [3] \rangle$ in Z_{12} .
- c) What's the kernel of $f(x) = 3x$ in $Z \rightarrow Z_9$?
- d) Let $(Z, +)$ and $(E, +)$ be the group of integers and even integers. Define a map $f: Z \rightarrow E$ such that $f(x) = 4x \forall x \in Z$. show that f is a homomorphism.
- e) Find $[Z_{15}: \langle [5] \rangle]$.
- f) Prove or disprove $Z_4^\#$ is a group.

Q.3 Attempt any two of the following. 08

- a) Let G be a finite group and H a subgroup of G . Then prove that order of H divides the order of G .
- b) Find suitable integer m and n such that $23m + 17n = 1$.
- c) if $\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 3 & 1 & 4 & 5 & 6 & 2 \end{pmatrix}$ and $\beta = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 2 & 4 & 1 & 3 & 6 & 5 \end{pmatrix} \in S_6$. compute
 - (a) $\alpha \circ \beta$
 - (b) $\beta \circ \alpha$
 - (c) α^{-1}
 - (d) β^{-1} .

Q.4 Answer any two of the following. 08

- a) Find the order of each element in $Z_7^\# = \{1, 2, 3, 4, 5, 6\}$ with respect to multiplication modulo 7.
- b) If R is an additive group of real numbers and R^+ be the multiplicative group of positive reals, show that the following mapping is an isomorphism $f: R \rightarrow R^+$ such that $f(x) = e^x \forall x \in R$.
- c) Prove that $\{[0], [3], [6], [9]\}$ is a subgroup of Z_{12} . Construct the Cayley table for the subgroup.

Q.5 Answer any one of the following 08

- a) State and prove Fundamental Theorem of Group Homomorphism.
- b) Prove that every finite group G is isomorphic to a permutation group.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November - 2025
BOTANY (Paper – VIII)
Embryology of Angiosperms (22221403)**

Day & Date: Wednesday, 12-11-2025
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) How many haploid microspores are formed from one microspore mother cell?

a) 1	b) 2
c) 3	d) 4
- 2) The layer of anther responsible for providing nourishment to developing pollen grains is called _____.

a) Epidermis	b) Tapetum
c) Endothecium	d) Exine
- 3) Megasporogenesis takes place in which part of the flower?

a) Anther	b) Ovule
c) Petal	d) Filament
- 4) Pollination by wind is called: _____.

a) Anemophily	b) Entomophily
c) Hydrophily	d) Omithophily
- 5) Double fertilization in plants results in the formation of: _____.

a) Two embryos
b) One embryo and endosperm
c) Two endosperms
d) One seed coat and one embryo
- 6) The structure that connects the embryo to the seed coat is: _____.

a) Funicle	b) Micropyle
c) Hilum	d) Suspensor
- 7) In angiosperms, the ploidy level of endosperm is: _____.

a) Haploid (n)	b) Diploid (2n)
c) Triploid (3n)	d) Tetraploid (4n)

- 8) Which of the following types of endosperm formation involves repeated free nuclear divisions before cell wall formation?
- a) Cellular endosperm
 - b) Nuclear endosperm
 - c) Helobial endosperm
 - d) Zygotic endosperm

Q.2 Answer any four of the following. 08

- a) What is microsporogenesis.
- b) Enlist types of ovules.
- c) Structure of pollen grain with suitable diagram.
- d) What is double fertilization?
- e) Describe Mechanism of pollination by water
- f) Significance of double fertilization.

Q.3 Attempt any two of the following. 08

- a) Describe typical structure of flower.
- b) Explain typical structure of gynoecium.
- c) Describe development of nuclear endosperm with suitable diagram

Q.4 Answer any two of the following. 08

- a) Describe with suitable diagram structure of typical androecium.
- b) Describe with suitable diagram tetrasporangiate anther.
- c) Describe monosporic type of development of female gametophyte.

Q.5 Answer any one of the following 08

- a) Describe with suitable example seed and fruit dispersal.
- b) Describe with suitable diagram development of Monocotyledon embryo.

Set	P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November - 2025
GEOGRAPHY (Paper – VII)
Economic Geography (22221435)**

Day & Date: Thursday, 13-11-2025
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 Fill in the blanks by choosing correct alternatives given below. 08

- 1) _____ is the headquarters of WTO.
a) Delhi
b) Madina
c) Geneva
d) Japan
- 2) _____ geography is the branch of Human Geography.
a) Climatology
b) Economic
c) Geomorphology
d) Oceanography
- 3) According to _____ "Economic geography is deals with of economic potentialities."
a) Raich
b) Hetner
c) Alexandar
d) Chisholm
- 4) Von Thunen's location theory on agriculture is based on the study of an agriculture field in _____.
a) India
b) Italy
c) Germany
d) China
- 5) In Primary sector _____ coloured workers are observed.
a) Blue
b) White
c) Pink
d) Red
- 6) In the north-eastern states of India, shifting agriculture is called _____.
a) Sheti
b) Ladang
c) Milpa
d) Jhuming
- 7) SEZ Approvals granted under the SEZ Act, _____.
a) 2000
b) 2005
c) 2010
d) 2015
- 8) Examples of commercial agriculture is _____.
a) Grain Farming
b) Dairy farming
c) Horticulture farming
d) All of these

- Q.2 Answer any four of the following. 08**
- a) State the key factors that influence on industrial location theory by Weber?
 - b) Full form of OPEC?
 - c) Define the Fishing?
 - d) State the example of primary activity?
 - e) State the only two names of industrial region in India?
 - f) Define the secondary activity?
- Q.3 Write short notes on any two of the following. 08**
- a) WTO.
 - b) SEZ.
 - c) Commercial agriculture.
- Q.4 Answer any two of the following. 08**
- a) Define the primary activity and explain it's characteristics?
 - b) Explain the nature and scope of economic geography?
 - c) Explain the distribution of iron ore industry in India?
- Q.5 Answer any one of the following 08**
- a) Describe the Agriculture land use model by Von Thunen?
 - b) Define the economic geography & Explain it's branches?

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November - 2025
ELECTRONICS (Paper – VII)
Operational Amplifier and Applications (22221426)**

Day & Date: Thursday, 13-11-2025
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 Multiple choice questions.

08

- 1) What is the main function of a differential amplifier?
 - a) To amplify noise signals
 - b) To reject common signals and amplify the difference
 - c) To amplify DC signals only
 - d) To act as a power
- 2) In an ideal op-amp, the input impedance is: _____.
 - a) Zero
 - b) Very low
 - c) Infinite
 - d) Equal to output impedance
- 3) Which op-amp configuration provides a gain of unity and high input impedance?
 - a) Inverting amplifier
 - b) Voltage follower
 - c) Summing amplifier
 - d) Differential amplifier
- 4) The output of a zero-crossing detector changes when: _____.
 - a) Output exceeds supply voltage
 - b) The input signal crosses 0V level
 - c) Input signal reaches maximum amplitude
 - d) Input current becomes zero
- 5) CMRR is the ratio of: _____.
 - a) Common mode gain to differential gain
 - b) Differential gain to common mode gain
 - c) Slew rate to gain
 - d) Output to input offset voltage
- 6) In a Schmitt Trigger, hysteresis is used to: _____.
 - a) Amplify noise
 - b) Increase frequency
 - c) Avoid false triggering
 - d) Reduce power consumption

- 7)** A Wien bridge oscillator is used to generate: _____.
a) Square wave b) Sine wave
c) Triangular wave d) Sawtooth wave
- 8)** In a differentiator circuit, the output voltage is proportional to; _____.
a) Input voltage b) Integral of input voltage
c) Derivative of input voltage d) Output current

Q.2 Answer any four of the following. 08

- Define slew rate. How does it affect the performance of an op-amp?
- What is meant by virtual ground in op-amp circuits?
- Write the expression for CMRR and explain its importance.
- What is the function of a comparator in op-amp applications?
- Define output offset voltage and input offset current.
- What is a sawtooth wave generator?

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

- Draw and explain the circuit of a voltage follower. What are its advantages?
- Explain the operation of an integrator circuit using op-amp with waveforms.
- Draw and explain the circuit diagram of a zero-crossing detector.

Q.4 Answer any two of the following. 08

- Explain the working of a precision half-wave rectifier using op-amp.
- Draw and explain the operation of a non-inverting amplifier. Derive its voltage gain.
- Draw and explain the summing amplifier circuit. Derive output voltage.

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

- Draw and block diagram of a typical op-amp and explain the function of each block in detail.
- Draw and explain the working of a triangular wave generator using op- amp.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November - 2025
GEOLOGY (Paper – VII)
Sedimentary and Metamorphic Petrology (22221414)**

Day & Date: Thursday, 13-11-2025
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) _____ type of sandstone contains sharply angular grains?
 - a) Arkose
 - b) Grit
 - c) ferruginous sandstone
 - d) argillaceous sandstone
- 2) Granulose represents foliated _____ fabric.
 - a) strongly
 - b) moderate
 - c) weakly
 - d) none of these
- 3) A tendency of metamorphic rock to split easily along thin, smooth planes is called _____.
 - a) slaty cleavage
 - b) lamination
 - c) stratification
 - d) none of these
- 4) The sediments having size more than 10 mm are called _____.
 - a) dust
 - b) pebbles
 - c) silt
 - d) boulders
- 5) The _____ sedimentary rocks are formed by deposition of sediments in standing, quiet water environment.
 - a) rudaceous
 - b) arenaceous
 - c) argillaceous
 - d) residual
- 6) The concentric coating of Aluminum hydroxide can be seen in _____.
 - a) limestone
 - b) fossiliferous limestone
 - c) oolitic limestone
 - d) bauxite
- 7) Composition of dolomite is _____.
 - a) CaCO_3
 - b) MgCO_3
 - c) $\text{CaCO}_3 \text{ MgCO}_3$
 - d) none of these
- 8) Which of the following shows strong-foliated fabric?
 - a) Marble
 - b) Schist
 - c) quartzite
 - d) none of these

- Q.2 Answer any four of the following. 08**
- a) Define oolitic limestone.
 - b) What is migmatites.
 - c) Give the names of minerals present in zeolite facies.
 - d) Define metamorphic facies.
 - e) What is graywackes?
- Q.3 Write short notes on any two of the following. 08**
- a) Conglomerate and breccia.
 - b) Greenschist Facies.
 - c) Rudaceous rocks with its varieties.
- Q.4 Answer any two of the following. 08**
- a) Describe the bedding and lamination structures in sedimentary rock.
 - b) Describe the granulite and eclogite facies.
 - c) Describe the Arenaceous sedimentary rock.
- Q.5 Answer any one of the following 08**
- a) Describe structures of metamorphic rock
 - b) Describe process of formation of sedimentary rock.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November - 2025
MICROBIOLOGY (Paper – VII)
Immunology & Medical Microbiology (22221420)**

Day & Date: Thursday, 13-11-2025
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 Rewrite the following sentence choosing the correct alternatives. 08

- 1) _____ cells produce the antibodies.

a) T cells	b) Dendritic cells
c) Plasma cells	d) Macrophages
- 2) _____ immunoglobulin is the first to be produced during an immune response.

a) IgE	b) IgM
c) IgG	d) IgA
- 3) _____ reaction is used routinely for serological diagnosis of typhoid.

a) Agglutination	b) Precipitation
c) Flocculation	d) Immunofluoresce
- 4) Antigens can be _____.

a) Proteins	b) carbohydrates
c) nucleic acids	d) all of these
- 5) Innate immunity is also called as _____.

a) Specific immunity	b) Inborn immunity
c) Acquired immunity	d) Adapted immunity
- 6) _____ is the form of agglutination used in blood typing.

a) Precipitation	b) Hemagglutination
c) Latex agglutination	d) Tube agglutination
- 7) _____ is the purpose of transport medium in specimen handling.

a) To sterilize the sample	
b) To reduce the volume	
c) To preserve the specimen and inhibit the growth of contaminants	
d) To stain the specimen	

- 8) _____ is an immune sera.
- a) Serum containing antibodies against specific antigens
 - b) Serum with antigens
 - c) Vaccine
 - d) None of the above.

Q.2 Answer any four of the following. 08

- a) Define precipitation.
- b) What is passive immunity?
- c) What is the role of Fever?
- d) Define active immunity.
- e) What is hapten?
- f) What is the role of normal flora in immunity?

Q.3 Attempt any two of the following. 08

- a) Explain the collection, handling and transportation of laboratory specimens.
- b) Write an account on types of Antigens.
- c) Write an account on laboratory diagnosis of Enteric fever.

Q.4 Answer any two of the following. 08

- a) Write an account on factors affecting antigenicity.
- b) Explain antigen antibody Agglutination reaction with any one example.
- c) Write an account on Candidiasis.

Q.5 Answer any one of the following 08

- a) Explain the Viral disease Dengue in detail.
- b) What is immunoglobulin? Write an account on classification, properties and functions of different immunoglobulin.

Set	P

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November – 2025
GEOGRAPHY (Paper – VIII)
Environmental Geography (22221436)**

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 stencils is allowed.

08

- 1)** The nature of environmental geography is _____.
a) Changing b) Complex
c) Interdisciplinary d) All of these.
- 2)** The term _____ means surrounding.
a) Region b) Climate
c) Environment d) Land
- 3)** The word _____ was coined by Tansley.
a) Ecosystem b) Climate
c) Humidity d) Rain Fall
- 4)** _____ and Cultural are two types of environment.
a) Natural b) Economic
c) Political d) Historical
- 5)** Green Plant that produce their own food is called _____.
a) Autotrophic b) Hetrophic
c) Producer d) Decomposer
- 6)** _____ is a main cause of desertification.
a) Biome b) Ecosystem
c) Deforestation d) None of these
- 7)** _____ gas is responsible for global warming.
a) Carbon dioxide b) Carbon monoxide
c) Oxygen d) Nitrogen
- 8)** Wastewater is main cause of _____ pollution.
a) Air b) Land
c) Water d) Sound

- Q.2 Answer the following. (Any Four) 08**
- a) Define the concept of Environmental Geography.
 - b) What is Biome?
 - c) What is Ecosystem?
 - d) What is acid rain?
 - e) What is Desertification?
 - f) What is Air Pollution?
- Q.3 Write short notes. (Any Two) 08**
- a) Global Warming
 - b) Nature of Environmental Geography
 - c) Food Chain
- Q.4 Answer the following. (Any Two) 08**
- a) Explain the types of Aquatic Biomes.
 - b) Explain the causes of Noise Pollutions.
 - c) Explain the Scope of Environmental Geography.
- Q.5 Answer the following. (Any One) 08**
- a) Write the causes and effects of Climate Change.
 - b) What is Water Pollution? Explain the causes of Water Pollution.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November – 2025
ELECTRONICS (Paper – VIII)
Digital Techniques and Microprocessor (22221427)**

Day & Date: Friday, 14-11-2025
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) In the 8085 processor _____ is used store the address of memory from which data is accessed.

a) HL pair	b) DE pair
c) PC	d) SP
- 2) IC 2764 is a _____.

a) 8 KB flash memory	b) 8 KB UVEPROM
c) 8 KB DRAM	d) 8 KB SRAM
- 3) The suitable clock frequency for 8085A microprocessors is _____.

a) 9 MHz	b) 6 MHz
c) 12 MHz	d) 3 MHz
- 4) Which one of these instructions represent Register addressing mode?

a) MOV D,A	b) MVI C,35 H
c) LDA 8500	d) STAX D
- 5) _____ technique is employed in ADC IC 0804 for converting analog data into digital data.

a) Dual Slope	b) Single Slope
c) Flash	d) SAR type
- 6) _____ IC is used as a bidirectional data bus buffer.

a) 74244	b) 74373
c) 74245	d) 74138
- 7) The memory access capacity of 8085 microprocessor is _____.

a) 64 KB	b) 32 KB
c) 16 KB	d) 8 KB
- 8) The control signals generated by uP 8085 are _____.

a) Read	b) Write
c) ALE	d) All of these

- Q.2 Answer the following. (Any Four) 08**
- a) Define the term resolution and accuracy of DAC.
 - b) Write four salient features of 8085 processor.
 - c) State the role of the 8085 processor's program counter.
 - d) What do you mean by SRAM and DRAM?
 - e) Write the name of ICs
 - i) 74244
 - ii) 74245
 - iii) 74138
 - iv) 74373
- Q.3 Attempt the following. (Any Two) 08**
- a) Write a note on Non-Volatile Memory.
 - b) Write a note on specifications of ADC and DAC.
 - c) Write a note on Register array of 8085 processor.
- Q.4 Attempt the following. (Any Two) 08**
- a) Write an Assembly Language Program to add two data bytes 49 H and 3C H, and save the result at RAM address 1050 H.
 - b) Describe the pin configuration of 8085 microprocessor.
 - c) Explain R-2R ladder method of digital to analog conversion.
- Q.5 Attempt the following. (Any One) 08**
- a) Classify the instruction set according to the function of instruction with suitable examples.
 - b) Draw the internal block diagram of 8085 processor and explain ALU, and Flag register.

Set	P
1	1
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**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November – 2025
GEOLOGY (Paper – VIII)
STRATIGRAPHY (22221415)**

Day & Date: Friday, 14-11-2025
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) Trilobites are index fossil of _____.
a) Paleozoic b) Mesozoic
c) Cenozoic d) Archean
- 2) The law of floral and faunal succession was proposed by _____.
a) Steno b) Smith
c) Kiew d) Phillip
- 3) Which era is called as age of reptiles _____.
a) Palaeozoic b) Mesozoic
c) Cenozoic d) Proterozoic
- 4) Fossil assemblages can be used in study of stratigraphy is given in a principle of _____.
a) Order of superposition b) Faunal succession
c) Uniformitarianism d) Hemi-crystalline
- 5) Khetri copper belt of Rajasthan is part of _____.
a) Vindhyan system b) Deccan trap
c) Delhi super group d) Gondwana system
- 6) Sedimentary beds present between two basaltic lava flows occurs in Deccan Trap are known as _____.
a) Infratrappean b) Intertrappean
c) Sandwiched beds d) Sill
- 7) Coal requirement of India is fulfilled by _____ supergroup.
a) Cuddapah b) Gondwana
c) Dharwar d) All of the above.

- 8) A branch of stratigraphy which deals with correlation of relative ages of rocks with the help of fossils present within them is called as _____.
a) Chrono-stratigraphy b) Bio-stratigraphy
c) Sedimentary rocks d) Paleontology

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

- a) Name the two major groups in Western Dharwar Craton (WDC).
- b) What is index fossil?
- c) What is Geological Time Scale?
- d) What is Unconformity?
- e) Write the sequence of period of Mesozoic era

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

- a) Describe the principle of uniformitarianism. Give example.
- b) Write note on Closepet granite.
- c) Describe lithostratigraphic correlation with suitable example.

Q.4 Write short notes. (Any Two) 08

- a) Explain in short Triassic of Spiti.
- b) Describe principle of Faunal Succession.
- c) List out the formation of lower and Upper Gondwana Supergroup.

Q.5 Write short notes. (Any One) 08

- a) Describe stratigraphic classification, lithology and economic importance of Dharwar Supergroup.
- b) What is unconformity? Explain types of unconformities and their significance in stratigraphy.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - IV) (New) (CBCS) Examination:
October/November - 2025
MICROBIOLOGY (Paper – VIII)
Introduction to Industrial Microbiology (22221421)**

Day & Date: Friday, 14-11-2025
Time: 03:00 PM To 05:00 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 tables and calculator is allowed.

Q.1 Rewrite the following sentences choosing the correct alternative. 08

- 1) Which of the following is the process of converting sugar into alcohol?
 - a) Oxidation
 - b) Pasteurisation
 - c) Bleaching
 - d) Fermentation
- 2) The purpose of dual fermentation process in Industry is to _____.
 - a) reduce the number of microorganisms used
 - b) increase fermentation time
 - c) replace all chemical process
 - d) to increase the yield of the product through synergistic microbial action.
- 3) _____ is used to provide oxygen in the fermentor.
 - a) Baffles
 - b) Sparger
 - c) Impeller
 - d) Cooling coils
- 4) _____ is the synthetic antifoaming agents.
 - a) silicon compounds
 - b) vegetable oil
 - c) sunflower oil
 - d) cottenseed oil
- 5) Which of the following shows zone of inhibition when grown on a particular agar medium.
 - a) organic acid producer
 - b) antibiotic producer
 - c) growth factor producer
 - d) amino acid producer
- 6) _____ carbohydrate is present in whey.
 - a) lactose
 - b) maltose
 - c) arabinose
 - d) sucrose
- 7) _____ is used for production of alcohol.
 - a) corn steep liquor
 - b) sulphite waste liquor
 - c) molasses
 - d) whey

- 8) Single cell protein means _____.
a) protein extracted from plants b) microbial biomass
c) animal protein d) human protein

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

- a) What is surface culture fermentation?
- b) Define sulphite waste liquor
- c) Give the purpose of inoculum media
- d) What is a precursor?
- e) What is the purpose of impeller and its design
- f) How is the temperature controlled during a fermentation process?

Q.3 Attempt the following. (Any Two) 08

- a) Write an account on molasses
- b) Explain the scale up process
- c) Write an account on Chemostat

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

- a) Give the primary screening of acid producers.
- b) Write an account on preservation of industrially important microorganisms.
- c) Draw a neat, labelled diagram of a bioreactor.

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

- a) Explain the various methods of strain improvement.
- b) Describe in detail penicillin fermentation.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
English (Compulsory)
Literary Mindscapes – I (22221500)**

Day & Date: Tuesday, 28-10-2025
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 Rewrite the following sentences choosing the correct alternative. 08

- 1) _____ is the second vision outlined by Dr. Kalam in his speech.
 - a) Freedom
 - b) Independence
 - c) Development
 - d) Financial growth
- 2) Who came to visit Phatik' s mother?
 - a) their grandfather
 - b) their uncle
 - c) their aunt
 - d) cousin
- 3) What according to the William Shakespeare, is the first stage of human life?
 - a) infancy
 - b) old age
 - c) being a student
 - d) death
- 4) Who snatched the queen's mirror?
 - a) her daughter
 - b) the new bride
 - c) the king
 - d) None of the above
- 5) How did the pupils view the schoolmaster?
 - a) silly and slow
 - b) soft and sassy
 - c) sad and shrewd
 - d) severe and stern
- 6) What does D.H. Lawrence mean when he says that money has got us down?
 - a) that it has ruined us
 - b) that it has made us tremulous
 - c) that it has made us greedy
 - d) that it has made us cruel
- 7) They expect good news. (Change the voice of the given sentence)
 - a) Good news is expected by them.
 - b) Good news was expected by them.
 - c) Good news had expected by them.
 - d) Good news had been expected by them.

- 8) She _____ a story for being late but her teacher understood her lie.
(Fill in the blank with choosing correct phrasal verb of the following alternatives)
- | | |
|------------|-------------|
| a) made of | b) made for |
| c) made up | d) made in |

Q.2 Write short answers to the following questions. (Any Four) 12

- a) What does Dr. Kalam say about India's freedom?
- b) How did Phatik feel arriving at the uncle's house?
- c) Why should one man/woman play many parts in the drama of life?
- d) Why is the queen unsatisfied and seeks a rival?
- e) Describe the character of the village schoolmaster.
- f) What, according to D.H. Lawrence, should be provided free of cost?

Q.3 Answer the following question. (Any One) 10

- a) What is the importance of 21st century skills? Explain.

OR

- b) What is the importance of learning skills? Explain.

Q.4 Write down long answer of the following question. 10

What are the most important learning skills (The 4 C's) of the 21st century?

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
PHYSICS (Special Paper - IX)
Mathematical Physics & Statistical Physics (22221509)**

Day & Date: Wednesday, 29-10-2025
Time: 09:00 AM To 12:00 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 a logarithmic table and calculator is allowed.

Q.1 A) Multiple choice questions.

10

- 1) $\nabla \times \vec{V}$ is the _____ line integral of the vector field per unit area.
a) maximum b) minimum
c) constant d) zero
- 2) Stoke's theorem gives the relation between line integral with _____.
a) volume integral b) surface integral
c) normal integral d) None of these
- 3) The three co-ordinates in cylindrical co-ordinates system are _____.
a) (x, y, z) b) (r, ϕ, θ)
c) (ρ, ϕ, z) d) (x, r, ϕ)
- 4) In orthogonal curvilinear co-ordinates system, the co-ordinate surfaces are mutually _____ everywhere.
a) curved b) parallel
c) perpendicular d) None of these
- 5) Volume of a cell in phase-space is _____.
a) n b) n^2
c) n^3 d) n^4
- 6) Thermodynamics cannot be applied to _____ ensemble.
a) canonical b) non-canonical
c) microstates d) phase space
- 7) The rms speed of molecules of mass ' m ' at temperature T is _____.
a) $\sqrt{2kT/m}$ b) $\sqrt{3kT/m}$
c) $\sqrt{3kT/\pi m}$ d) $\sqrt{8kT/m}$
- 8) According to Stefan's law _____.
a) $E = \sigma T^4$ b) $E = \sigma T^2$
c) $E = \sigma T^3$ d) $E = \sigma T$

- 9) _____ particles are Bosons.
- a) Electrons b) Photons
c) α particles d) π meson
- 10) Fermions have spin value _____.
a) $1/2$ b) 1
c) 0 d) any one

B) Answer the following.

06

- 1) What is the Gauss's divergence theorem?
- 2) In a spherical polar coordinate system, h_3 is _____.
- 3) The equation of length element of curvilinear coordinate system is _____.
- 4) Define phase density.
- 5) Fermi-Dirac statistics is applicable to _____.
- 6) The number of accessible microstates corresponding to given macrostates are called as _____.

Q.2 Solve Any Eight of the following.

16

- a) What is Partial differential equation?
- b) Obtain Green's first theorem.
- c) Describe Cartesian co-ordinates system.
- d) Find the volume element in spherical polar co-ordinates.
- e) Define thermodynamic probability.
- f) If black body at a temperature 6174° K emits $4700 \text{ \AA}$ with maximum energy, calculate the temperature at which it will emit wavelength of $1.4 \times 10^{-5} \text{ m}$ with maximum energy.
- g) Define most probable speed.
- h) Show that the Helmholtz function. $F = -NkT \log Z$.
- i) Define order and degree of differential equation.
- j) Write any one postulate of Fermi- Dirac statistics.

Q.3 A) Attempt Any Two of the following.

10

- Obtain an expression for gradient of scalar in orthogonal curvilinear co-ordinates.
- Derive Planck's radiation formula in terms of frequency.
- Obtain Laplacian operator in orthogonal co-ordinate system.

B) Write a note on Fermi energy?

06

Q.4 A) Attempt Any Two of the following.

08

- Derive Maxwell - Boltzmann distribution law.
- Describe Black body radiation with diagram.
- Distinguish between M-B and B-E Statistics.

B) Derive the solution of Hermite's polynomial equation.

08

Q.5 Attempt Any Two of the following.

16

- a)** Derive Bose-Einstein distribution law with basic postulates.
- b)** What are thermodynamic functions? Express them in terms of Boltzmann partition function.
- c)** What do you mean by ensemble? Describe a microcanonical and canonical ensemble.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
CHEMISTRY (Special Paper - IX)
Physical Chemistry (22221505)**

Day & Date: Wednesday, 29-10-2025
Time: 09:00 AM To 12:00 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 a log table and calculator is allowed.

Q.1 A) Multiple choice questions. 10

- 1) It is impossible to measure precisely and accurately, the position and momentum of a quantum object. This is a statement of _____ is applicable for following pair of variables.
 - a) Heisenberg's uncertainty principle
 - b) Wave particle duality
 - c) De Broglie hypothesis
 - d) Compton effect
- 2) The activity of pure metal has the value of _____.
 - a) infinity
 - b) zero
 - c) unity
 - d) can't say
- 3) The dotted line in the phase diagram represents the state of _____.
 - a) stable equilibrium
 - b) metastable equilibrium
 - c) true equilibrium
 - d) non equilibrium
- 4) The chemiluminescence is observed in _____.
 - a) β -naphthol
 - b) luminol
 - c) anthracene
 - d) All of the above
- 5) The reduced phase rule is expressed as _____.
 - a) $F = C - P + 1$
 - b) $F = C - P - 2$
 - c) $F = C + P - 2$
 - d) $F = C - P$
- 6) For a reaction that obeys Einstein law, _____.
 - a) $\phi = 1$
 - b) $\phi > 1$
 - c) $\phi < 1$
 - d) $\phi = 0$
- 7) The equation $I_t = I_0 10^{-\epsilon ct}$ represents _____ law.
 - a) Lambert's
 - b) Beer's
 - c) Grotthus
 - d) Einstein's

- 8) Which electrode can be used as a reference electrode?
 - a) hydrogen gas
 - b) calomel
 - c) silver-silver chloride
 - d) All of these
- 9) Which of the following process is radiative?
 - a) internal conversion
 - b) intersystem crossing
 - c) both (a) and (b)
 - d) fluorescence
- 10) In photosynthesis, _____ acts as a sensitizer.
 - a) water
 - b) heat
 - c) chlorophyll
 - d) carbon dioxide

B) Fill in the blank/definitions/one sentence answer/one word answer/Give name/predict the product. 06

- 1) The mathematical expression for de Broglie hypothesis is given as _____.
- 2) What is chemiluminescence?
- 3) What is triple point in phase diagram?
- 4) State Wein's displacement law.
- 5) Write Schrödinger wave equation.
- 6) The free energy change and the emf of a cell are related as _____.

Q.2 Solve Any Eight of the following. 16

- a) Give two examples of sparingly soluble salts.
- b) State Stefan-Boltzmann fourth power law.
- c) State Beer-Lambert's law.
- d) What is standard electrode potential of Zn/Zn^{2+} ?
- e) Give the typical life times of fluorescence and phosphorescence.
- f) What is polymorphism?
- g) Define degree of freedom.
- h) Convert $7500 \text{ \AA}$ to corresponding frequency.
- i) State Stark-Einstein law of photochemical equivalence.
- j) State Gibbs' phase rule.

Q.3 A) Attempt Any Two of the following. 10

- a) With the help of neat labelled Jablonski diagram, explain various radiative photophysical pathways.
- b) Write a note on photoelectric effect.
- c) What is quantum yield. Give the reasons for low and high values of quantum yield.

B) Short note/ Solve 06
Derive the expression for Nernst equation.

Q.4 A) Attempt Any Two of the following. 08

- a) Discuss Compton effect.
- b) Write differences between photochemical and thermal reactions.
- c) Construct and explain the phase diagram for water.

B) Describe/Explain/Solve.**08**

The emf of a following cell is 0.675 V at 25°C while at 0°C it is 0.692 V, $\text{Cd}/\text{CdCl}_2 \cdot 2.5 \text{H}_2\text{O}(\text{s})/\text{AgCl}(\text{s})/\text{Ag}^+$

The cell reaction is $\text{Cd} + 2\text{AgCl}(\text{s}) + \text{H}_2\text{O} \rightarrow \text{CdCl}_2 \cdot 2.5\text{H}_2\text{O}(\text{s}) + 2\text{Ag}$

Calculate the free energy change, enthalpy change and entropy change for the above reaction at 25°C.

Q.5 Attempt Any Two of the following.**16**

- a) Derive an expression for emf of a concentration cell with transference.
- b) With the help of neat labelled phase diagram, discuss lead-silver system.
- c) What is black body? Discuss Planck's black body radiation distribution equation.

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
BOTANY (Special Paper - IX)
Plant Systematics (22221501)**

Day & Date: Wednesday, 29-10-2025
Time: 09:00 AM To 12:00 PM

Max. Marks: 80

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

Q.1 A) Multiple choice questions.

10

- 1) *Allium cepa* (Onion) is _____ type of modified stem.
 - a) Corn
 - b) Rhizome
 - c) Bulb
 - d) Tuber
- 2) APG stands for _____.
 - a) Angiosperm Phyllotaxy Group
 - b) Angiosperm Phylogenetic Group
 - c) Artificial Phylogenetic Group
 - d) Artificial Phylogenetic Family
- 3) In hypogynous flower the ovary is _____.
 - a) Superior
 - b) Inferior
 - c) Half superior
 - d) Half inferior
- 4) The organization of taxonomic information in logical classification is known as _____.
 - a) Phylogenetic
 - b) Systematic
 - c) Classical taxonomy
 - d) Cytotaxonomy
- 5) *Spathodea campanulata* belongs to family _____.
 - a) Annonaceae
 - b) Poaceae
 - c) Malvaceae
 - d) Bignoniaceae
- 6) In family Lamiaceae _____ type of inflorescence is found.
 - a) Verticillaster
 - b) Cyathium
 - c) Hypanthium
 - d) Spadix
- 7) *Bougainvillia spectabilis* belongs to family _____.
 - a) Poaceae
 - b) Nyctaginaceae
 - c) Rutaceae
 - d) Polygonaceae

- 8) In most angiosperms, petals are probably evolutionary derivatives of _____.
a) Peduncle b) Sepals
c) Stamens d) Carpels
- 9) In floral formula 'K' stands for _____.
a) Calyx b) Corolla
c) Perianth d) Androecium
- 10) _____ is an example of simple fruit.
a) Banana b) Apple
c) Pine apple d) Fig

B) Answer in one sentence.

06

- 1) Write any two demerits of APGIII system of classification.
- 2) Define flower.
- 3) Define phyllotaxy.
- 4) What is mean by hypogynous flower?
- 5) Define inflorescence.
- 6) Which is the lowermost category in classification?

Q.2 Solve Any Eight of the following.

16

- a) Write reproductive characters of family Malvaceae.
- b) What is the evolutionary trend in flower symmetry?
- c) Enlist 4 examples of modification of root.
- d) Draw structure of typical flower.
- e) Write any two merits of Engler and Prantl system of classification.
- f) Enlist types of aestivation.
- g) Mention economic importance of family Nyctaginaceae.
- h) Enlist types of ovule.
- i) What is evolutionary trend in carpel number?
- j) Enlist special types of inflorescence.

Q.3 A) Attempt Any Two of the following.

10

- Describe evolutionary trends of xylem.
- Write concept of floral diagram.
- Write merits of APG III system of classification.

B) Write Shorts note on.

06

Types of Placentation

Q.4 A) Attempt Any Two of the following.

08

- Describe the structure of typical Gynoecium with a neat labelled sketch.
- Describe types of pinnately compound leaf.
- Mention economic importance of family Lamiaceae.

B) Describe vegetative and reproductive characters of Family- Poaceae.

08

Q.5 Attempt Any Two of the following.

16

- a)** Describe any four types of racemose inflorescence with diagram.
- b)** Explain in detail outline of Englar & Prantl system of classification.
- c)** Describe types of stem modification.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
ZOOLOGY (Special Paper - IX)
Molecular Biology (22221513)**

Day & Date: Wednesday, 29-10-2025
Time: 09:00 AM To 12:00 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 Watson and Crick model of DNA describes _____.
 - a) DNA is single-stranded
 - b) DNA is a double helix
 - c) RNA is a double helix
 - d) DNA replication is conservative
- 2) Which of the following enzymes is involved in unwinding the DNA during replication?
 - a) DNA polymerase
 - b) DNA ligase
 - c) Helicase
 - d) RNA polymerase
- 3) In eukaryotes, the mRNA is modified at the 3' end by _____.
 - a) Capping
 - b) Splicing
 - c) Polyadenylation
 - d) Exon-exon joining
- 4) The genetic code is characterized by _____.
 - a) 1 codon per amino acid
 - b) Codons that overlap
 - c) Codons that are read in a non-degenerate way
 - d) Multiple codons coding for a single amino acid
- 5) The lac operon is involved in the regulation of _____.
 - a) Lipid metabolism
 - b) Amino acid synthesis
 - c) Sugar metabolism
 - d) RNA transcription
- 6) Which of the following is a post-transcriptional modification?
 - a) DNA methylation
 - b) RNA splicing
 - c) DNA replication
 - d) Transcription initiation
- 7) Which mechanism of DNA repair involves the removal of pyrimidine dimers?
 - a) Mismatch repair
 - b) Base excision repair
 - c) Nucleotide excision repair
 - d) Photoreactivation

- 8) The semi-conservative model of DNA replication was experimentally proven by _____.
 a) Hershey and Chase b) Meselson and Stahl
 c) Watson and Crick d) Franklin and Wilkins
- 9) siRNA is involved in _____.
 a) Gene regulation b) Protein synthesis
 c) DNA replication d) mRNA degradation
- 10) Which of the following is NOT a part of recombinant DNA technology?
 a) Restriction enzymes b) DNA ligase
 c) RNA polymerase d) DNA polymerase

B) One-line/Fill in the blanks/Definition.**06**

- 1) Define RNA interference.
- 2) What is the significance of the lac operon?
- 3) Write the full form of PCR.
- 4) Define exon.
- 5) What is the function of the enzyme RNA polymerase?
- 6) Name the type of RNA that carries genetic information from DNA to the ribosome.

Q.2 Solve Any Eight of the following.**16**

- a) Explain the salient features of DNA.
- b) What is DNA replication? Explain the process in prokaryotes.
- c) Explain the concept of gene regulation in prokaryotes using the lac operon model.
- d) Describe the properties of the genetic code.
- e) What are the functions of tRNA during protein synthesis?
- f) Discuss the differences between prokaryotic and eukaryotic transcription.
- g) Explain the process of RNA splicing.
- h) Write about the mechanism of post-transcriptional modifications in eukaryotic mRNA.
- i) Discuss the structure and function of ribosomes.
- j) What is recombination in DNA technology? Explain its applications.

Q.3 A) Attempt Any Two of the following.**10**

- a) Describe the process of translation in prokaryotes.
- b) Explain DNA replication in eukaryotes.
- c) Write a detailed note on Pyrimidine dimerization and mismatch repair mechanisms.

B) Short note/ Solve**06**

Write a short note on the Wobble Hypothesis.

- Q.4 A) Attempt Any Two of the following. 08**
- a) Explain the semi-conservative nature of DNA replication with diagrams.
 - b) Describe the role of RNA polymerase in transcription.
 - c) Define post-transcriptional modifications. Discuss their significance.
- B) Describe/Explain/Solve. 08**
- Explain recombinant DNA technology and its applications in medicine.
- Q.5 Attempt Any Two of the following. 16**
- a) Describe gene regulation in eukaryotes.
 - b) Explain the process of protein synthesis with respect to translation.
 - c) Discuss the mechanism of RNA interference and its applications.

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
MATHEMATICS (Special Paper - IX)
Algebra - II (22221517)**

Day & Date: Wednesday, 29-10-2025
Time: 09:00 AM To 12:00 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 dimension of $P_3(\mathbb{R})$ is _____.
a) n
b) n^2
c) $n + 1$
d) 4
- 2) If F is field then the number of ideals of F are _____.
a) 0
b) 2
c) 1
d) ∞
- 3) Which of the following is false if θ is homomorphism from $R \rightarrow s$?
a) $\ker \theta$ is subring of R
b) $\ker \theta$ is ideal of R
c) $\ker \theta$ is additive subgroup of R
d) $\ker \theta = \{O_R\}$
- 4) The kernel of the homomorphism $\theta: z \rightarrow z_n$ is the set _____.
a) $[n]$
b) $[n^2]$
c) $[0]$
d) $[e]$
- 5) Which of the following are not vector spaces?
a) $C(R)$
b) $C(C)$
c) $R(Q)$
d) $R(C)$
- 6) Let $T: V \rightarrow u$ be a linear transformation then $\frac{V}{\ker T} \cong$ _____.
a) Range T
b) Null space of T
c) V
d) U
- 7) Consider the two statements
i) Any subject of linearly independent set is linearly independent
ii) Any superset of linearly dependent set is linearly dependent
Then _____
a) Only (i) is true
b) Only (ii) is true
c) Both (i) & (ii) are true
d) Both (i) & (ii) are false

B) Define inner product space and hence solve $|\langle x, y \rangle| \leq \|x\| \cdot \|y\|$ **06**

Q.4 A) Attempt Any Two of the following. **08**

a) Let S be a linearly independent subset of a vector space V and v be a vector in V that is not in S then prove that $S \cup \{v\}$ is linearly dependent iff $v \in \text{span}(S)$.

b) Prove the parallelogram law on inner product space V . i.e.

$$\|x + y\|^2 + \|x - y\|^2 = 2\|x\|^2 + 2\|y\|^2$$

c) If D is an integral domain then prove that characteristic of D is either 0 or prime.

B) Prove that the span of any subset S of a vector space V is a subspace of V and any subspace of V that contains S must contain $\text{span}(S)$. **08**

Q.5 Attempt Any Two of the following. **16**

a) State and prove Replacement theorem.

b) Prove that P is prime ideal iff R/P is an integral domain.

c) Let W be a subspace of a finite dimensional vector space V . Then prove that W is finite dimensional & $\dim(W) \leq \dim(V)$ Also show that if $\dim(W) = \dim(V)$ then $V = W$.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
STATISTICS (Special Paper - IX)
Statistical Inference – I (22221520)**

Day & Date: Wednesday, 29-10-2025
Time: 09:00 AM To 12:00 PM

Max. Marks: 80

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

Q.1 A) Multiple choice questions. 10

- 1) The types of estimates are _____.
 - a) Point estimate
 - b) Interval estimate
 - c) Estimation of confidence region
 - d) All the above
- 2) Which one of the following is unique estimator?
 - a) Unbiased
 - b) Biased
 - c) U.M.V.U.E.
 - d) Sufficient
- 3) If T_1 and T_2 be two unbiased estimator of θ . The estimator T_1 is said to be more efficient than estimator T_2 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
- 4) If T is unbiased for θ then $\phi(T)$ is unbiased for $\phi(\theta)$ if ϕ is _____.
 - a) Linear
 - b) Continuous
 - c) Onto
 - d) One-to-one
- 5) If the expected value of an estimator is 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
- 6) An estimator is considered to be best if its distribution is _____.
 - a) Continuous
 - b) Discrete
 - c) Concentrated about the true parameter value
 - d) Normal
- 7) Efficiency of an estimator is related to _____.
 - a) Mean
 - b) Median
 - c) Mode
 - d) Variance

- 8) Bias of an estimator can be _____.
a) Positive b) Negative
c) Either positive or negative d) Always Zero
- 9) The estimator $\frac{\sum X_i}{n}$ of population mean is _____.
a) An Unbiased estimator b) A biased estimator
c) Both a and b d) None of these
- 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) If statistic T is unbiased estimator of parameter θ then unbiased estimator of $7\theta-2$ is _____.
- 2) If an Estimator T_n of population parameter θ converges in probability to θ as n tends to infinity is said to be _____.
- 3) A statistic is a function of _____.
- 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) The denominator in the Crammer-Rao inequality is known as _____.

Q.2 Solve Any Eight of the following.

16

- a) Define a statistic and give one example.
- b) Define likelihood function of a random variable $X_1, X_2, \dots, X_n$ from Poisson distribution with parameter θ .
- c) Define information function $I(\theta)$ of parameter θ .
- d) Distinguish between an estimator and estimate.
- e) Show that sample mean is unbiased estimator of population mean.
- f) Define Minimum Variance Unbiased Estimator (MVUE).
- g) Define a Parameter and give one example.
- h) Define likelihood function of a random variable $X_1, X_2, \dots, X_n$ from geometric distribution with parameter θ .
- i) Prove that sample SD is always biased estimator of population SD.
- j) Define sampling distribution of an estimator.

Q.3 A) Attempt Any Two of the following.

10

- Let $X_1, X_2, \dots, X_n$ be a random sample from $U(0, \theta)$ then find sufficient statistic for θ .
- Prove that two distinct unbiased estimators of $\phi(\theta)$ give rise to infinitely many Unbiased Estimator of $\phi(\theta)$.
- Let $X_1, X_2, \dots, X_n$ be a r.s. from $N(\theta, \sigma^2)$ distribution. Show that the sample mean Square s^2 is consistent estimator of σ^2 .

- B)** Explain the concept of sufficiency. Let $X_1, X_2, \dots, X_n$ be a random sample of size n from a distribution with pdf
 $f(x, \theta) = \theta x^{\theta-1} ; 0 < x < 1$
 0 ; otherwise.
 obtain a sufficient statistic for θ . **06**

Q.4 A) Attempt Any Two of the following. **08**

- a) Obtain the MLE of the parameter θ based on a.r.s. of size n from Binomial Distribution.
- b) State and prove sufficient condition for consistency for θ
- c) Explain the procedure of obtaining the estimate of the parameters by method of maximum likelihood estimator.

- B)** Let X_1 and X_2 is a r.s from $P(\theta)$ distribution let $T_1 = \frac{X_1+X_2}{2}, T_2 = \frac{X_1+2X_2}{3}$ **08**
 Show that T_1 and T_2 are unbiased estimator of μ and also find the efficiency of T_2 in relative to T_1 .

Q.5 Attempt Any Two of the following. **16**

- a) State and prove Uniqueness theorem for UMVUE.
- b) If X has $N(\mu, \sigma^2)$ find the Fisher information function.
 - i) $I(\mu)$ when σ^2 is known
 - ii) $I(\sigma^2)$ when μ is known
- c) State and prove Crammer Rao Inequality.

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
GEOLOGY (Special Paper - IX)
Economic Geology (22221525)**

Day & Date: Wednesday, 29-10-2025
Time: 09:00 AM To 12:00 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 calculator is allowed.

Q.1 A) Multiple choice questions.

10

- 1) The useless mineral which occurs in association with ore is called _____.
a) Tenor
b) Gangue mineral
c) Ore deposit
d) Metallic ore
- 2) Corundum is an example _____.
a) Abrasive mineral
b) Mineral fuel
c) Refractory minerals
d) Mineral pigment
- 3) When a vein is not filled completely with mineral matter, open spaces left in the center such unfilled spaces are called _____.
a) Chambered
b) Hollow
c) Vugs
d) Cavity
- 4) Which type of coal shows brown colour _____.
a) Semi bituminous
b) Anthracite
c) Bituminous
d) Lignite
- 5) Cavity filling is association with mainly _____.
a) Mechanical concentration
b) Sedimentation
c) Contact Metasomatic
d) Hydrothermal Processes
- 6) Pyrolusite is a mineral of _____.
a) Manganese
b) Lead
c) Iron
d) Copper
- 7) Which country is highest producer of diamond _____.
a) China
b) Russia
c) India
d) Greenland

- 8) Diamond in kimberlite and corundum in nephelinesyenite are good examples of _____.
a) Disseminated deposit b) Segregated deposit
c) Injected deposit d) Pegmatitic deposit
- 9) The ore deposits that are formed at the same time as the enclosing rock are called _____.
a) Syngenetic b) Epigenetic
c) Hypogenenic d) Syncgenetic
- 10) Hutti gold mines are located in _____ state of India.
a) Karnataka b) Madhya Pradesh
c) Sikkim d) Bihar

B) Fill in the blanks:**06**

- 1) The tenor value of gold is always _____.
- 2) The oldest oil field in India _____.
- 3) The highest rank of coal _____.
- 4) The placer deposits that occur along hill slopes are _____.
- 5) Hydrothermal ore deposits of mesothermal type are formed at _____ temperature.
- 6) Ruby is gem variety of _____.

Q.2 Solve Any Eight of the following.**16**

- a) What is crustification?
- b) List the ores of iron.
- c) Write two types of early magmatic ore deposit.
- d) Define sublimation.
- e) Give the name of any 4 metallic ore deposit.
- f) Write down rank of coal.
- g) Give examples of residual deposits.
- h) What are the condition required for formation of petroleum?
- i) What is pegmatite?
- j) Give example of Dissemination ore deposit.

Q.3 A) Attempt Any Two of the following.**10**

- a) Write a note on residual deposit.
- b) Explain late magmatic ore deposit with suitable diagram.
- c) Explain in brief cavity filling deposit.

B) Write short note on contact metasomatic deposit.**06****Q.4 A) Attempt Any Two of the following.****08**

- a) Discuss the geological occurrence and distribution of iron ore in India.
- b) What is magmatic concentration? explain early magmatic concentration deposit.
- c) Define hydrothermal deposit? Explain classification of hydrothermal deposit.

B) Describe the origin, occurrence and distribution of coal. **08**

Q.5 Attempt Any Two of the following. 16

- a)** Define Gossan. Write a brief note on Supergene Sulphide enrichment with neat labelled diagram.
- b)** Discuss the distribution of petroliferous basin of India.
- c)** Discuss the geological occurrence and distribution of gold deposits in India.

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
MICROBIOLOGY (Special Paper - IX)
Virology (22221529)**

Day & Date: Wednesday, 29-10-2025
Time: 09:00 AM To 12:00 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) The protein coat surrounding the viral genome is called _____.
 - a) Capsid
 - b) Envelope
 - c) Core
 - d) Matrix
- 2) Which protein is crucial for maintaining the lysogenic state in Lambda phage?
 - a) Cro protein
 - b) CI repressor protein
 - c) Lysozyme
 - d) RNA polymerase
- 3) Which of the following stages is observed in a one-step growth curve after the latent period?
 - a) Eclipse phase
 - b) Adsorption phase
 - c) Burst or release phase
 - d) Attachment phase
- 4) Which method is commonly used for the enumeration of bacteriophages?
 - a) Plaque assay
 - b) Hemagglutination assay
 - c) ELISA
 - d) Western blot
- 5) Which of the following is the genome of the virus?
 - a) DNA
 - b) RNA
 - c) DNA or RNA
 - d) DNA and RNA
- 6) Which of the following statements are true about a virion?
 - a) Lytic phage
 - b) Lysogenic phage
 - c) The viral capsid
 - d) An infectious and fully formed viral particle
- 7) The genetic material of the Tobacco Mosaic Virus (TMV) is _____.
 - a) Single-stranded DNA
 - b) Double-stranded DNA
 - c) Single-stranded RNA
 - d) Double-stranded RNA

- 8) Which of the following is the genetic material of Adenoviruses?
 a) Single-stranded RNA b) Double-stranded RNA
 c) Single-stranded DNA d) Double-stranded DNA
- 9) Infectious RNA particles without the protein coat are called _____.
 a) Prion b) Virion
 c) Viroid d) Virusoid
- 10) The viral genome inserted into the bacterial DNA is termed as _____.
 a) Lysogeny b) Prophage
 c) Lytic cycle d) Virulent phage

B) Fill in the blank / Definition / One sentence answer / One-word answer / Give the name / Predict the product etc. 06

- 1) What is the role of the capsid in a virus?
- 2) What is the first step in the T4 bacteriophage lytic cycle?
- 3) Give the name of diseases caused by Influenza virus.
- 4) What is a temperate phage?
- 5) What type of genetic material does bacteriophage ØX 174 contain?
- 6) Give the name of any two animal viruses.

Q.2 Solve Any Eight of the following. 16

- a) Define virus.
- b) Define Prions.
- c) Give the two names of oncogenic viruses.
- d) Enlist the different types of cancer.
- e) What type of Genetic material present in the Ebola Virus.
- f) What is the basis of the Baltimore classification system?
- g) What are the symptoms of Swine flu?
- h) What are the symptoms of HIV virus?
- i) Enlist the names of techniques used for the purification of viruses.
- j) How do viroids differ from viruses?

Q.3 A) Attempt Any Two of the following. 10

- a) Explain the general properties of viruses.
- b) Describe the mechanism of replication of prions.
- c) Explain the Viral classification based on the LHT system.

B) Write a short note on Viroids and Prions. 06

Q.4 A) Attempt Any Two of the following. 08

- a) Give the characteristics of cancerous cell.
- b) Draw a neat labeled diagram of lambda bacteriophage.
- c) Describe the embryonated egg inoculation technique used for isolating viruses.

B) Explain the Prevention and Control of plant viral diseases. 08

Q.5 Attempt Any Two of the following.

- a)** Explain in detail Tobacco mosaic virus (TMV) disease.
- b)** Describe the reproduction of Adenoviruses.
- c)** Explain in detail the concept of the One-step growth curve experiment.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
ELECTRONICS (Special Paper - IX)
Linear Integrated Circuits and Applications (22221537)**

Day & Date: Wednesday, 29-10-2025
Time: 09:00 AM To 12:00 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 calculator is allowed.

Q.1 A) Multiple choice questions. 10

- 1) _____ process is used for growing a single crystal silicon structure upon an original silicon substrate.
 - a) Oxidation
 - b) Lithography
 - c) Epitaxial
 - d) Ion Implantation
- 2) An antilog amplifier has a _____ in series with the input.
 - a) inductor
 - b) a resistor
 - c) a capacitor
 - d) diode or BJT
- 3) In the notch filter the quality factor is _____.
 - a) greater than 10
 - b) equal to bandwidth
 - c) zero
 - d) less than 10
- 4) IC _____ is a negative adjustable voltage regulator.
 - a) LM 317
 - b) LM 337
 - c) LM 331
 - d) LF 398
- 5) In case of PLL, the capture range is always _____ the lock range.
 - a) less than
 - b) equal with
 - c) greater than
 - d) equal with VCO frequency
- 6) _____ IC corresponds to PLL.
 - a) IC 555
 - b) IC 565
 - c) IC 547
 - d) IC 556
- 7) For proper operation of voltage regulator input voltage must be _____ the output voltage.
 - a) less than
 - b) equal to
 - c) greater than
 - d) all of these
- 8) In an active clipper circuit the clipping level is decided by the _____.
 - a) input voltage
 - b) supply voltage
 - c) output voltage
 - d) reference voltage.

- 9) _____ circuit is also called as an amplitude limiter.
 a) Peak detector b) Clipper
 c) Clamper d) S/H
- 10) In the Monolithic npn transistor, the buried layer is of _____.
 a) n type b) p+ type
 c) n+ type d) p type

B) Define the following terms.**06**

- 1) Peak Detector
- 2) Roll of rate
- 3) Integrated circuit
- 4) Load regulation
- 5) VCO
- 6) Active filter

Q.2 Solve Any Eight of the following.**16**

- a) State the types of an integrated circuit.
- b) Draw the diagram of active clamper circuit.
- c) Define Band stop active filter.
- d) Write the important features of the three terminal IC regulators.
- e) Define lock range and capture range of PLL.
- f) Calculate the value of IC resistance having sheet resistance of $20 \Omega / \text{sq.}$ and has aspect ratio $L:W=40:4$.
- g) Draw the circuit diagram of antilog amplifier.
- h) Give the advantages of active filters.
- i) Calculate low cut off frequency of second order high pass filter. if $R_1 = R_2 = 33 \text{ K } \Omega$ and $C_1 = C_2 = 0.0047 \mu\text{F}$.
- j) Draw the basic block diagram IC regulator.

Q.3 A) Attempt Any Two of the following.**10**

- a) Explain monolithic diode.
- b) Explain working of sample and hold circuit using Op-Amp.
- c) Explain working of band pass filter.

B) Explain second order Butterworth high pass filter.**06****Q.4 A) Attempt Any Two of the following.****08**

- a) Explain working of active clipper.
- b) Explain working of PLL as a frequency multiplier.
- c) Explain block diagram of basic IC regulator.

B) Explain working of PLL with its transfer characteristics.**08****Q.5 Attempt Any Two of the following.****16**

- a) Explain in brief the steps involved in the fabrication of IC.
- b) Give the classification of filter and explain second order low pass filter.
- c) Explain basic operation of voltage-controlled oscillator.

Seat No.	

Set **P**

B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
COMPUTER SCIENCE (Special Paper - IX)
Data Communication and Networking (22221533)

Day & Date: Wednesday, 29-10-2025
Time: 09:00 AM To 12:00 PM

Max. Marks: 80

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

Q.1 A) Multiple choice questions. 10

- 1) Which one of the following is not a function of network layer?
 - a) congestion control
 - b) error control
 - c) routing
 - d) inter-networking
- 2) Communication between a computer and a keyboard involves transmission.
 - a) simplex
 - b) half-duplex
 - c) full-duplex
 - d) automatic
- 3) _____ is a network that this technology connects sites that are in diverse locations.
 - a) LAN
 - b) MAN
 - c) WAN
 - d) None of these
- 4) What does each packet contain in a virtual circuit network?
 - a) only source address
 - b) only destination address
 - c) full source and destination address
 - d) a short VC number
- 5) Check sum is used for _____.
 - a) Error correction
 - b) Error detection
 - c) Both a & b
 - d) None of these
- 6) Which of the following is the network layer protocol for the internet?
 - a) hypertext transfer protocol
 - b) file transfer protocol
 - c) Ethernet
 - d) internet protocol
- 7) Repeater operates in which layer of the OSI model _____.
 - a) Physical Layer
 - b) Network Layer
 - c) Data link Layer
 - d) Transport Layer

- 8) The most common technique to change an analog signal to digital data is called _____.
 - a) PAL
 - b) PCM
 - c) Sampling
 - d) None of the above
- 9) In transmission, the carrier signal is modulated so that its amplitude varies with the changing amplitudes of the modulating signal.
 - a) AM
 - b) PM
 - c) FM
 - d) None of the above
- 10) In _____ topology the traffic is only in one direction.
 - a) Mesh
 - b) Bus
 - c) Star
 - d) Ring

B) Give the answer of below questions.

06

- 1) The _____ is the protocol used to make hypertext document readable on WWW.
- 2) CSMA/CA stands for _____.
- 3) A computer that facilitates data sharing, resource sharing etc on a network is known as _____.
- 4) A physical address assigned by NIC manufacturer is called _____ address.
- 5) _____ is the technique of changing the characteristics of the signal being transmitted so that it carries data on it.
- 6) _____ is the process of efficiently selecting a path in a network along which data packets will travel to their destination.

Q.2 Solve Any Eight of the following.

16

- a) What is UDP?
- b) What is Routing?
- c) What is data flow?
- d) Define error and its types.
- e) List the components of communication.
- f) What is ALOHA?
- g) What is a noise?
- h) Define router and switch.
- i) Define Protocols & Standards.
- j) Long form of RTP, SMTP.

Q.3 A) Attempt Any Two of the following.

10

- Explain Fiber Optic Cable.
- Explain Checksum Check with example.
- Write a note on packet switching.

B) Explain Shortest Path Routing in detail.

06

Q.4 A) Attempt Any Two of the following. 08
a) Explain Satellite Communication.
b) Explain Go Back N ARQ.
c) Explain Modulation with its types.

B) Explain ISO-OSI reference model in detail. 08

Q.5 Attempt Any Two of the following. 16
a) Explain Data Compression in detail.
b) Explain Multiplexing in detail.
c) Explain Congestion Control in Virtual-Circuit Subnets.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
PHYSICS (Special Paper - X)
Solid State Physics (22221510)**

Day & Date: Thursday, 30-10-2025
Time: 09:00 AM To 12:00 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 table and calculators is allowed.

Q.1 A) Multiple choice questions. 10

- 1) Superconductor exhibits a perfect _____.
a) paramagnetism b) diamagnetism
c) ferromagnetism d) ferrimagnetism
- 2) The superconducting materials which exhibit two critical fields (H_{C1} & H_{C2}) and mixed state are called _____.
a) type-I superconductors
b) type-II superconductors
c) type-I as well as type-II superconductors
d) None of these
- 3) The magnetic susceptibility of diamagnetic materials is _____.
a) zero b) negative
c) positive d) infinity
- 4) According to Curie law, susceptibility χ is _____.
a) directly proportional to T
b) inversely proportional to T
c) inversely proportional to T^2
d) inversely proportional to $T^{1/2}$
- 5) In insulator _____ band is completely filled by an electron.
a) conduction b) valence
c) energy d) forbidden
- 6) In metal, forbidden energy gap E_g is of the order of _____.
a) 5 to 6 eV b) 0.75 to 1 eV
c) 0 eV d) 10 to 20 eV

- 7) The electrical conductivity of metal is _____.
 a) independent on electron density
 b) dependent on electron density
 c) independent on proton density
 d) dependent on proton density
- 8) Fermi energy $E_f =$ _____.
 a) $\frac{h^2 m^2}{8L^2 R^2}$
 b) $\frac{h^2 L^2}{8m^2 R^2}$
 c) $\frac{h^2 R^2}{8mL^2}$
 d) $\frac{m^2 L^2}{8h^2 R^2}$
- 9) X-rays are _____.
 a) Electromagnetic waves
 b) Visible radiations
 c) Radio waves
 d) Doctor waves
- 10) Who discovered X-rays?
 a) Rontgen
 b) Einstein
 c) Maxwell
 d) Fermi

B) One sentence answer.**06**

- 1) Who observed the phenomenon of superconductivity for the first time?
- 2) Which type of magnetic material, the ferrite belongs?
- 3) For which charge carriers Hall coefficient is positive?
- 4) Write down the electronic configuration of sodium.
- 5) State Wiedmann-Franz relation.
- 6) Can we determine size of unit cell of the crystal from X-ray diffraction study?

Q.2 Solve any eight of the following.**16**

- a) What is superconductor?
- b) Define Curie temperature.
- c) Define Neel temperature.
- d) Define valence band.
- e) Define conduction band.
- f) Explain degeneracy of energy states in metals.
- g) State any four properties of metals.
- h) Define reciprocal lattice.
- i) State relation between direct lattice and reciprocal lattice.
- j) Draw (100) plane.

Q.3 A) Attempt any Two of the following.**10**

- a) Explain "Hysteresis loop" in ferromagnetic material.
- b) Derive an expression for effective mass of an electron.
- c) Explain Braggs law in reciprocal lattice.

- B)** Derive an expression for the interplaner spacing for the plane of (hkl) type in the cubic structure. **06**

- Q.4 A) Attempt any Two of the following. 08**
- a) What is Meissner effect?
 - b) Explain the effect of Magnetic field on superconductor.
 - c) Discuss Fermi-Dirac distribution of electron in metal.
- B) Explain Sommerfeld's model of metal. Derive an expression for the energy of a free electron in the metal. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Describe seven systems of crystal with suitable diagrams.
 - b) Describe powder method of X-ray diffraction for analysis of cubic structure.
 - c) Explain in detail about motion of electron in one-dimensional periodic potential.

Seat No.	

Set

**B.Sc. (Plain) (Semester - V) (New) (CBSC) Examination:
October/November - 2025
CHEMISTRY (Special Paper – X)
Inorganic Chemistry (22221506)**

Day & Date: Thursday, 30-10-2025
Time: 09:00 AM To 12:00 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 calculator is allowed.

Q.1 A) Multiple choice questions. 10

- 1) Tetragonal complexes have additional stabilization over _____ complex.

a) square planar	b) regular octahedral
c) tetrahedral	d) trigonal pyramidal
- 2) Efficiency of catalyst increases with increasing _____ of the metal catalyst.

a) smoothness
b) roughness
c) neither smoothness nor roughness
d) None of these
- 3) In fast breeder nuclear reactor, the fuel used is _____.

a) U-239	b) Th-231
c) Th-232	d) Pu-232
- 4) There are _____ heme groups in hemoglobin.

a) 1	b) 2
c) 3	d) 4
- 5) Manufacture of ammonia by Sulphuric acid by contact process using _____ catalyst.

a) Pt	b) Fe/Mo
c) Ni	d) Fe ₂ O ₃
- 6) Jahn-Teller effect can account for _____ complex.

a) regular octahedral	b) square planar
c) tetrahedral	d) tetragonal
- 7) Porphyrin is _____ dentate ligand.

a) mono	b) bi
c) tri	d) tetra

- 8) CFSE for d^1 tetrahedral complex is _____.
a) $-6Dq$
b) $4Dq$
c) $0.4Dq$
d) $10Dq$
- 9) _____ component of fertilizer is used in stimulates early growth purpose.
a) Phosphorus
b) Nitrogen
c) Potassium
d) Oxygen
- 10) Increase in CFSE _____ the stability of the complexes.
a) decreases
b) increases
c) first increases then decreases
d) keep the same

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. **06**

- 1) Define nuclear fusion and fission reactions.
- 2) Define homogeneous catalyst.
- 3) Give the name of elements used as control rods in the nuclear reactor.
- 4) Give the any two factors responsible for crystal field stabilization energy.
- 5) Give an example of macro elements in the biological process.
- 6) What is mean by artificial transmutation?

Q.2 Solve any eight of the following. 16

- Give the four limitations of MOT.
- What are endothermic nuclear reactions?
- What is the function of sodium in our body?
- What are the types of catalyst?
- Draw the labelled diagram of Boiling water nuclear energy plant.
- Draw the structure of Myoglobin.
- What is mixed fertilizer and give one example?
- Give the functions of metal ion in biological process.
- Calculate the magnetic moment of $[\text{Co}(\text{NH}_3)_6]^{+3}$ complex.
- What is the role of moderator in nuclear reactor with example?

Q.3 A) Attempt any Two of the following. 10

- What are factors affecting on the crystal field splitting.
- Write a note on Fast breeder nuclear reactor.
- Write note on manufacturing of urea in detail.

B) Short note/Solve **06**

Give the difference between Hemoglobin and Myoglobin.

Q.4 A) Attempt any Two of the following. 08

- a) What do you mean by the terms positive and negative catalysis? Differentiate with examples.
- b) Explain the Jahn Teller effect in hexachlorocuparate (II) ion $[\text{Cu}(\text{Cl})_6]^{2+}$
- c) Explain radioisotopes as tracers for structural determination of phosphorus pentachloride.

B) Describe/Explain/Solve. 08

Explain the structure and working of ion pump.

Q.5 Attempt any Two of the following. 16

- a) Discuss the adsorption theory of the catalysis.
- b) With the help of MO diagram, explain the formation and characteristics of $[\text{Fe}(\text{CN})_6]^{3-}$.
- c) Write a note on classification and types of nuclear reactions.

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
BOTANY (Special Paper - X)
Genetics (22221502)**

Day & Date: Thursday, 30-10-2025
Time: 09:00 AM To 12:00 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 calculator is allowed.

O.1 A) Multiple choice questions.

10

- 1) Study of genes, genetic variation & heredity is called _____.
 - a) Genetics
 - b) Bioinformatics
 - c) Biotechnology
 - d) Physiology
- 2) Cytoplasmic inheritance carried out by _____.
 - a) Mitochondria only
 - b) Chloroplast only
 - c) Mitochondria and Chloroplast
 - d) Golgi Body
- 3) Holandric characters are carried out by _____ chromosomes in man.
 - a) A
 - b) X
 - c) Y
 - d) Z
- 4) The strength of linkage between two genes depend upon the distance between the genes on chromosome was proposed by _____.
 - a) Mendel
 - b) Morgan
 - c) Darwin
 - d) Lamarck
- 5) Triploid female in *Drosophilla* is denoted as _____.
 - a) $3A+XXX$
 - b) $2A+XY$
 - c) $2A+XXX$
 - d) $3A+XY$
- 6) A person with colour blindness cannot distinguish _____ colours.
 - a) Black & White
 - b) Red & Green
 - c) Yellow & Orange
 - d) Blue & Green
- 7) Ear length in *Zea mays* represents _____ inheritance.
 - a) Mendelian
 - b) Cytoplasmic
 - c) Polygenic
 - d) Linkage

- 8) Locus represents _____ of gene on chromosome.
- a) Function b) Size
- c) Number d) Physical location
- 9) Petite in Yeast controlled by _____.
- a) Chloroplast DNA b) Mitochondrial DNA
- c) Nuclear DNA d) None of Above
- 10) Complete linkage observed in _____.
- a) *Drosophilla* b) Lizard
- c) Bird d) Frog

B) Fill in the blank/Give answer in one sentence.

06

- 1) What are autosomes?
- 2) What is recessive trait?
- 3) Genotype of homozygous tall plant is _____.
- 4) Define Sterility in plants.
- 5) Define variation.
- 6) Hypertrichosis is an example of _____ linked inheritance.

Q.2 Solve any eight of the following.

16

- a) What is Phenotypic ratio?
- b) Define Gene.
- c) Enlist the sex chromosomes in man.
- d) How many linkage groups found in *Drosophila*.
- e) What is mean by incomplete linkage?
- f) State the Mendel's law of segregation.
- g) What is the cause for coupling and repulsion of alleles?
- h) Enlist factors affecting gene frequency.
- i) What is back cross?
- j) What is polygenic inheritance?

Q.3 A) Attempt any Two of the following.

10

- Give an account Bridges experiment of sex determination.
- Distinguish between Autosomes and sex chromosomes.
- Describe the concept of crossing over with its significance.

B) Explain in brief Colour blindness in man with suitable example.

06

Q.4 A) Attempt any Two of the following.

08

- Explain Hardy -Weinberg's law with suitable example.
- Describe Haemophilia in man.
- What is genetic mapping? Explain it with three factor cross.

B) Explain the Mendels law of independent assortment.

08

Q.5 Attempt any Two of the following.

16

- a)** Explain mechanism of sex determination in man (Human).
- b)** Describe chloroplast inheritance in *Mirabilis jalapa*.
- c)** Explain in brief interaction of supplementary gene.

Set P

**B.Sc. (Plain) (Semester – V) (New) (CBSC) Examination:
October/November - 2025
ZOOLOGY (Special Paper-X)
Principles of Genetics (22221514)**

Day & Date: Thursday, 30-09-2025
Time: 09:00 AM To 12:00 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 calculator is allowed.

Q.1 A) Multiple choice questions. 10

- 1) The Phenomenon of two or more than two genes affecting the expression of each other is called _____.
 - a) Crossing over
 - b) Pairing
 - c) Gene interaction
 - d) Linkage
- 2) Color blindness and Hemophilia are well known examples of _____ genes.
 - a) Complementary
 - b) Supplementary
 - c) Multiple genes
 - d) Sex linked genes
- 3) Crossing over, the exchange of genetic material between non-sister chromatids of homologous chromosomes, occurs during the _____.
 - a) Prophase I
 - b) Metaphase I
 - c) Anaphase I
 - d) Telophase I
- 4) Deletion, duplication, inversion and translocation are types of _____.
 - a) Linkages
 - b) Mutations
 - c) Sex determination
 - d) Crossing over
- 5) Down syndrome is caused due to _____.
 - a) Bacterial infection
 - b) A chromosomal abnormality
 - c) Viral infection
 - d) Lack of oxygen supply to the brain during birth
- 6) _____ syndrome is most commonly associated with females,
 - a) Turners
 - b) Down
 - c) Klinefelters
 - d) Williams

- 7) _____ means a character or phenotypic trait, which is regulated by more than one gene.
- a) Sex linked inheritance b) Polygenic inheritance
c) Mutation d) Gene interaction
- 8) The geometrical device that helps to find out all possible combinations of male & female gametes is known as _____.
- a) Bateson Square b) Mendel Square
c) Punnett Square d) Mendel's Cube
- 9) The process by which one bacterium transfers genetic material to another through direct contact is called _____.
- a) Mutation b) Conjugation
c) Fragmentation d) Extension
- 10) Transposons are also known as _____.
- a) Lethal genes b) Multiple genes
c) Jumping genes d) Sex linked genes

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. 06

- 1) _____ law states that the two alleles of a pair segregate or separate during gamete formation such that a gamete receives only one of the two factors.
- 2) _____ is defined as the branch of biology that deals with the study of genetic variation, genes, and heredity.
- 3) The alternative forms of same gene influenced on same trait is called _____.
- 4) Jumping genes are called as _____.
- 5) Chromosome 21, specifically an extra or partial copy (trisomy 21), is responsible for _____ syndrome.
- 6) Inheritance of skin color is an example of _____.

Q.2 Solve any eight of the following. 16

- a) What is incomplete dominance?
b) Define lethal genes.
c) What are the supplementary gene interactions?
d) Define Linkage.
e) Symptoms of Turner's syndrome
f) What is somatic cell hybridization?
g) CLB method
h) Transposons
i) Define Recombination
j) What is conjugation?

Q.3 A) Attempt any Two of the following. 10

- a) Describe laws of Mendelian Inheritance.
b) Describe the symptoms of Klinefelter's and Turner's syndrome.
c) Give an account on Polygenic inheritance with suitable inheritance.

B) Describe the Complementary gene interaction. **06**

Q.4 A) Attempt any Two of the following. **08**

- a) Give an account on somatic cell hybridization.
- b) Define Mutation? Describe classification of gene mutation.
- c) Give an account on mechanism and treatment of Down and Turners syndrome.

B) Describe/Explain/Solve **08**

Explain Crossing over and give its significance

Q.5 Attempt any Two of the following. **16**

- a) Give examples of sex linked and sex influenced inheritance.
- b) Describe types of chromosomal aberrations.
- c) Describe conjugation and transformation in Bacteria.

Seat No.	

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
MATHEMATICS (Special Paper - X)
Complex Analysis (22221518)**

Day & Date: Thursday, 30-10-2025
Time: 09:00 AM To 12:00 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 for each of the following. 10

- [illegible]

- 6) If $z = 0$ is a simple pole of $f(z)$, then the residue at this pole is given by _____.
 a) $\lim_{z \rightarrow a} (z - a)f(z)$ b) $\lim_{z \rightarrow 0} (z - a)f(z)$
 c) $\lim_{z \rightarrow 0} zf(z)$ d) $f(a)$
- 7) If $z = \frac{z - \sin z}{z^3}$ at $z = 0$ is _____.
 a) Simple pole b) Pole of order 2
 c) Essential singularity d) Removable singularity
- 8) For the function $f(z) = \tan\left(\frac{1}{z}\right)$ at $z = 0$ is _____.
 a) isolated essential singularity
 b) non isolated essential singularity
 c) pole
 d) removable singularity
- 9) $\int_L dz$ where L is any rectifiable arc joining the points $z = a$ to $z = b$ is equal to _____.
 a) $b - a$ b) $z - a - b$
 c) $a - b - z$ d) z
- 10) The Residue of the function $\frac{1}{(z^2+1)^3}$ at $z = i$ is _____.
 a) $\frac{3}{16i}$ b) $\frac{-3i}{16}$
 c) $\frac{-3}{16i}$ d) $\frac{3i}{16}$

B) Fill in the blanks.**06**

- 1) If L is circle $|z| = r > 0$ then $\int_L \frac{dz}{z} =$ _____.
- 2) If L is a semi-circular arc $|z| = 1$ from -1 to $+1$ above the real axis then $\int_L \bar{z} dz =$ _____.
- 3) The function $f(z) = |xy|^{\frac{1}{2}}$ is not _____ at $z = 0$.
- 4) Residue of $\frac{z^2}{(z^2+1)^2}$ at $z = -i$ is _____.
- 5) The function $f(z) = e^{\frac{1}{z}}$ has _____ singularity at $z = 0$.
- 6) The function $f(z) = w = u + iv$ is independent of $\bar{z} = x - iy$ if _____.

Q.2 Attempt the following. (Any Eight)**16**

- Show that $u = \frac{1}{2} \log(x^2 + y^2)$ is harmonic function.
- If $w = f(z) = u + iv$ is analytic region in R then prove that $\frac{\partial w}{\partial x} = -i \frac{\partial w}{\partial y}$
- Find the residue of $\frac{z+1}{z^2(z-3)}$ at $z = 3$
- What kind of singularity $z \operatorname{cosec} z$ at $z = \infty$
- Find zeros and poles of $\left(\frac{z+1}{z^2+1}\right)^2$
- Expand $\frac{1}{4z-z^2}$ for $0 < |z| < 4$
- Find the residue of $z \cos\left(\frac{1}{z}\right)$ at $z = 0$
- Prove that $\int_c \frac{1}{z-a} dz = 2\pi i$, where c is circle given by $|z-a| = r$.
- If $f(z)$ and $g(z)$ have derivative at z then prove that $\frac{d}{dz}[f(z) \pm g(z)] = f'(z) \pm g'(z)$.
- Construct the analytic function $f(z) = u + iv$ where $u = \sin x \cosh y$.

Q.3 A) Attempt the following. (Any Two)**10**

- If $f(z) = u + iv$ is an analytic function of $z = x + iy$ and $u - v = \frac{e^y - \cos x + \sin x}{\cosh y - \cos x}$ find $f(z)$ subject to the condition $f\left(\frac{\pi}{2}\right) = \frac{3-i}{2}$
- Find the value of the integral $\int_0^{1+i} (x - y + ix^2) dz$
 - along the straight line from $z = 0$ to $z = 1 + i$
 - along the real axis from $z = 0$ to $z = 1$ and then along a line parallel to imaginary axis from $z = 1$ to $z = 1 + i$
- Expand $f(z) = \frac{1}{(z+1)(z+3)}$ in a Laurents series valid for
 - $1 < |z| < 3$
 - $|z| > 3$

B) Prove that polar form of Cauchy's Riemann equations**06**

$$\frac{\partial u}{\partial r} = \frac{1}{r} \frac{\partial v}{\partial \theta} \quad \text{and} \quad \frac{\partial v}{\partial r} = -\frac{1}{r} \frac{\partial u}{\partial \theta} \quad \text{where } r = \sqrt{x^2 + y^2}, \quad \theta = \tan^{-1}\left(\frac{y}{x}\right)$$

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

- Obtain the Taylor's and Laurent's series which represents the function $\frac{z^2-1}{(z+2)(z+3)}$ in the regions
 - $|z| < 2$
 - $2 < |z| < 3$
- State and prove Cauchy's fundamental theorem.
- Prove that $\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} = \frac{4\partial^2}{\partial z \partial \bar{z}}$

- B)** Prove that necessary and sufficient condition that $w = f(z) = u + iv$ be analytic in region R is that Cauchy's Riemann equation $u_x = v_y, u_y = -v_x$ are sufficient in R where suppose that the derivative continuous in R . **08**

Q.5 Attempt the following. (Any Two) **16**

- a)** State and prove Cauchy's residue theorem.

b) Show that
$$\int_0^{2\pi} \frac{d\theta}{a + b \sin \theta} = \frac{2\pi}{\sqrt{a^2 - b^2}}, a > b > 0$$

- c)** Prove that the function $\sin \left[c \left(z + \frac{1}{z} \right) \right]$ can be expanded in series of

the type $\sum_{n=0}^{\infty} a_n z^n + \sum_{n=1}^{\infty} b_n z^{-n}$ in which the coefficients of both of

z^n and z^{-n} are $\frac{1}{2\pi} \int_0^{2\pi} \sin(2c \cos \theta) d\theta$

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November – 2025
STATISTICS (Special Paper - X)
Probability Distributions (22221521)**

Day & Date: Thursday, 30-10-2025
Time: 09:00 AM To 12:00 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 table and calculators is allowed.

Q.1 A) Multiple choice questions.

10

- 1) Let (X, Y) is $BN(0, 0, \sigma_1^2, \sigma_2^2, \rho)$ and suppose $U = \frac{X}{Y}$ and $V = Y$ then the marginal distribution of U is _____.
 - a) Cauchy
 - b) Normal
 - c) Lognormal
 - d) Laplace
- 2) If $X \rightarrow \text{Laplace}(\mu, \lambda)$ with p.d.f. $f(x) = \frac{1}{2\lambda} e^{-\frac{1}{\lambda}|x-\mu|}$
 $0 < \lambda, |\mu|, |x|$; mean = _____.
 - a) λ
 - b) μ
 - c) λ^2
 - d) None of these
- 3) If X is a Pareto (α, β) r.v., then the its c.d f is _____.
 - a) $1 + \left(\frac{\beta}{x}\right)^\alpha$
 - b) $1 - \left(\frac{\beta}{x}\right)^\alpha$
 - c) $1 + \left(\frac{\beta}{x}\right)^\alpha$
 - d) $1 - \left(\frac{\beta}{x}\right)^\alpha$
- 4) If $X \sim B(1, P)$, Suppose X is truncated at $X = 0$ then $V(X) =$ _____.
 - a) 1
 - b) 0
 - c) pq
 - d) None of these
- 5) Let (X, Y) is $BN(3, 2, 4, 9, 0.5)$ then $Cov(X, Y) =$ _____.
 - a) 0
 - b) 1
 - c) 2
 - d) 3
- 6) Median of logistic distribution with parameter μ, σ^2 is _____.
 - a) μ
 - b) σ^2
 - c) $\mu + \sigma^2$
 - d) None of these
- 7) Mean of truncated Poisson distribution truncated at $X = 0$ is _____.
 - a) 0
 - b) $1 - e^{-\lambda}$
 - c) λ
 - d) $\frac{1}{1 - e^{-\lambda}}$

- 8) If X, Y are iid $\exp(\lambda)$ r.v.s. then $Z = X - Y$ has _____ distribution.
 a) Exponential b) Laplace
 c) Lognormal d) Cauchy
- 9) If X is a Pareto (α, β) r.v., then $E(X) =$ _____
 a) $\frac{\alpha\beta}{\beta - 1}$ b) $\frac{\alpha\beta}{\beta + 1}$
 c) $\frac{\alpha\beta}{\alpha - 1}$ d) $\frac{\alpha\beta}{\beta + 1}$
- 10) If X is Cauchy (μ, λ) then its quartile deviation is = _____.
 a) μ b) λ
 c) $\mu + \lambda$ d) $\mu - \lambda$

B) Fill in the blank.**06**

- 1) The Median of Cauchy distribution is _____.
- 2) If $X \sim W(1, 1)$ then the distribution function is _____.
- 3) The nature of Pareto distribution is _____.
- 4) If $X \sim N(\mu, \sigma^2)$ then e^x has _____.
- 5) The distribution function of truncated exponential distribution is _____.
- 6) If $X \sim W(\alpha, \beta)$ then $\frac{X}{\alpha} \sim$ _____.

Q.2 Solve any eight of the following.**16**

- a) State p.m.f. of truncated Poisson distribution at $X = 0$.
- b) State the p.d.f. of Logistic distribution with parameters (μ, σ) .
- c) State the p.d.f. of standard Laplace distribution.
- d) What is the p.d.f. of Pareto distribution, when $\alpha = \beta = 1$?
- e) State mean and variance of Laplace distribution.
- f) State the p.m.f. of truncated exponential distribution truncated at $x = 0$.
- g) If X is Cauchy (μ, λ) write expressions for Q1 and Q3.
- h) Sketch Probability curve of Laplace distribution.
- i) State p.d.f. of Weibull distribution with parameters (a, β) .
- j) State p.d.f. of normal distribution truncated to the right above 'b'.

Q.3 A) Attempt any Two of the following.**10**

- a) Explain the relationship between Cauchy distribution and Uniform distribution.
- b) Derive the p.m.f. of truncated Binomial distribution to truncated at $x = 0$.
- c) Find Distribution function of Pareto Distribution.

- B)** Let $Y = X_1 - X_2/2$ where, X_1 and X_2 are i.i.d. χ^2 variate with two degrees of freedom. Show that Y has double exponential distribution.

06

Q.4 A) Attempt any Two of the following. 08

- a) Find means of Bivariate normal distribution.
- b) Derive p.d.f. of truncated Normal distribution truncated to the both side.
- c) Find first quartiles for Laplace distribution.

B) Find mean and variance of Logistic distribution. 08

Q.5 Attempt any Two of the following. 16

- a) Calculate the first and second quartiles of the Cauchy distribution.
- b) Derive p.d.f. of truncated normal distribution to the left below 'a', and Find mean of truncated normal distribution to the left below 'a'.
- c) If X and Y are independent random variable each following $N(0, 2)$, Then prove that $Z = X/Y$ follows Cauchy Distribution.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
GEOLOGY (Special Paper - X)
Hydrogeology (22221526)**

Day & Date: Thursday, 30-10-2025
Time: 09:00 AM To 12:00 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 Question.

10

- 1) Connate water is in _____.
 - a) Atmosphere
 - b) Igneous rocks
 - c) Sedimentary rocks
 - d) Metamorphic rock
- 2) Which of the following is likely to be an Aquiclude?
 - a) Sandstone
 - b) Shale
 - c) Conglomerate
 - d) Limestone
- 3) Which aquifer has highest specific yield?
 - a) Sand and gravel
 - b) Clay
 - c) Shale
 - d) Limestone unfractured
- 4) Which factor decreases permeability?
 - a) Well sorted coarse grain
 - b) Large pore spaces
 - c) Poor sorted with clay matrix
 - d) Fracturing of rocks
- 5) Groundwater recharge in arid regions mainly occurs by _____.
 - a) Direct rainfall infiltration
 - b) Capillary rise
 - c) Snow melt
 - d) Flood water infiltration
- 6) Which method gives information about groundwater quality?
 - a) Electrical resistivity
 - b) Seismic refraction
 - c) Water Sampling
 - d) Gravity survey
- 7) Which isotope is used to study modern groundwater recharge less than 50 years?
 - a) Tritium
 - b) Carbon-14
 - c) Uranium series
 - d) Potassium-Argon

- 8) The most common cause of groundwater contamination in rural India is _____.
 b) Industrial waste b) Nitrate from fertilizers
 c) Thermal pollution d) Saline water intrusion
- 9) Clay lenses in sedimentary deposits have _____ aquifer.
 a) Perched aquifer b) Confined aquifer
 c) Leaky aquifer d) Storage
- 10) Granite is a _____.
 a) Aquifuge b) Aquiclude
 c) Aquitard d) None of the above

B) Answer the following questions in a one sentence / Fill in the blanks. **06**

- 1) Define hydrogeology.
- 2) Define permeability.
- 3) What is Intrinsic permeability?
- 4) The hydraulic gradient is _____.
- 5) What are the seasonal fluctuations of groundwater?
- 6) What is it called when pumping groundwater changes the level of the water table around the pumping well?

Q.2 Solve of the following. (Any Eight) 16

- a) What is the purpose of a hydrogeological study?
- b) What is an aquifer?
- c) Where is most water stored in the water cycle?
- d) What is impervious bed?
- e) Define groundwater basin.
- f) What is specific retention?
- g) What is the definition of recharge zone?
- h) Define piezometric surface.
- i) What is Depression springs?
- j) Define porosity.

Q.3 A) Attempt of the following. (Any Two) 10

- Describe rock properties affecting on groundwater.
- Describe the vertical distribution of groundwater and draw the diagram.
- Describe zone of saturation and conditions of fluctuations of water table.

B) Write a note on electric resistivity method in ground water exploration. 06

Q.4 A) Attempt of the following. (Any Two) 08

- Describe cone of depression with labelled diagram.
- Describe ground water interaction with surface water with labelled diagram.

- c) Describe the concept of groundwater flow and add note on water flow rates and their direction techniques.

B) Explain the major geological features identifiable in aerial photographs that are suitable for ground water exploration. **08**

Q.5 Attempt of the following. (Any Two) **16**

- a) Discuss about porosity, its types and factors affecting porosity with diagram.
- b) Define specific yield and specific retention and Explain their relationship to porosity.
- c) Discuss Rainwater Harvesting and various methods to manage the groundwater depletion in India.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
MICROBIOLOGY (Special Paper - X)
Agricultural Microbiology (22221530)**

Day & Date: Thursday, 30-10-2025
Time: 09:00 AM To 12:00 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) _____ 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 thuringienesis</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) Most of the soil microorganisms are _____.
 a) Thermophiles b) Psychrophiles
 c) Mesophiles d) Hyperthermophiles
- 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) Green manure
- 4) Ammonification
- 5) Rhizosphere
- 6) Name the most dominant group of microorganisms in soil.

Q.2 Solve any eight of the following.**16**

- a) Function of leg haemoglobin
- b) Give examples of genetically modified plants.
- c) Define nitrification.
- d) Define Vermicompost.
- e) Name two nitrogen fixing bacteria.
- f) Define Biofertilizer.
- g) Define term 'Pesticide'.
- h) Causative agent of whip smut of sugarcane
- i) Enlist enzymes involved in Cellulose degradation.
- j) Define soil ecosystem.

Q.3 A) Attempt any Two of the following.**10**

- a) Describe in detail the process of Vermicomposting.
- b) Explain carbon cycle in nature.
- c) Write a note on different properties of soil.

B) Write short note on large scale production of Rhizobium**06****Q.4 A) Attempt any Two of the following.****08**

- a) Explain various control measures of plant diseases.
- b) Give an account of beneficial and harmful interactions in soil.
- c) Write a short note on whip smut of sugarcane

B) Describe biodegradation of lignin.**08****Q.5 Attempt any Two of the following.****16**

- a) Give an account on biopesticides, their production and applications.
- b) Discuss in detail causative agent, symptoms and control of oily spots of pomegranate.
- c) Common symptoms produced by plant pathogens.

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
ELECTRONICS (Special Paper - X)
Fundamentals of Microcontroller (22221538)**

Day & Date: Thursday, 30-10-2025
Time: 09:00 AM To 12:00 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 calculator is allowed.

0.1 A) Chose correct *alternative* and rewrite the sentence **10**

- 1) On chip ROM capacity of 8051 micro-controller is _____.
a) 8 KB b) 64 KB
c) 16 KB d) 4 KB
- 2) For accessing data from internal memory _____ register is used as a memory pointer.
a) R1 and R2 b) PC
c) DPTR d) SP
- 3) The 8051 microcontroller contains _____.
a) Two 8-bit parallel ports b) Four 8-bit parallel ports
c) Four 8-bit serial ports d) Two 8-bit serial ports
- 4) _____ SFR is used for selection of register bank in 8051 microcontroller.
a) ACC b) TCON
c) PSW d) IP
- 5) _____ of the microcontroller 8051 can be used as a higher order address bus.
a) Port-0 b) Port-1
c) Port-3 d) Port-2
- 6) ADD A, #05 H is an example of _____ addressing mode.
a) Immediate b) Direct
c) Indirect d) Branch
- 7) The width of DPTR SFR is _____ bit.
a) 8 b) 16
c) 10 d) 12

- B)** With suitable flow-chart write ALP to transfer the block of 10 location within the internal memory. **08**

Q.5 Attempt any Two of the following. 16

- a)** What is the addressing mode? Explain addressing modes of 8051 microcontroller with its examples.
- b)** Write ALP to generate the continuous square wave of frequency 100 KHz & 50% duty cycle on port P2.0 line using timer-1 in mode-2. If the crystal frequency is 12 MHz.
- c)** Draw the functional diagram of 8051 microcontroller and explain alternative functions of port-3.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November – 2025
Computer Science (Special Paper - X)
Advanced Java (22221534)**

Day & Date: Thursday, 30-10-2025
Time: 09:00 AM To 12:00 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 Question.**10**

- 1) JDBC stands for: _____.
 - a) Java Database Connectivity
 - b) Java Data Code
 - c) Java Deployment Connectivity
 - d) Java Base Code
- 2) Which JDBC interface is used to execute stored procedures?
 - a) Statement
 - b) ResultSet
 - c) CallableStatement
 - d) PreparedStatement
- 3) Which servlet method is called only once in the lifecycle?
 - a) init()
 - b) service()
 - c) doGet()
 - d) None of above
- 4) Which is not a session tracking technique in Servlet?
 - a) Cookies
 - b) Hidden Form Fields
 - c) RequestDispatcher
 - d) URL Rewriting
- 5) Which of the following is a disadvantage of cookies?
 - a) Can store large data
 - b) Stored on server
 - c) Disabled by client
 - d) None
- 6) Which object is not an implicit object in JSP?
 - a) out
 - b) config
 - c) session
 - d) string
- 7) What is the extension of JSP file?
 - a) .html
 - b) .java
 - c) .jsp
 - d) .xml
- 8) Which tag in JSP is used to include Java code?
 - b) <% %>
 - c) <%! %>
 - b) <%= %>
 - d) All of the above

- 9) In Hibernate, which file is used for configuration?
 - a) hbm.xml
 - b) config.xml
 - c) hibernate.cfg.xml
 - d) mapping.xml
- 10) What is Spring's core feature for injecting dependencies?
 - a) Inheritance
 - b) Polymorphism
 - c) Encapsulation
 - d) Dependency Injection

B) Fill in the blanks.**06**

- 1) ODBC stands for _____.
- 2) _____ is used to forward a request from one resource to another in a servlet.
- 3) To declare variables and methods in JSP, we use the _____ tag.
- 4) The annotation used to define a class as a Hibernate entity is @ _____.
- 5) The core container module of Spring is _____.
- 6) Spring ORM is used to integrate Spring with _____ or JPA.

Q.2 Solve the following (Any Eight)**16**

- a) Explain features of JDBC.
- b) Explain executeQuery() and executeUpdate() with example.
- c) Describe ResultSet and its methods.
- d) Difference between CGI and Servlet.
- e) Explain Servlet life cycle with diagram.
- f) Explain requestDispatcher- include() and forward()
- g) What is session tracking? Explain cookies.
- h) Explain JSP life cycle.
- i) Describe useBean tag with example
- j) Explain architecture of hibernate.

Q.3 A) Attempt the following (Any Two)**10**

- 1) Compare Statement, PreparedStatement, and CallableStatement.
- 2) Explain session tracking mechanisms in Servlet.
- 3) Explain Spring Dependency Injection types with examples.

B) Write a short note on JSTL core tags.**06****Q.4 A) Attempt the following (Any Two)****08**

- 1) Explain JDBC architecture with types of drivers.
- 2) Describe implicit objects in JSP.
- 3) Explain annotations in Hibernate with example

B) Explain Spring MVC architecture and its components.**08****Q.5 Attempt the following (Any Two)****16**

- a) Develop a simple JDBC application for data retrieval.
- b) Write a JSP program using useBean, setProperty and getProperty.
- c) Create a Spring Boot application to perform CRUD using Spring Data JPA.

Seat No.	

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
PHYSICS (Special Paper - XI)
Classical Mechanics (22221511)**

Day & Date: Friday, 31-10-2025
Time: 09:00 AM To 12:00 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.
4) Draw neat labeled diagrams wherever necessary.

Q.1 A) Select correct alternative. 10

- 1) The velocity (v_f) with which the projectile falls on the ground is _____ the velocity (v_i) with which it was projected.
 - a) Greater than
 - b) Equal
 - c) Less than
 - d) Greater than equal to
- 2) Equation of motion for a particle moving in potential $V = \frac{1}{2} kx^2$ in linear harmonic oscillator by using Lagrange's equation is _____.
 - a) $m\ddot{x} + kx = 0$
 - b) $m\dot{x} + kx = 0$
 - c) $m\dot{x} + kx = 0$
 - d) $\ddot{\theta} + \frac{g}{l} \sin\theta = 0$
- 3) In southern hemisphere the air is deflected to the _____ and hence, in a cyclone the wind whirls in the _____ sense.
 - a) left, anticlockwise
 - b) left, clockwise
 - c) right, anticlockwise
 - d) right, clockwise
- The Brachistochrone problem shows that, the transit time of a
 - 4) particle from a higher to a lower point under the influence of gravity is _____.
 - a) minimum
 - b) maximum
 - c) infinite
 - d) moderate
 - 5) For undamped motion if the displacements are small then the restoring force due to mg will be _____.
 - a) $\frac{mg}{1}$
 - b) $\frac{mgx}{1}$
 - c) $\frac{x}{1}$
 - d) $-k(x_2 - x_1)$
 - 6) A rigid body is said to have _____ degrees of freedom.
 - a) six
 - b) three
 - c) two
 - d) nine

- 7) The constraints in the motion of the molecules moving inside a gas container is _____.
 - a) non-holonomic
 - b) rheonomous
 - c) holonomic
 - d) holonomic, scleronomous
- 8) If the missile is moving towards the north in northern hemisphere, its deflection due to Coriolis force is towards the _____.
 - a) east
 - b) west
 - c) north
 - d) south
- 9) For a rigid body, the distance between any two of its constituent particles is _____.
 - a) infinite
 - b) zero
 - c) unity
 - d) constant
- 10) For horizontal motion on the earth the maximum magnitude of the Coriolis acceleration is at the _____.
 - a) equator
 - b) poles
 - c) at the latitude 45°
 - d) at the latitude 60°

B) Fill in the blank / Definition/One sentence answer/one word answer/Give the name/Predict the project etc. 06

- 1) When a force system keeps a body at rest, the subject is _____.
- 2) Equation describing the motion for a simple pendulum using Lagrangian is _____.
- 3) The Coriolis force acting on a horizontally moving particle at the equator is _____.
- 4) The transit time of a particle from a higher point to a lower point under the influence of gravity is a _____ along a cycloid passing through the two points.
- 5) State the Chasle's theorem on the discussion of Euler's theorem.
- 6) The constraint is a _____ on the freedom of motion of system of particles.

Q.2 Solve any eight of the following. 16

- a) State conservative theorem for linear and angular momentum for a system of particles.
- b) Explain with example holonomic and nonholonomic constraints.
- c) Explain inertial and non-inertial frames of reference.
- d) What are the advantages of Hamilton's formulation
- e) A sling carrying a stone in a force free space with an angular velocity 4 rad/s produces centripetal acceleration 144 rad/s^2 . Calculate the radius of the circle intercepted by sling?
- f) State Euler's theorem.
- g) State principle of virtual work.
- h) Explain why the earth flattened at the poles.
- i) Explain the formation of cyclones.
- j) State any two effects of Coriolis force in a nature

- Q.3 A) Attempt any Two of the following. 10**
- a) State and prove theorem of conservation for energy of the system of particles.
 - b) Show that the shortest distance between two points in a plane is along a straight line passing through it.
 - c) Derive an expression for the angular momentum of a rigid body in the component's form.
- B) Show that the angular acceleration of a particle is the same in fixed and rotating coordinate systems. Obtain an expression for velocity and acceleration relative to fixed axes. 06**
- Q.4 A) Attempt any Two of the following. 08**
- a) A body is dropped from a height of 100 m from rest at latitude $\Phi = 45^\circ$, calculate the horizontal eastward deflection of the body. ($\omega = 7.29 \times 10^{-5} \text{ rad/s}$)
 - b) Derive an expression for the total energy of a system of two coupled pendulums in term of normal coordinates.
 - c) Show that in the rotational motion of a rigid body applied with torque, the rate at which work is done by the torque is equal to the rate of change of kinetic energy of the body.
- B) State Hamilton's principle and obtain Euler-Lagrangian equation from it. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Derive an expression for time of flight and range of projectile motion in resistive medium.
 - b) Obtain Lagrange's equations of motion from D'Alembert's principle for conservative system.
 - c) What are symmetric and antisymmetric modes of oscillations? Obtain the equations of motion of two coupled simple pendulums in terms of normal coordinates.

Max. Marks: 80

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

10

- Page 1 of 3

- 9) In NMR spectroscopy _____ radiation are used.
- a) ultraviolet b) infra-red
- c) radio-frequency d) visible
- 10) In mass spectrum, the intensity assigned to base peak is _____.
- a) 50 % b) 90 %
- c) 0 % d) 100 %

B) Fill in the blank.

06

- 1) The finger print region of the IR spectrum lies in the range _____ cm^{-1}
- 2) In cyclopropane Angle Strain is _____.
- 3) Acid hydrolysis of AAE produces _____.
- 4) Diethyl Malonate on reaction with urea in the presence of sodium ethoxide at 110°C gives _____.
- 5) The nuclei having spin $I > 0$ are known as _____.
- 6) _____ spectroscopy is low pressure technique.

Q.2 Solve any eight of the following.

16

- a) State and explain Hook's law.
- b) Equatorial methyl cyclohexane is more stable than axial methyl cyclohexane, why?
- c) Explain Ketonic hydrolysis of Ethyl acetoacetate.
- d) Explain the principles of mass spectroscopy.
- e) Mention the application of IR spectroscopy.
- f) Explain keto-enol tautomerism with suitable example.
- g) What is Stobbe's condensation? Give one example.
- h) Define Equivalent Proton's & non-equivalent protons.
- i) What is Chemical Shift? How is it measured?
- j) Define the term
 - i) Stereo-selective reaction
 - ii) Stereo specific reaction

Q.3 A) Attempt any Two of the following.

10

- Explain different types of ions generated in Mass Spectroscopy with suitable example.
- What is the Internal Standard used in PMR spectra? Why?
- How is Diethyl Malonate prepared? Give the synthesis of Succinic acid from Diethyl malonate.

B) Write short note on types of vibration in IR Spectroscopy.

06

Q.4 A) Attempt any Two of the following.

08

- Explain mechanism of MPV reduction with example.
- Describe the application of Mass Spectroscopy.

c) Determine the structure from following data.

Molecular formula - $C_{10}H_{13}Cl$

- NMR - a) singlet 1.57 δ (6H)
b) singlet 3.07 δ (2H)
c) singlet 7.27 δ (5H)

B) Explain relative stabilities of different conformer of cyclohexane with their structure and potential energy diagram. **08**

Q.5 Attempt any Two of the following. **16**

- a) Explain NMR instrument diagram. Write note on shielding and deshielding effect involved in NMR spectroscopy.
- b) What is reactive methylene group? How will you prepare the following from Ethyl acetoacetate.
- i) n-Butyric acid
 - ii) Crotonic acid
 - iii) 4 methyl Uracil
- c) An organic compound A [C_3H_6O] which is Ketone reacts with compound B [$C_4H_7O_2Br$] and metallic Zn and dry ether to give the compound C [$C_7H_{13}O_3ZnBr$]. The compound C on hydrolysis with HCl gives a β -hydroxy ester D [$C_7H_{14}O_3$]. The compound D on further hydrolysis gives E [$C_5H_{10}O_3$] which is readily dehydrated on heating to form α, β unsaturated acid. What are A, B, C, D & E write reaction and name of reaction.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
BOTANY (Special Paper - XI)
Molecular Biology (22221503)**

Day & Date: Friday, 31-10-2025
Time: 09:00 AM To 12:00 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) For regulation of transcription repressor bind to _____.
a) Attenuator b) Terminator
c) Anti terminator d) Operator
- 2) In prokaryotes, the ribosomal subunits are _____.
a) 30 S and 40 S b) 40 S and 50 S
c) 30 S and 50 S d) 40 S and 60 S
- 3) The initiation of translation in eukaryotes requires _____.
a) Initiation factor IF-2 b) 40S ribosomal subunit
c) Methionyl tRNA d) Ribosomal RNA
- 4) The uncoiling of double helix is carried out by _____.
a) Primase b) Helicase
c) SSB d) Okazaki fragments
- 5) Which one of the following sequences is complimentary to TGGCAGCCT?
a) ACCGTCGGA b) ACCGUCGGA
c) AGGCTGCCA d) TGGCTCGGA
- 6) The primers from newly synthesized prokaryotic DNA strand are removed by _____.
a) DNA polymerase I b) DNA polymerase II
c) DNA polymerase III d) Topoisomerase II
- 7) The genetic information of DNA is encoded by _____.
a) The backbone b) Base pairs
c) Sequence of bases d) Major groove

- 8) True DNA replication is possible because of _____.
 - a) Phosphate backbone
 - b) Hydrogen bonding
 - c) Complementary base pair rule
 - d) None of these
- 9) The methylated genes are _____.
 - a) Active
 - b) Superactive
 - c) Inactive
 - d) Pseudogenes
- 10) Which of the following is not a type of RNA processing?
 - a) Polyadenylation at the 3' end
 - b) Capping of 5' end
 - c) Removal of exons
 - d) Splicing

B) Fill in the blanks.**06**

- 1) RNA involved in protein synthesis is _____.
- 2) The production of mRNA is carried out by _____.
- 3) In a DNA strand the nucleotides are linked together by the enzyme _____.
- 4) The amino acid attaches to the tRNA at its _____.
- 5) The short strand of _____ Act as primer for the replication of DNA.
- 6) The enzyme that introduces positive and negative supercoils in DNA is _____.

Q.2 Solve any eight of the following.**16**

- a) Enlist the types of DNA.
- b) What is RNA splicing?
- c) Enlist any two posttranslational modifications.
- d) What is promoter?
- e) Give the function of mRNA.
- f) What is transcription?
- g) What is operon?
- h) What is Shine-Dalgarno sequence?
- i) Enlist the stop codons.
- j) What are heat shock proteins?

Q.3 A) Attempt any Two of the following.**10**

- a) Describe the structure of Ribosomes.
- b) Describe B - DNA with suitable diagram.
- c) Explain the organization of genome in eukaryotes.

B) Explain the lactose operon in *Escherichia coli*.**06**

- Q.4 A) Attempt any Two of the following. 08**
- a) Describe the clover leaf model for tRNA
 - b) Explain the role of any two transcription factors in eukaryotes
 - c) Explain the process of RNA splicing.

- B) Explain role of various enzymes involved in DNA replication. 08**

- Q.5 Attempt any Two of the following. 16**

- a) Explain the Kornberg experiment for discovery of the DNA.
- b) Describe the process of protein synthesis.
- c) Describe the process of transcription in prokaryotes.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
Zoology (Special Paper - XI)
Endocrinology (22221515)**

Day & Date: Friday, 31-10-2025
Time: 09:00 AM To 12:00 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 calculator is allowed.

Q.1 A) Multiple Choice Questions.**10**

- 1) Endocrine gland is a _____.
a) Ductless gland b) Ductus gland
c) Salivary gland d) Digestive gland
- 2) Hormone is called as _____.
a) Messenger b) Chemical messenger
c) RNA messenger d) DNA
- 3) The Endocrine system acts with Nervous system called as _____.
a) Exocrine b) Secretion
c) Neuroendocrine d) Endocrine
- 4) The Neuroendocrine secreted a Chemical agent is called as _____.
a) Fluid b) Salivary Secretion
c) Hormone d) Neurohormone
- 5) The Melatonin Hormone secreted by _____ gland.
a) Pineal gland b) Thyroid gland
c) Adrenal gland d) Parathyroid gland
- 6) A Certain substances which released locally and have local effect called as _____.
a) Hormones b) Local Hormones
c) Neuro Hormone d) Digestive Secretion
- 7) The hypophysis lies just beneath the _____.
a) Pineal gland b) Thyroid gland
c) Hypothalamus d) Pancreas

- 8) The Hormones releasing from Hypothalamic called as _____.
 - a) Secretion
 - b) Chemical substance
 - c) Proregulating
 - d) Regulating Hormone
- 9) Neurohypophysis is _____ Lobe of pituitary gland.
 - a) Posterior
 - b) Anterior
 - c) Lateral
 - d) Ventral
- 10) The Placentas secretes _____.
 - a) HCG
 - b) TSH
 - c) ACTH
 - d) LH

B) Fill in the blanks.**06**

- 1) Hypophysis is called _____ type of gland.
- 2) GnRH Gonadotropin releasing Hormone which is releasing from the _____.
- 3) The embryo becomes attached to the wall of uterus and this uterine wall is known as _____.
- 4) The steroid secretion is called _____.
- 5) The human placenta produces a hormone called _____.
- 6) The hormone produced by placenta and ovaries is _____.

Q.2 Solve any eight of the following.**16**

- a) Disorders of pituitary gland.
- b) Hypothalamic control of pituitary gland.
- c) Adenohypophysis.
- d) Neurohypophysis.
- e) Female hormones.
- f) Male hormones.
- g) Follicular hormone.
- h) Prostaglandin hormone.
- i) Neurohormone
- j) Hypothalamus

Q.3 A) Attempt any Two of the following.**10**

- 1) What are the local Hormones? And their role.
- 2) What is Pineal gland? Discuss various functions.
- 3) Describe the Endocrine function of Testis with the help of various associated hormones.

B) Describe the Endocrine activity of Adenohypophysis.**06****Q.4 A) Attempt any Two of the following.****08**

- 1) Describe the Histology and activity of Ovary?
- 2) Discuss the Endocrine role of Pineal gland and diseases due to deficiency and excessive secretion.
- 3) What is endocrine system?

B) Describe the Endocrine function of Testis. **08**

Q.5 Attempt any Two of the following. **16**

- a)** Describe the second Messenger concept of hormonal action.
- b)** Describe the role of hormonal action.
- c)** Write an account of the mechanism of steroid hormonal balance.

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
MATHEMATICS (Special Paper - XI)
Real Analysis (22221519)**

Day & Date: Friday, 31-10-2025
Time: 09:00 AM To 12:00 PM

Max. Marks: 80

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

Q.1 A) Choose correct alternative for each of the following. 10

- 1) If $f(x) = x^2$ and $g(x) = \sin x$ for $-\infty < x < \infty$, find $(f \circ g)(x) = \underline{\hspace{2cm}}$.
a) $\sin x$
b) $\sin^2 x$
c) $x^2 \sin x$
d) $x \sin x^2$
- 2) If B is an infinite subset of countable set A then B is _____.
a) Equivalent
b) Uncountable
c) Countable
d) Both a) and b)
- 3) If χ is characteristic function on sets A and B then $\chi_{(A \cap B)} = \underline{\hspace{2cm}}$.
a) $\min(\chi_A, \chi_B)$
b) $\max(\chi_A, \chi_B)$
c) $1 - \chi_A$
d) $\chi_A - \chi_B$
- 4) $\lim_{n \rightarrow \infty} \left(1 + \frac{2}{n}\right)^n = \underline{\hspace{2cm}}$.
a) e
b) e^n
c) 0
d) e^2
- 5) If $\{s_n\}_{n=1}^\infty = \{(-1)^n\}_{n=1}^\infty$ then $\limsup_{n \rightarrow \infty}(s_n) = \underline{\hspace{2cm}}$.
a) 1
b) -1
c) 0
d) $-\infty$
- 6) A monotonic increasing sequence which is not bounded above is _____.
a) Convergent
b) Divergent
c) Diverges to ∞
d) Diverges to $-\infty$
- 7) The decreasing sequence is of the following.
a) $\left\{-\frac{1}{n}\right\}$
b) $\left\{1 - \frac{1}{n}\right\}$
c) $\left\{2 - \frac{1}{n}\right\}$
d) $\left\{2 + \frac{1}{n}\right\}$

- 8) The series $\sum_{n=2}^{\infty} \frac{1}{n(\log n)^p}$ is convergent if ____.
- a) $p < 1$ b) $p > 1$
c) $p = 1$ d) $p \geq 1$
- 9) If $\sum_{n=1}^{\infty} b_n$ Converges absolutely, and if $\lim_{n \rightarrow \infty} \frac{|a_n|}{|b_n|}$ exists then $\sum a_n$ is ____.
- a) Converges b) Diverges
c) Converges absolutely d) Converges conditionally
- 10) The series $1 + r + r^2 + r^3 + \dots$ is oscillatory if ____.
- a) $r = 1$ b) $r < 1$
c) $r = -1$ d) $r > 1$

B) Fill in the blanks.

06

- 1) If $f(x) = \log x$ for $x \in (0, \infty)$ and $A = [0,1]$ then $f^{-1}(A) = \underline{\hspace{2cm}}$.
- 2) Find $(A - C) \cap (B - C)$.
- 3) Let $s = \{1, -1, 1, -1, 1 \dots \dots\}$ and $\delta(i) = 2i - 1 \quad \forall i \in \mathbb{N}$, Find $(so\delta)(i) = \underline{\hspace{2cm}}$.
- 4) If $a_1 + a_2 + a_3 + \dots$ is converges to s then,
 $a_2 + a_3 + a_4 + \dots$ is converges to .
- 5) A monotonic decreasing sequence, which is bounded below is .
- 6) Find $\lim_{n \rightarrow \infty} \sup \left(\left(1 + \frac{1}{n} \right) \cos n\pi \right) = \underline{\hspace{2cm}}$.

Q.2 Attempt the following. (Any Eight)

16

- a) If $\sum a_n$ is convergent series then $\lim_{n \rightarrow \infty} a_n = 0$
- b) Prove that $1 + \frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + \dots$ converges.
- c) Discuss the convergence of the series $\sum \frac{(1+\frac{1}{n})^{2n}}{e^n}$
- d) Prove that the sequence $1, 0, 1/2, 0, 1/3, 0, 1/4, \dots$ converges to zero.
- e) If Sequence $\{s_n\}$ converges to L , then $\{|s_n|\}$ converges to $|L|$
- f) Define Monotonic sequence.
- g) If $\lim_{n \rightarrow \infty} s_n = L$ and $\lim_{n \rightarrow \infty} t_n = M$ then $\lim_{n \rightarrow \infty} (s_n + t_n) = L + M$.
- h) If $f: A \rightarrow B$ if $X \subset A, Y \subset A$ then $F(X \cap Y) \subset F(X) \cap F(Y)$
- i) If $F(x) = \sin x$, if $A = [0, \frac{\pi}{6}]$ and $B = [0, \frac{\pi}{2}]$ find $F(A \cap B)$
- j) Prove that $(A - B) = A \cap B'$

Q.3 A) Attempt the following. (Any Two) **10**

- a) Prove that the sequence $\left\{\left(1 + \frac{1}{n}\right)^n\right\}$ is convergent and limit lies between 2 and 3
- b) Let $\sum a_n$ be a series of non negative number and, let $s_n = a_1 + a_2 + \dots + a_n$ then $\sum a_n$ is convergent if $\{s_n\}$ is bounded.
- c) If $f: A \rightarrow B$ and $X \subset B, Y \subset B$ then $f^{-1}(X \cup Y) = f^{-1}(X) \cup f^{-1}(Y)$

B) If $\{s_n\}$ and $\{t_n\}$ are bounded sequences of real number then **06**

- i) $\limsup_{n \rightarrow \infty} (s_n + t_n) \leq \limsup_{n \rightarrow \infty} (s_n) + \limsup_{n \rightarrow \infty} (t_n)$
- ii) $\liminf_{n \rightarrow \infty} (s_n + t_n) \geq \liminf_{n \rightarrow \infty} (s_n) + \liminf_{n \rightarrow \infty} (t_n)$

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

- a) If A and B are countable sets. Prove that $A \times B$ is countable.
- b) If the sequence of real number (s_n) is convergent then (s_n) is bounded. But converse? Give example.
- c) If $s_1 > s_2 > 0$ and if $s_{n+1} = \frac{1}{2}(s_n + s_{n-1})$ for $n \geq 2$
Prove that $s_1, s_3, s_5 \dots$ is monotonic decreasing.

B) If A and B are subset of S then **08**

- i) $(A \cup B)' = A' \cap B'$
- ii) $(A \cap B)' = A' \cup B'$

Q.5 Attempt the following. (Any Two) **16**

- a) If $\limsup_{n \rightarrow \infty} \sqrt[n]{|a_n|} = A$ then then series of real number $\sum_{n=1}^{\infty} a_n$
 - 1) converges absolutely if $A < 1$
 - 2) diverges if $A > 1$
 - 3) test fails if $A = 1$

- b) If $A_1, A_2, A_3 \dots$ are countable set, then $\bigcup_{n=1}^{\infty} A_n$ is countable.

- c) For each $n \in I$, let $I_n = [a_n, b_n]$ be a non empty bounded of real number such that $I_1 \supset I_2 \supset I_3 \supset \dots \supset I_n \supset I_{n+1} \supset \dots$ and $\lim_{n \rightarrow \infty} (b_n - a_n) = \lim_{n \rightarrow \infty} l(I_n) = 0$

then $\bigcap_{n=1}^{\infty} I_n$ contains precisely one point.

Seat No.	

Set **P**

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
STATISTICS (Special Paper - XI)
Sampling Techniques (22221522)**

Day & Date: Friday, 31-10-2025
Time: 09:00 AM To 12:00 PM

Max. Marks: 80

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

Q.1 A) Choose the correct alternative. 10

- 1) The population size of i^{th} stratum in stratified sampling.
 - a) N
 - b) n
 - c) N_i
 - d) n_i
- 2) Probability of selection of same 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) When respondents not available for information then this is _____.
 - a) formula error
 - b) sampling error
 - c) non- sampling error
 - d) None of 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 is 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?
 - a) lesser the number of strata, better it is
 - b) more the number of strata, poorer it is
 - c) more number of strata, better it is
 - d) not more than ten items should be there in a stratum

- 9) A sample consists of _____.
 a) all units in the population
 b) 50 per cent units in the population
 c) 5 per cent units in the population
 d) any fraction of the population
- 10) The total number of possible samples of size n , drawn from population size N by SRSWR is _____.
 a) n
 b) N
 c) NCn
 d) N^n

B) Define the following.**06**

- 1) Census
- 2) Random sampling
- 3) Auxiliary variable
- 4) Sampling frame
- 5) Sampling error
- 6) Population

Q.2 Solve the following. (Any Eight)**16**

- a) Write any two situations where sampling is used.
- b) Give a real-life situation where stratified sampling is used.
- c) State characteristics of a good questionnaire.
- d) What is meant by optimum allocation?
- e) State the objectives of sample survey.
- f) Give a real-life situation where systematic sampling is used.
- g) Give a real-life situation where cluster sampling is used.
- h) Define purposive sampling.
- i) State the advantages of sampling method over census method.
- j) Write difference between stratified sampling and cluster sampling.

Q.3 A) Attempt the following. (Any Two)**10**

- a) Show that ratio estimator is biased.
- b) Explain sampling for proportion, obtain its unbiased estimator for population proportion.
- c) Describe stratified random sampling procedure.

B) Write short note on systematic sampling.**06****Q.4 A) Attempt the following. (Any Two)****08**

- a) Describe, in brief the cluster sampling.
- b) Find under what condition ratio estimate is more efficient than SRS.
- c) Explain regression estimators of population mean.

B) Describe the idea of two-stage and multistage sampling in details.**08**

Q.5 Attempt the following. (Any Two)**16**

- a)** Discuss choice of sample size based on the cost of survey and variability by using cost function.
 - i) Minimize variability for given variability
 - ii) Minimize cost for given variability
- 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.

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
Geology (Special Paper - XI)
Applied Geology - Engineering Geology (22221527)**

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) Choose the correct alternative. 10

- 1) The stream which receive groundwater discharge is called _____.
 - a) Influent
 - b) Effluent
 - c) Ephemeral
 - d) Perennial
- 2) Which of the following is the most suitable reservoir rocks?
 - a) Sandstone with poorly sorted angular grains
 - b) Sandstone with well sorted rounded grain
 - c) Shale
 - d) Black shale
- 3) Which soil horizon is the zone of accumulation, so named because dissolved matter, leached from other parts of the soil, precipitates to form new minerals?
 - a) A- horizon
 - b) B- horizon
 - c) C- horizon
 - d) O- horizon
- 4) The mass movement process in which cohesive blocks of earth move on a failure plane with concave up geometry is known as _____.
 - a) Debris flow
 - b) Creep
 - c) Rotational slide
 - d) Translational slide
- 5) What type of river is most suitable for construction of dam?
 - a) Effluent
 - b) Influent
 - c) Insulated
 - d) Low gradient
- 6) Rapid mass movement of water saturated regolith is called _____.
 - a) Landslide
 - b) Creep
 - c) Solifluction
 - d) Earth flow

- 7) The ability of an earth material to transmit water is a measure of its _____.
 - a) Porosity
 - b) Recharge
 - c) Aquifer
 - d) Permeability
- 8) What is the characteristic sloping surface in rotational slides?
 - a) Curved
 - b) Planar
 - c) Circular
 - d) Undulated
- 9) Which of the following is not a method of control of mass movement?
 - a) Afforestation
 - b) Retaining wall
 - c) Chemical treatment of rocks
 - d) Deforestation
- 10) A solid barrier constructed at a suitable location across a river valley to impound water is called _____.
 - a) Reservoir
 - b) Dam
 - c) Bridge
 - d) Retaining wall

B) Answer the following questions in a one sentence.

06

- 1) Which is the longest dam in India?
- 2) What is alluvial soil?
- 3) What is porosity?
- 4) What is stress?
- 5) Give example of gravity dam in India.
- 6) Define texture.

Q.2 Solve any eight of the following.

16

- a) What is modulus of elasticity?
- b) Define tunnel.
- c) What is rock bolting?
- d) Define mass movement.
- e) What is mudflow?
- f) What is lahars?
- g) Define of pedology.
- h) Define soil profile.
- i) What is saprolite?
- j) What is cohesion and non - cohesion?

Q.3 A) Attempt any two of the following.

10

- 1) Write note on residual stress.
- 2) Describe remedial measures of landslide.
- 3) Describe soil profile.

B) Write a note on specific gravity and compressive strength.

06

- Q.4 A) Attempt any two of the following. 08**
- 1) Describe swelling of clays.
 - 2) Explain in detail tensile strength.
 - 3) Explain seepage problem of tunnel.
- B) Explain earthen and rock-fill dams. 08**
- Q.5 Attempt any two of the following. 16**
- a) Describe various geological structures which may cause landslide event.
 - b) Discuss various methods to control landslides.
 - c) Define tunnels? Explain tunnel construction in faulted region.

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
Microbiology (Special Paper - XI)
Immunology (22221531)**

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

Q.1 A) Choose the correct alternative and rewrite the sentences again. **10**

- 1) The immune response against self-antigen results into _____.
 - a) Tolerance
 - b) Autoimmunity
 - c) Allergy
 - d) Hypersensitivity
- 2) _____ test is used to check matching and cross matching in the blood transfusion of ABO blood group system.
 - a) Coombs
 - b) Widal
 - c) VDRL
 - d) RPR
- 3) In humoral immunity _____ cells secrete antibody.
 - a) T_H
 - b) Plasma cells
 - c) Memory cell
 - d) Macrophage
- 4) _____ blood group is called universal blood donor.
 - a) A^+
 - b) B^+
 - c) O^-
 - d) AB^+
- 5) Serum sickness is example _____ hypersensitivity.
 - a) Type I
 - b) Type II
 - c) Type III
 - d) Type IV
- 6) _____ antibody produced in secondary immune response.
 - a) IgM
 - b) IgG
 - c) IgD
 - d) IgA
- 7) _____ is the graft between genetically different individuals belonging to same species
 - a) Auto graft
 - b) Isograft
 - c) Allograft
 - d) Xenograft

- 8) The APC presents the antigen to _____ lymphocytes.
- a) T_H b) T_C
- c) T_S d) B
- 9) _____ is an example of primary lymphoid organ.
- a) Spleen b) Lymph node
- b) Thymus c) Payers patches
- 10) Auto-antibodies against vitamin B₁₂ receptors are produced in _____
- a) Pernicious anemia b) Rheumatoid arthritis
- c) Myasthenia gravis d) SLE

B) Define the following.

06

- 1) What is complement?
- 2) Enlist the role of NK cells.
- 3) Define cell mediated immunity.
- 4) What is hemolytic anemia?
- 5) What is MALT?
- 6) What is role of plasma and memory cell?

Q.2 Solve the following (Any Eight)

16

- a) What is xenograft?
- b) What are the biological properties of complement?
- c) Rh blood grouping.
- d) Define humoral immunity?
- e) What is SLE?
- f) Enlist antigen presenting cells.
- g) What is hypersensitivity?
- h) What is phagocytosis?
- i) Draw a neat labeled diagram of lymph node.
- j) Enlist the granulocytes along with their role.

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

10

- 1) Give a detailed account on exogenous antigen processing pathway.
- 2) Discuss in brief alternate complement pathway.
- 3) Describe in detail mechanism of Type-I hypersensitivity.

B) Discuss in detail mechanism of primary and secondary immune response.

06

Q.4 A) Attempt the following (Any Two)

08

- 1) What is blood transfusion? Discuss in brief complications of blood transfusions.
- 2) Describe in detail delayed type of hypersensitivity.
- 3) Describe in short classical complement pathway.

B) Discuss in detail ABO blood grouping.

08

Q.5 Attempt the following (Any Two)

16

- a)** Describe in detail structure and function of primary lymphoid organ
- b)** Discuss in detail organ specific autoimmune disease.
- c)** Discuss in detail types of graft. Add a note on mechanism of graft rejection.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November – 2025
Electronics (Special Paper - XI)
Sensors and Transducers (22221539)**

Day & Date: Friday, 31-10-2025
Time: 09:00 AM To 12:00 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) Multiple choice questions. 10

- 1) _____ key component is used in PIR sensors to focus infrared radiation onto the sensor element.
 - a) Concave lens
 - b) Fresnel lens
 - c) Glass window
 - d) Mirror
- 2) The part of a relay that moves to open or close contacts is called _____.
 - a) Coil
 - b) Armature
 - c) Base
 - d) Core
- 3) In capacitive transducers the capacitance is increased if the spacing of plates is _____.
 - a) Increased
 - b) decreased
 - c) both a and b
 - d) none of these
- 4) _____ is an active transducer.
 - a) Strain gauge
 - b) Piezoelectric
 - c) Thermistor
 - d) LDR
- 5) LDR's are also called _____.
 - a) Photo voltaic cell
 - b) Photo resistive cell
 - b) Photo emissive cell
 - d) All of the mentioned
- 6) The basic working principle of a strain gauge is based on _____.
 - a) Change in resistance due to temperature
 - b) Change in capacitance due to deformation
 - c) Change in resistance due to strain
 - d) Magnetic field variation
- 7) PIR sensors detects _____.
 - a) Static objects
 - b) Moving cold objects
 - c) Movement of warm bodies (like humans and animals)
 - d) Sound vibration from movement

- 8) _____ does NOT affect the output of a Hall Effect sensor.
a) Magnetic field strength b) Direction of magnetic field
c) Ambient light d) Current through the sensor
- 9) pyrometer is used to measure _____.
a) Pressure b) Humidity
b) High temperature c) Electrical resistance
- 10) _____ is the output voltage of LM35 for 25°C temperature.
a) 25 mV b) 250 mV
c) 0.25 V d) 2.5 V

B) One sentence answer.**06**

- 1) Write Definition of Accuracy.
- 2) What does LVDT stand for?
- 3) Define Measurand.
- 4) What is passive transducer?
- 5) What does RTD stand for?
- 6) What kind of displacement does RVDT measure?

Q.2 Solve the following (Any Eight)**16**

- a) Give basic difference between sensor and transducer.
- b) What is smart sensor? Give any one example of smart sensor.
- c) What is Actuator?
- d) Give the applications of optocoupler.
- e) Discuss the basic needs of measurement.
- f) What is Gauge factor in case of Strain Gauge?
- g) What is Principle of operation of Capacitive Transducers?
- h) What is photoelectric transducers?
- i) Differentiate between Active and Passive sensors
- j) What is need of System calibration?

Q.3 A) Attempt the following (Any Two)**10**

- 1) Explain pyrometer.
- 2) Draw the block diagram of a measurement system and explain each block.
- 3) Explain Capacitor microphone.

B) Write a note on RTD.**06****Q.4 A) Attempt the following (Any Two)****08**

- 1) Explain PIR Sensor.
- 2) Explain LPG Sensor.
- 3) Explain the construction and operation of Electromagnetic Relay.

B) Describe LVDT with diagram.**08**

Q.5 Attempt the following (Any Two)**16**

- a)** Discuss the static characteristics of a measurement system.
- b)** Explain photo-diode and photo-transistor transducers. Give any one application.
- c)** Explain Thermocouple in brief.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
COMPUTER SCIENCE (Special Paper - XI)
Dot Net Core (22221535)**

Day & Date: Friday, 31-10-2025
Time: 09:00 AM To 12:00 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. 10

- 1) What is MSIL.?
 - a) Microsoft Socket Interface Library
 - b) Microsoft Intermediate Language
 - c) Microsoft Interface Library
 - d) Microsoft Integer Language
- 2) Which reference modifier is used to define reference variable.?
 - a) &
 - b) ref
 - c) #
 - d) \$
- 3) Which of these keywords is used to manually throw an exception.?
 - a) Try
 - b) Finally
 - c) Throw
 - d) Catch
- 4) A delegate defines _____.
 - a) Washington representative
 - b) Class that encapsulates methods
 - c) Means of passing arrays into methods
 - d) Substitute of an inherited method.
- 5) _____ is not Exception class.
 - a) DivideByZeroException
 - b) ArithmeticException
 - b) NullReferenceException
 - d) OverflowStackException
- 6) The data members of a class by default are.?
 - a) Protected, public
 - b) Private, public
 - c) Private
 - d) Public
- 7) Which of the following .Net components can be used to remove unused references from the managed heap.?
 - a) CLR
 - b) Class Loader
 - c) Garbage Collector
 - d) CTS

- 8) What does the term “boxing” means in .Net.?
 - a) Convert value to object
 - b) Convert reference type to value type.
 - c) Convert the primitive type into a value type.
 - d) None of the above
- 9) Choose the keyword which declares the indexer.?

a) Base	b) This
b) Super	c) Extract
- 10) Which of these keywords is not a part of exception handling.?

a) Try	b) Finally
c) Thrown	d) Catch

B) Fill in the blanks.**06**

- 1) anonymous method is one way to create an ____ block of code.
- 2) The collection type that allows you to store key-value pairs is called a ____.
- 3) CLR stands for ____.
- 4) Which keyword is used to prevent a class from being inherited in C#.?
 - a) public
 - b) private
 - c) sealed
 - d) final
- 5) Which C# concept has the capability of an object to take number of different forms and hence display behaviour as accordingly.
- 6) The class that sends (or raises) the event is called the ____.

Q.2 Solve any Eight of the following.**16**

- a) What is FCL.?
- b) What is interface?
- c) Define Serialization.?
- d) What is Delegate.?
- e) List C# data types.
- f) State difference between class and structure.
- g) What is collection.?
- h) What is advantages of using LINQ.?
- i) Define the term Expression Lambda.
- j) What is background thread.?

Q.3 A) Attempt any Two of the following.**10**

- a) Explain parameter passing techniques.
- b) Write a program to implement constructor overloading.
- c) Write a program which handles custom exception.

- B)** Write a program which implement List generic collection for its method.

06**Q.4 A) Attempt any Two of the following.****08**

- a) Explain abstract class with example.
- b) Explain types of serialization.
- c) Explain Property with example.

- B)** Explain Generic delegates Func<T>, Action<T> and Predicate<T> with example. **08**

Q.5 Attempt any Two of the following. **16**

- a)** Define inheritance. Explain operator and method overloading and overriding.
- b)** Write a program for multicast delegate.
- c)** Write a program to implement static class.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
Physics (Special Paper - XII)
Nuclear Physics (22221512)**

Day & Date: Saturday, 01-11-2025
Time: 09:00 AM To 12:00 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) In Betatron electron is made to move in fixed _____ orbits.
 - a) elliptical
 - b) circular
 - c) Both a & b
 - d) None of the above
- 2) In GM counter, GM plateau region is sensitive to particles which are _____.
 - a) positively charged
 - b) negatively charged
 - c) Neutral
 - d) Of any kind
- 3) The transparent cementing substance called _____ is used to provide good optical contact in Scintillation counter.
 - a) Phosphor
 - b) Gum
 - c) Lucite
 - d) Adhesive
- 4) Negative Packing fraction indicates _____.
 - a) Greater stability
 - b) less stability
 - c) Total stability
 - d) Nothing about stability
- 5) ${}_{47}\text{Ag}^{107} + {}_1\text{H}^1 \rightarrow \dots \text{Cd}^{107} + 2 {}_0\text{n}^1$
 - a) 1, 47
 - b) 2, 48
 - c) 3, 46
 - d) 3, 46
- 6) 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
- 7) Leptons respond to _____.
 - a) Strong interactions
 - b) Weak interactions
 - c) Weak & electromagnetic interactions
 - d) a & b

- 8) The energy released per fission is about _____.
 a) 100 MeV b) 931 MeV
 c) 200 MeV d) 500 MeV
- 9) The spin of the nucleus is the result of spins of _____.
 a) ${}_1\text{H}^1$ & n^1 b) n^1
 c) ${}_1\text{H}^1$ d) independent of nucleons
- 10) β particles are _____.
 a) Photons b) Electrons
 c) Helium nuclei d) Neutrons

B) Answer the following questions

06

- 1) Define Nucleus?
- 2) The atomic mass of an Atom is 110.97015 amu and mass number is 110. Calculate the Mass Defect of the Atom
- 3) What do you mean by a nuclear reaction?
- 4) What do you mean by projectile?
- 5) How many nucleons are there in Carbon atom?
- 6) Who put forth the Liquid Drop Model of nucleus?

Q.2 Solve any Eight of the following.

16

- a) State the resonance condition in Betatron.
- b) Define Recovery time.
- c) Draw neat diagram of Scintillation Counter.
- d) What is the function of Nuclear Detectors?
- e) Mass number of an atom is 19 & its atomic mass is 19.80613amu. Find packing fraction of the atom.
- f) Define Nuclear Magnetic Moment.
- g) Define amu.
- h) State the uses of Accelerators.
- i) State any two properties of a particles.
- j) Write the semi-empirical formula for BE of nucleus.

O.3 A) Attempt any Two of the following.

10

- Draw Packing fraction curve and explain stability of nucleus.
- Derive an expression for threshold energy of an endothermic nuclear reaction.
- Write a note on Quadrupole moment of nucleus.

B) Write a note on Elementary particles.

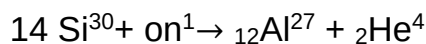
06

Q.4 A) Attempt any Two of the following.

08

- Discuss advantages and disadvantages of Betatron.
- Write a note on nuclear interactions.
- Explain Stripping Reaction with an example.

- B) State the types of nuclear reactions. Give the general scheme of nuclear reaction. Hence calculate the Q value of the following nuclear reaction & comment on the result. **08**



Given:- Mass of ${}_{14}\text{Si}^{30} = 30.9706 \text{ amu}$

Mass of ${}_0\text{n}^1 = 1.014102 \text{ amu}$.

Mass of ${}_{12}\text{Al}^{27} = 27.97216 \text{ amu}$.

Mass of ${}_2\text{He}^4 = 4.00388 \text{ amu}$

Q.5 Attempt any Two of the following.

16

- Explain the principle, construction & working of Cloud Chamber. State the advantages and disadvantages of Cloud Chamber.
- Discuss β ray spectrometer to determine K E of β particle.
- Draw BE curve and explain the characteristics of BE curve. Explain the stability of nucleus based on Binding energy curve.
The atomic mass of Aluminum is 27.007216 amu and atomic mass number is 27. Calculate the Binding Energy of Aluminum.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
CHEMISTRY (Special Paper - XII)
Analytical and Industrial Physical Chemistry (22221508-A)**

Day & Date: Saturday, 01-11-2025
Time: 09:00 AM To 12:00 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 most correct alternative of the following and rewrite the sentences 10

- 1) In conductivity cell _____ metal plates are used as an electrode.
 - a) platinum
 - b) copper
 - c) zinc
 - d) aluminum
- 2) For measurement accurate conductance of an electrolyte its solution is prepared in _____.
 - a) distilled water
 - b) conductivity water
 - c) tap water
 - d) Cl₂ water
- 3) Transmittance is the reciprocal of _____.
 - a) molar absorptivity
 - b) opacity
 - c) extinction coefficient
 - d) absorbance
- 4) The equation $I_t = I_0 e^{-\epsilon c l}$ represents the mathematical expression for _____.
 - a) Lambert's Law
 - b) Lamberts-Beer's Law
 - c) Grothaus's-Draper Law
 - d) None of these
- 5) Titrations in which end points are determined by e.m.f. measurements are called _____ titrations.
 - a) conductometric
 - b) redox
 - b) potentiometric
 - d) precipitation
- 6) According to latest convention, the emf of a cell may be expressed as _____.
 - a) $E_{\text{Cell}} = E_{\text{Right}} + E_{\text{Left}}$
 - b) $E_{\text{Cell}} = E_{\text{Left}} - E_{\text{Right}}$
 - c) $E_{\text{Cell}} = E_{\text{Right}} / E_{\text{Left}}$
 - d) $E_{\text{Cell}} = E_{\text{Right}} - E_{\text{Left}}$
- 7) In chromium plating, generally _____ is used as an anode.
 - a) Cr
 - b) Pt
 - b) Pb
 - d) Ni

- 8) _____ metal is preferred for anodic oxidation.
- a) Copper b) Nickel
c) Aluminum d) Chromium
- 9) In flame photometer the temperature of the flame is controlled by _____ factor/s.
- a) fuel-oxidant ratio b) type of solvent
b) type of fuel and oxidant c) All of these
- 10) The flame photometry is concerned with the measurement of _____ of emitted light.
- a) frequency b) intensity
c) wavelength d) wavelength and intensity

B) Fill in the blanks

06

- 1) In photoelectric colorimeters, the response from the photo current is measured by means of a _____
- 2) The molecular formula of quinhydrone is _____
- 3) Sample used for analysis in flame photometry is usually in the form _____
- 4) In the process of electroplating the article to be plated is generally made as _____
- 5) For determination of cell constant, the electrolyte preferred is _____
- 6) The equivalence conductance of the solution is given by the relation, $\lambda =$ _____

Q.2 Solve Any Eight of the following.

16

- a) Define the terms - i) Transmittance ii) Optical density
- b) Draw labelled basic circuit of direct reading potentiometer.
- c) Give the advantages of potentiometric titrations.
- d) What is pickling process?
- e) Give the Faraday's second law of electrolysis.
- f) What is throwing power?
- g) Give Boltzmann distribution equation for fraction of free atoms thermally excited.
- h) Draw block diagram of flame photometer.
- i) Mention various types of conductometric titrations.
- j) Represent the nature of curve obtained in conductometric titration of strong acid against strong alkali.

Q.3 A) Attempt Any Two of the following.

10

- Write note on photovoltaic cell.
- Discuss precipitation titration potentiometrically.
- Discuss briefly the Lundergarph burner. Give its advantages.

- B) Explain briefly the process of chromium plating. Give its applications. 06**

- Q.4 A) Attempt Any Two of the following. 08**
- a) Explain the causes of deviations from beer's law.
 - b) Discuss single cell photoelectric colorimeter
 - c) What is cell constant? How it is determined?
- B) Give the construction and working of quinhydrone electrode. How it is used in the determination of pH of a solution? 08**
- Q.5 Attempt Any Two of the following. 16**
- a) Describe in detail the processes of anodising. Give its applications.
 - b) Explain the various components of flame photometer.
 - c) Give principle of conductometric titrations. Discuss in detail conductometric titrations of weak acid against strong base.

Seat No.	

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November – 2025
CHEMISTRY (Special Paper - XII)
Methodology and Materials of Industrial Importance (22221508-B)**

Day & Date: Saturday, 01-11-2025

Max. Marks: 80

Time: 09:00 AM To 12:00 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 Question. 10

- 1) In the scientific method _____ of the following is the correct sequence.
 - a) Observation → Hypothesis → Experiment → Theory → Law
 - b) Hypothesis → Theory → Observation → Law → Experiment
 - c) Observation → Theory → Hypothesis → Law → Experiment
 - d) Experiment → Observation → Hypothesis → Law → Theory
- 2) The matrix in a composite mainly provides _____.
 - a) Strength and stiffness
 - b) Binding and load transfer to reinforcement
 - c) High conductivity
 - d) Thermal resistance only
- 3) Carbon nanotubes (CNTs) are examples of _____.
 - a) Zero-dimensional nanomaterials
 - b) One-dimensional nanomaterials
 - c) Two-dimensional nanomaterials
 - d) Three-dimensional nanomaterials
- 4) In simple linear regression, the correlation coefficient r _____.
 - a) Always lies between -1 and +1
 - b) Can exceed +1 for strong positive correlation
 - c) Is always non-negative
 - d) Must be exactly zero for a good fit
- 5) A bio-nanocomposite is best described as _____.
 - a) Pure inorganic nanowire
 - b) Hybrid material combining biological molecules and nanomaterials
 - c) Nanoparticles made only from metal
 - d) Only artificial nanomaterials

- 6) Nanomaterials are defined as materials with structural features in the size range of _____.
 - a) 1-100 nm
 - b) 100-1000 nm
 - c) 1-10 μm
 - d) 0.1-1 mm
- 7) The most suitable container for storing flammable chemicals is _____.
 - a) Plastic bottles
 - b) Metal cans with tight lids
 - c) Glass bottles kept in direct sunlight
 - d) Open beakers inside the fume hood
- 8) ANOVA (Analysis of Variance) is mainly used to _____.
 - a) Compare the relationship between two variables
 - b) Test differences between the means of multiple groups
 - c) Predict dependent variable values
 - d) Fit exponential functions
- 9) Recovery, recycling, and reuse of laboratory chemicals is primarily done to _____.
 - a) Reduce experimental time
 - b) Save storage space only
 - c) Minimize waste and promote sustainability
 - d) Increase reaction rate
- 10) _____ of the following is the primary purpose of laboratory ventilation?
 - a) To reduce energy consumption
 - b) To maintain constant room temperature
 - c) To prevent accumulation of toxic fumes and vapors
 - d) To provide light in the workspace

B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc.

06

- 1) What is the main purpose of analyzing residuals in curve fitting?
- 2) What is the primary purpose of wearing protective apparel in a chemical laboratory?
- 3) State one role of the matrix in composites.
- 4) Which part of a composite provides strength matrix or reinforcement?
- 5) Name one method for preparing gold nanoparticles.
- 6) What is meant by “self-assembled nanostructure”?

- Q.2 Solve the following. (Any Eight) 16**
- a) Define the SI unit of temperature and give its symbol.
 - b) Name two types of protective apparel used in a chemical laboratory.
 - c) Define nanomaterials. Give one example.
 - d) What is the role of the matrix in a composite material?
 - e) State two differences between descriptive statistics and inferential statistics.
 - f) Give two examples of environmental effects on composites.
 - g) Name two reinforcement materials used in composites.
 - h) Mention any two methods of preparation of gold nanoparticles.
 - i) What is the purpose of ANOVA in statistical analysis?
 - j) Name two applications of carbon nanotubes (CNTs).
- Q.3 A) Attempt the following. (Any Two) 10**
- a) Explain the concept of bio-nanocomposites with one suitable example.
 - b) Discuss the role of correlation coefficient (r) and its misuse in data analysis.
 - c) Explain the safe working procedures in a chemical laboratory. Discuss the role of protective apparel, laboratory ventilation.
- B) Explain the chemical and green synthesis methods for preparation of gold and silver nanoparticles. 06**
- Q.4 A) Attempt the following. (Any Two) 08**
- a) Explain the limitations of conventional engineering materials. How do composites overcome these limitations?
 - b) Discuss the applications of composites in aerospace, automotive, and biomedical fields.
 - c) Describe the process of multiple linear regression (MLR) and its applications in chemistry.
- B) Explain the methods of waste chemical management in laboratories. 08**
- Q.5 Attempt the following. (Any Two) 16**
- a) Give an overview of nanostructures and nanomaterials. How are nanomaterials classified based on their dimensions?
 - b) What is Chemometrics? Discuss the applications of ANOVA, correlation and regression in chemical data analysis?
 - c) Describe the safe storage and handling of hazardous chemicals. How should acids, bases, flammable solvents, and gases be stored?

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
BOTANY (Special Paper - XII)
Plant Breeding (22221504-A)**

Day & Date: Saturday, 01-11-2025
Time: 09:00 AM To 12:00 PM

Max. Marks: 80

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

Q.1 A) Choose the most correct alternative of the following and rewrite the sentences 10

- 1) _____ is the adaptation or adjustment of an individual plant or a population of plants under the changed climate.
a) Plant introduction b) Acclimatization
c) Mutation d) Polyploidy
- 2) _____ is the process of bringing wild species under human management.
a) Domestication b) Acclimatization
c) Plant introduction d) Cultivation
- 3) _____ is the removal of stamens from female parent before they burst and shed their pollens.
a) Emasculation b) Hybridization
c) Crossing d) Harvesting
- 4) _____ method is usually used for hybridization in self-pollinated crop plants.
a) Pedigree method or breeding
b) Bulk method or breeding
c) Back cross method
d) All of these
- 5) _____ is a sign, symbol, or word used to distinguish products or services of an organization from those of others.
a) Copyright b) Patent
b) Trademark d) None of these
- 6) Intellectual property rights are legal rights that provide creators protection for _____.
a) original works b) inventions
c) appearance of products d) All of these

- 7) _____ is a type of intellectual property protection that protects original works of authorship
- a) Trade Secrets b) Patents
b) Copyrights d) Trademarks
- 8) _____ of the following is incorrect with respect to mutation.
- a) Sudden
b) Continuous
c) Change in chromosomes and genes
d) Leads to variation in DNA
- 9) _____ of the following chemical induces polyploidy in plants.
- a) Formalin b) Colchicine
b) 5-Bromouracil c) None of these
- 10) _____ of the following is not involved in classical plant breeding practices.
- a) The hybridisation of pure lines
b) Artificial selection of plants
c) Desirable traits of higher yield
d) Molecular biology

B) Fill in the blanks.**06**

- 1) IPR stands on (full form) _____
- 2) The copyright symbol is _____
- 3) NRCP, Solapur mainly works on crop _____
- 4) International Rice Research Institute (IRRI) is located in _____
- 5) The headquarters of the ICAR is located at _____
- 6) Maldandi-35-1 is an improved variety of crop _____

Q.2 Solve any Eight of the following.**16**

- a) Define plant breeding.
b) What is hybridization?
c) What is mutation?
d) Define polyploidy.
e) Write down two aims of plant breeding.
f) Enlist main steps of hybridization.
g) What is emasculation?
h) What is copyright?
i) Define mass selection.
j) Enlist types of property.

Q.3 A) Write a short note on any two of the following.**10**

- a) Scope of plant breeding
b) Plant genetic resources
c) Advantages of IPR

B) Explain in brief role of mutation in plant breeding.**06**

- Q.4 A) Attempt any Two of the following. 08**
- a) Comment upon mass selection method.
 - b) Explain in brief domestication of crop plants.
 - c) Comment upon contribution of NRCP institute on crop Pomegranate.
- B) Explain in brief. 08**
- a) Trade secrets
 - b) Centres of crop origin
- Q.5 Attempt any Two of the following. 16**
- a) Explain in detail steps in hybridization technique.
 - b) Explain in detail aims and scope of plant breeding in crop improvement.
 - c) What is polyploidy? Explain in detail role of polyploidy in plant breeding.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
BOTANY (Special Paper - XII)
Economic Botany (22221504-B)**

Day & Date: Saturday, 01-11-2025
Time: 09:00 AM To 12:00 PM

Max. Marks: 80

- 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.

Q.1 A) Select the correct alternative front the following **10**

- 1) Botanical name of chick pea is _____
 a) *Cicer arietinum* b) *Glycerrhiza glabara*
 c) *Adathoda zelylanica* d) *Rauvolfia serpentina*
- 2) Botanical name of red gram is _____
 a) *Cicier aritinum* b) *Cajanus cajan*
 c) *Araches hypogia* d) *Adathoda zelyanica*
- 3) *Withania somnifera* is a _____ drug.
 a) stem b) rhizome
 c) leaf d) root
- 4) 'Gulvel satva' is prepared from _____
 a) *Tinospora cordifolia* b) *Papaver somniferum*
 b) *Terminalia belerica* d) *Ephedra species*
- 5) Example of drugs obtained from flower bud is _____
 a) Hirda b) Clove
 b) Behda d) Red gram
- 6) _____ is used as botanical pesticide.
 a) Neem b) Custard apple
 c) Tobacco d) All of the above
- 7) _____ is cultivated as fodder legume.
 a) Lucerne b) Chick pea
 c) Cango pea d) Pigeon pea
- 8) _____ is source of rhizome dyes.
 a) Turmeric b) Indigo
 b) Heena d) Oak

- 9) *Arachis hypogaea* commonly known as _____
 a) Arecanut b) Peanut
 b) Walnut c) None of these
- 10) Alkaloid azadirachtin having insecticidal property is present in _____
 a) Awala b) Groundnut
 c) Neem d) Soyabean

B) Answer the following: one sentence only.

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

- What is mean by fodder legume? Give its two examples.
- What are plant fibers?
- State the botanical name and source of drag ginger.
- What are plant dyes? Give any two environmental advantages of plant insecticides.
- Give any two economic importance of groundnut.
- State the economic importance of custard apple.
- State the different chemical constituents of *Tinospora*.
- State the morphology of cotton.
- What are textile fibers?
- Give the botanical name of chickpea and red gram.

Q.3 A) Attempt any two of the following.

10

- Give the morphology and economic importance of Indigo
- Describe morphology and medicinal uses of turmeric.
- Give the morphology, source and economic importance of Lawsonia.

B) Write short notes (any two of the following)

06

- State economic importance of ginger.
- Describe the medicinal properties of *Adathoda zelyanica*.
- Explain the dying properties of Heena.

Q.4 A) Attempt any Two of the following.

08

- Give the botanical name, source and economic importance of fruit drug.
- Give the botanical name, source and economic importance of coir.
- Explain the botanical name, morphology, source and economic importance of red gram.

B) Write short notes (any Two of the following)

08

- a) Describe economic importance of Withania.
- b) Explain economic importance of teak.
- c) Explain the economic importance of Palas.

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 custard apple.
- c) Give the brief account on cultural practices of soyabean.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
ZOOLOGY (Special Paper - XII)
Wildlife Conservation & Management (22221516)**

Day & Date: Saturday, 01-11-2025
Time: 09:00 AM To 12:00 PM

Max. Marks: 80

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

Q.1 A) Choose the most correct alternative of the following and rewrite the sentences 10

- 1) _____ of these is the most effective means of Conserving Biodiversity.
 - a) Preserve habitats.
 - b) Get rid of predators
 - c) Census species during the breeding season.
 - d) Vaccinate species against diseases.
- 2) _____ of the following is not a principle of remote sensing.
 - a) Interaction of energy with satellite
 - b) Electromagnetic energy
 - c) Electro-magnetic spectrum
 - d) Interaction of energy with atmosphere
- 3) The function is performed by the data input/capture subsystem of GIS is _____.
 - a) Transformation of Data
 - b) Acquiring Data
 - c) Storage of Data Elements
 - d) Retrieval of Data Elements
- 4) Rice variety is an example for _____ of the following biodiversity.

a) Genetic diversity	b) Species diversity
c) Ecosystem diversity	d) Community diversity
- 5) _____ happens if there is a change in genetic diversity.
 - a) It leads to the loss of biological diversity
 - b) It leads to the loss of only human species
 - c) It leads to the pollution
 - d) It leads to more population

- 6) _____ is the fundamental method of representing GIS entities?
a) Mapping Method b) Drawing Method
c) Raster Method d) GIS Method
- 7) The protection and conservation of species in their natural habitat is called as _____
a) In-situ conservation
b) Ex-situ conservation
c) Off-site conservation
d) No conservation
- 8) In _____ one of the following states is "Gir forest" located.
a) Maharashtra b) Rajasthan
c) Haryana d) Gujarat
- 9) Bandipur National Park is located in _____ of the given states.
a) Andhra Pradesh b) Rajasthan
b) Assam c) Karnataka
- 10) _____ is the smallest forest state in India.
a) Madhya Pradesh b) Punjab
c) Andhra Pradesh d) Karnataka

B) One sentence answer.**06**

- 1) Define Wild life conservation
- 2) Write full form of GIS.
- 3) Tadoba National Park is located in which district?
- 4) Write full form of (GIB).
- 5) What is full form of CITES?
- 6) IUCN stands for?

Q.2 Solve any Eight of the following.**16**

- a) Explain the values of wild life.
- b) Write the importance of conservation.
- c) Define habitat analysis.
- d) What is Topography?
- e) What are Biological Parameters?
- f) Explain Pug marks.
- g) Enlist any two National parks in India.
- h) Write the concept of climax.
- i) What is mean by Conservation ethics?
- j) Write the names of any two sanctuaries in India.

Q.3 A) Attempt any Two of the following.**10**

- a) Write Standard evaluation procedures for remote sensing.
- b) What is succession? Write Advancing the succession process.
- c) Explain methods for Fecal analysis of ungulates and carnivores.

B) Explain in detailed Restoration of degraded habitats.**06**

Q.4 A) Attempt any Two of the following. 08

- a) Explain the common diseases of wild animal.
- b) Write the methods of population estimation.
- c) Explain Tiger conservation-Tiger reserves in India & its management challenges.

B) Explain Care of injured and diseased animal. 08

Q.5 Attempt any Two of the following. 16

- a) Define Wildlife Protection Act and explain National: Wildlife Protection Act-1972 and conservation.
- b) Explain in detailed the concept of different categories of IUCN'S Red data list.
- c) Write the Application of biostatistics in Biodiversity estimation and explain Shannon Diversity Indices with suitable example.

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
MATHEMATICS (Special Paper - XII)
Partial Differential Equations (22221520-A)**

Day & Date: Saturday, 01-11-2025
Time: 09:00 AM To 12:00 PM

Max. Marks: 80

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

Q.1 A) Choose correct alternative and rewrite the sentence. 10

- When $f(x, y)$ is of from $x^m y^n$, if $n < m$ then $\frac{1}{F(D, D')}$ should be _____.
 - $\frac{D}{D'}$
 - $\frac{D'}{D}$
 - DD'
 - $\frac{1}{D'}$
- The general solution of $(D + D' + 1)y = 0$ is _____.
 - $z = e^{-x} \phi(y - x)$
 - $z = e^{-x} \phi(y + x)$
 - $z = e^{-4x} \phi(y - x)$
 - $z = e^{-5x} \phi(y - x)$
- The equation $z = px + qy + f(p, q)$ is the from of _____.
 - $f_1(x, p) = f_2(y, q)$
 - Clairaut's from
 - $F(p, q, z) = 0$
 - $F(p, q) = 0$
- The first order partial differential equation $p = P(x, y)$ and $q = Q(x, y)$ are compatible if and only if _____.
 - $\frac{\partial P}{\partial y} = -\frac{\partial Q}{\partial x}$
 - $\frac{\partial P}{\partial x} = \frac{\partial Q}{\partial y}$
 - $\frac{\partial P}{\partial y} = \frac{\partial Q}{\partial x}$
 - $\frac{\partial P}{\partial x} = -\frac{\partial Q}{\partial y}$
- The equation $(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$ is _____ partial differential equation.
 - Linear
 - Non linear
 - Semi-linear
 - Quasi-linear
- The P.I. of $\left(\frac{\partial^2 v}{\partial x^2}\right) + \left(\frac{\partial^2 v}{\partial y^2}\right) = 12(x + y)$ is _____.
 - $(x + y)$
 - $(x + y)^2$
 - $(x + y)^3$
 - $(x + y)^4$

- 7) 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) $z = ax - y\sqrt{1 + a^2} + c$
- 8) The C.F. of $(D^2 - D')z = 2y - x^2$ is _____.
 a) ΣAe^{-hx+h^2y} b) ΣAe^{hx+h^2y}
 c) ΣAe^{hx-h^2y} d) ΣAe^{-hx-h^2y}
- 9) The particular integral of $\frac{1}{D-mD'}f(x, y)$ is _____.
 a) $\int f(x, c - mx)dx$ b) $\int f(y, c - mx)dx$
 c) $\int f(x, c + mx)dx$ d) $\int f(y, c + my)dy$
- 10) The integral which does not contains an arbitrary constant is called _____.
 a) Complete integral b) Singular integral
 c) General integral d) Particular integral

B) Fill in the blanks.**06**

- 1) The P.I. of $\frac{1}{D+D'} \sin x =$ _____.
 2) The singular integral of $z = px + qy + pq$ is _____.
 3) When the number of arbitrary constants is less than the number of independent variables then by eliminating arbitrary constant, we get more than _____ partial differential equation of order _____.
 4) If $F(D, D')$ be a homogenous function of D and D' of degree n then $\frac{1}{F(D, D')} \phi^{(n)}(dx + by) =$ _____.
 5) The meaning of $\frac{1}{D'}(x^4y^3) =$ _____.
 6) If $a \neq 0$, then the general solution of equation $(bD - aD' - c)z = 0$ is _____.

Q.2 Attempt Any Eight of the following.**16**

- a) Solve $\frac{\partial^2 z}{\partial x^2} - a^2 \frac{\partial^2 z}{\partial y^2} = 0$
 b) Eliminate arbitrary constants a and b from $z = (x - a)^2 + (y - b)^2$ to form the partial differential equation.
 c) From partial differential equation by eliminating the function $z = e^{ax+by} f(ax - by)$
 d) Show that the differential equation $\frac{\partial z}{\partial x} = 5x - 7y$ and $\frac{\partial z}{\partial y} = 6x + 8y$ are not compatible.
 e) Solve $p + q = 1$

- f) Solve $(D^2 + D'^2 + 2DD')z = 0$
 g) Find the P.I. of $(D - D')(D + D' + 1)z = e^{2x+3y}$
 h) Solve $(D - D^2)z = 0$
 i) Find the complete integral of $p - 3x^2 = q^2 - y$
 j) Solve $(DD' + aD + bD' + ab)z = e^{mx+ny}$

Q.3 A) Attempt Any Two of the following. 10

- a) Solve $x(y^2 - z^2)p - y(z^2 + x^2)q = z(x^2 + y^2)$
 b) Find the equation of integral surface of the differential equation.
 $2y(z - 3)p + (2x - z)q = y(2x - 3)$ which pass through circle
 $z = 0, x^2 + y^2 = 2x$.
 c) From a partial differential equation by eliminating the arbitrary
 function ϕ from $\phi(x + y + z, x^2 + y^2 - z^2) = 0$. What is the order
 of this partial differential equation?

B) If $f(D, D')$ is homogenous function of D and D' of degree n and 06

$F(a, b) = 0$ i.e. $(bD - aD')$ is a factor of $F(D, D')$ then show that

$$\left(\frac{1}{bD - aD'}\right)^n \phi(ax + by) = \frac{x^n}{b^n n!} \phi(ax + by)$$

Q.4 A) Attempt Any Two of the following. 08

- a) Explain the method of solving the equation of the form $f(p, q, z) = 0$
 b) Solve $(2D^2 - 5DD' + 2D'^2)z = 24(y - x)$
 c) Find a complete of $g(p_z^2 + q^2) = 4$

B) Derive the partial differential equation by eliminating the arbitrary 08

function ϕ from the equation $\phi(u, v) = 0$ where u and v are functions
 of x, y, z .

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) Solve:
 i) $(D + D' - 1)(D + D' - 3)(D + D')z = e^{x+y} \sin(2x + y)$
 ii) $(D^2 - 6DD' + 9D'^2)z = \tan(y + 3x)$
 c) Explain the method of finding complementary function of the linear
 homogenous partial differential equation with constants coefficients
 namely $f(D, D')z = f(x, y)$ when roots are distinct.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
Mathematics (Special Paper - XII)
Operations Research (22221520-B)**

Day & Date: Saturday, 01-11-2025
Time: 09:00 AM To 12:00 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 most correct alternative of the following and rewrite the sentences 10

- 1) A variable which does not appear in the basic variable (B) column of simplex table is _____.
 - a) never equal to zero
 - b) always equal to zero
 - c) called a basic variable
 - d) none of the above
- 2) A variable used to convert $\leq$ inequality to equation is called as _____.
 - a) Surplus
 - b) Slack
 - c) Artificial
 - d) Basic
- 3) For any primal problem and its dual.
 - a) optimal value of objective functions is same
 - b) primal will have an optimal solution if and only if dual does too
 - c) both primal and dual may be infeasible
 - d) all of the above
- 4) In a linear programming problem, a basic solution is said to be non-degenerate basic feasible solution if _____ basic variables are zero.
 - a) All
 - b) Some
 - c) One
 - d) at least one
- 5) In canonical form of LPP _____.
 - a) Objective function is of maximization type
 - b) All variables x_i 's are non-negative
 - c) All constraints are of $\leq$ type
 - d) All of these

- 6) If there are 5 –workers and 5-jobs in assignment problem then there would be _____.
 - a) 9 solutions
 - b) 24 solutions
 - c) 16 solutions
 - d) 120 solutions
- 7) Random number satisfies _____.
 - a) Uniformity
 - b) Independence
 - b) Both A & B
 - d) None of these
- 8) Mean time between two successive arrivals is equal to _____.
 - a) Arrival rate
 - b) Service rate
 - c) Reciprocal of arrival rate
 - d) Reciprocal of service rate
- 9) Jockeying is said to be there in queuing system if number of servers is _____.
 - a) 0
 - b) 1
 - c) 0 or 1
 - c) None of these
- 10) If a customer enters in the queue but after some time loses patience and decided to leave then he is said to have _____.
 - a) Balking
 - b) Jockeying
 - c) Reneging
 - d) Alternating

B) Fill in the blanks

06

- 1) IBFS of L.P.P. is obtained by assuming the values of _____ variables equal to zero.
- 2) In Big-M method, where M is very big number, is the cost of _____.
- 3) The initial solution of T.P. can be obtained by applying any known method. However, the only condition is that _____.
- 4) Sample value of random variable $X \sim U(0,0.5)$ for random number 0.5 is _____.
- 5) The customers who move from one queue to another are said to be _____.
- 6) The probability distribution of customers joining queue is _____.

Q.2 Solve any Eight of the following.

16

- a) Explain role of artificial variable in L.P.P.
- b) Explain the steps for forming dual from its primal
- c) Explain Big-M method for solving L.P.P.
- d) State Primal and Dual forms of L.P.P.
- e) State general rules of solving sequential problem with n jobs on 2 machines
- f) Define the term random number. Explain properties of random numbers.
- g) Explain essential features of characteristics of queuing system.
- h) Explain the Classification of queuing model.

- i) Generate 5 random number using Mid-square method for given seed value 2500.
- j) Explain Mid-Square method of random number generation.

Q.3 A) Attempt any Two of the following. 10

- a) Define the following terms in L.P.P.
 - i) Feasible solution
 - ii) Basic feasible solution
 - iii) Degenerate solution
 - iv) Optimum solution
- b) Explain Simplex algorithm to solve L.P.P.
- c) Explain Modified distribution method (MODI) to obtain optimal solution for Transportation problem.

B) Explain mathematical formulation of assignment problem. 06

Q.4 A) Attempt any Two of the following. 08

- a) Explain North-West corner rule and Vogel's approximation method.
- b) Define Assignment problem and explain Hungarian method to solve it.
- c) Define transportation problem and explain VAM method to obtain initial basic feasible solution.

B) Explain use of Artificial Variable in Linear Programming Problem. 08

Q.5 Attempt any Two of the following. 16

- a) Explain queuing model: M/M/1 using FCFS queue discipline and find expected number of customers in the system and in queue.
- b) Define Total elapsed time and Describe the Algorithm of processing of n jobs through m machines.
- c) Explain following random number generation method

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
STATISTICS (Special Paper - XII)
Operations Research (22221523-A)**

Day & Date: Saturday, 01-11-2025
Time: 09:00 AM To 12:00 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 most correct alternative of the following and rewrite the sentences 10

- 1) Constraints in an LP model represents _____
 - a) limitations
 - b) requirements
 - c) balancing limitations and requirements
 - d) All of the above
- 2) Which of the following is an assumption of an LP model?

a) Divisibility	b) Proportionality
c) Additivity	d) All of the above
- 3) 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
- 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) 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

- 6) The minimum expected opportunity loss (EOL) is ____
 - a) equal to EVPI
 - b) minimum regret
 - c) equal to EMV
 - d) both (a) and (b)
- 7) A decision alternative in decision making problem is known as ____
 - a) Strategy
 - b) States of Nature
 - b) Payoff
 - d) None of these
- 8) The slack for an activity is equal to ____
 - a) $LF - LS$
 - b) $EF - ES$
 - c) $LS - ES$
 - d) None of the above
- 9) A type of decision-making Environment is ____
 - a) Certainty
 - b) Uncertainty
 - c) Risk
 - c) All of these
- 10) 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

B) Fill in the blanks**06**

- 1) The graphical method can only be used when there are ____ decision variables.
- 2) The ____ is that region which satisfies all constraints.
- 3) To solve a L.P.P. by simplex method all b_j 's should be ____
- 4) If a game involves more than two players, then it is called a ____ game.
- 5) The method of finding an initial solution based upon opportunity costs is called ____
- 6) Monte Carlo is technique for ____

Q.2 Solve any Eight of the following.**16**

- a) Define Surplus Variable.
- b) Write the definition of solution, basic solution.
- c) Define LPP in the mathematical form.
- d) How to balance Unbalanced T. P.?
- e) State the mathematical formulation for T.P.
- f) What is the artificial variable?
- g) What is an opportunity loss in decision making problem?
- h) Write similarities and differences between PERT and CPM.
- i) When is Big M method useful?
- j) What is Sequencing Problem?

Q.3 A) Attempt any Two of the following.**10**

- a) Write the procedure of processing n jobs on two machines.
- b) Write the steps involved in the Procedure of Monte Carlo Simulation.

- c) 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 Procedure of Least-Cost Method. 06

Q.4 A) Attempt any Two of the following. 08

- What is a Decision Making under Risk?
- Explain the procedure of generating random number from Binomial distribution.
- Give the Steps involved in Minimax regret criterion

B) Solve Following LPP 08

$$\begin{aligned} \text{Maximize } Z &= X_1 - X_2 + 3X_3 \\ \text{Subject to the constraints,} \\ X_1 + X_2 + X_3 &\leq 10 \\ 2X_1 - X_2 &\leq 2 \\ 2X_1 - 2X_2 + 3X_3 &\leq 30 \\ X_1, X_2, X_3 &\geq 0 \end{aligned}$$

Q.5 Attempt any Two of the following. 16

- a) Find the Initial Basic Feasible Solution to the following Transportation problem by using Matrix Minima 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) 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

- c) Find the optimal sequence in performing the following five jobs on two machines. Processing times (in hours) are given in the following table.

Job	1	2	3	4	5
Machine M1	30	120	50	20	90
Machine M2	80	100	90	60	30

Also find total elapsed time and idle times for both machines.

Seat No.	

Set P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
STATISTICS (Special Paper - XII)
Regression Analysis (22221523-B)**

Day & Date: Saturday, 01-11-2025
Time: 09:00 AM To 12:00 PM

Max. Marks: 80

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

Q.1 A) Select the correct alternative front the following **10**

- 1) In simple linear regression model $Y = \beta_0 + \beta_1 X + \varepsilon$, β_0 and β_1 are respectively _____
 - a) response variable and regressor variable
 - b) response variable and predictor variable
 - c) intercept and slope
 - d) None of These
- 2) In simple linear regression model, errors follow _____
 - a) Normal distribution
 - b) Binomial distribution
 - c) Poisson distribution
 - d) Uniform distribution
- 3) The sum of residuals in any regression model that contains an intercept is always _____
 - a) zero
 - b) one
 - c) non-zero
 - d) positive
- 4) Forward selection 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
- 5) Regression means _____
 - a) relation between variables
 - b) relation between dependent and independent variables
 - c) relation between dependent variables
 - d) all the above
- 6) Hat matrix is given by _____
 - a) $X(X'X)^{-1}$
 - b) $X'(X'X)^{-1}$
 - c) $X'(X'X)^{-1} X$
 - d) $X(X'X)^{-1} X'$

- 7) 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}
- 8) If all observations on response variable Y are located on a straight line, then _____.
 a) $SST = SSR$
 b) $SST = SS_{res}$
 c) $SSR = SS_{res}$
 d) $SST = SSR = SS_{res}$
- 9) In multiple linear regression, estimate of σ^2 is given by _____.
 a) MS_R
 b) MS_{Res}
 c) SSR
 d) SST
- 10) Logistic regression is used when we want to predict _____.
 a) a dichotomous variable from continuous or dichotomous variables
 b) a continuous from dichotomous variables
 c) any categorical variable from several other categorical variable
 d) a continuous variable from dichotomous or continuous variables

B) Fill in the blanks

06

- 1) In the regression equation, $Y = 10 + 5X + \varepsilon$, the slope is _____.
- 2) The transformation $\ln\left(\frac{n(x)}{1-n(x)}\right)$ is called _____.
- 3) In simple linear regression model, the distribution of error term is assumed to be _____.
- 4) In simple linear regression model, to test the hypothesis about intercept parameter _____ test is used.
- 5) In multiple linear regression models, variance of least square estimator of β is _____.
- 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

- Define multiple linear regression model.
- Define simple linear regression with assumptions.
- Define hat matrix H and its properties.
- Discuss logit transformation in the context of logistic regression model.
- State all variables selection methods.
- Explain residual.
- Define coefficient of determination R^2 .
- Write logistic regression model.
- What is the use of normal probability plot?

- Q.3 A) Attempt Any Two of the following. 10**
- a) Find confidence interval for β_1 in simple linear regression.
 - b) State multiple linear regression model with p regressors. Also, state the assumptions.
 - c) Describe any two criteria for evaluating subset regression models.
- B) Write short notes 06**
- a) Backward elimination method
 - b) Forward selection method
- Q.4 A) Attempt Any Two of the following. 08**
- a) In simple linear regression model, describe the procedure of testing regression coefficients, using t-test.
 - b) Explain how residuals plots are useful in verifying assumptions in a linear regression model.
 - c) Write note on transformations for linearizing a non-linear model.
- B) Define odds ratio ψ . Write its interpretation if 08**
- i) $\psi = 1$ ii) $\psi > 1$ iii) $\psi < 1$
- Q.5 Attempt Any Two of the following. 16**
- a) Describe a multiple linear regression model. Stating the assumptions, obtain the least square estimator of (LSE) $\hat{\beta}$ of β .
 - b) Derive the maximum likelihood estimators of parameters of a logistic regression model with one covariate.
 - c) Explain the concept of the simple linear regression with illustrations. Derive least square estimator of the regression coefficients in the model

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
GEOLOGY (Special Paper - XII)
Applied Geology – Prospecting and Mining Geology (22221528)**

Day & Date: Saturday, 01-11-2025
Time: 09:00 AM To 12:00 PM

Max. Marks: 80

- Instructions:**
- 1) All questions are compulsory.
 - 2) Draw neat and labeled diagram 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 front the following/ 10

- 1) When an elastic wave propagates in a medium, its velocity depends on _____
 - a) Density of the medium only
 - b) Elasticity of the medium only
 - c) Both density and elasticity of the medium
 - d) Neither density nor elasticity of the medium
- 2) High magnitude of anomalous elements in a particular area is called _____

a) Anomaly	b) Background value
c) Threshold value	d) Excessive value
- 3) In the seismic refraction method, the waves sent along the ground surface is picked by _____

a) Geo satellite instrument	b) Geophone
c) Wave detector	d) All of the mentioned
- 4) When minerals are located too deep in the ground, the method used for mining is _____

a) <i>Open pit mining</i>	b) <i>Quarries</i>
b) <i>Surface mining</i>	d) <i>Sub-surface mining</i>
- 5) Coning and quartering is _____
 - a) A mining method employed in unconsolidated ground.
 - b) A mining method employed for the diamond mining.
 - c) A method employed for obtaining a laboratory sample from the field sample.
 - d) A cutting and filling method employed in underground mining.

- 6) In the curve-matching technique if $\rho_1 > \rho_2 > \rho_3$, the curve type is _____
- | | |
|-------------|-------------|
| a) 'Q' type | b) 'H' type |
| c) 'A' type | d) 'K' type |
- 7) Torsion balance surveys are conducted for _____
- | | |
|-------------------------|---------------------------|
| a) Gravity prospecting | b) Electrical prospecting |
| c) Magnetic prospecting | d) Seismic prospecting |
- 8) Prospecting based on geological maps with scale of 1:50,000 is called _____ survey.
- | | |
|-------------------|----------------------|
| a) Reconnaissance | b) Preliminary |
| b) Detailed | d) None of the above |
- 9) Oil shales are known from Lower Silurian is the best example of which of the following geological criteria?
- | | |
|------------------|-----------------|
| a) Climatic | b) Structural |
| b) Stratigraphic | c) Lithological |
- 10) How can mining become more environmentally sustainable?
- | |
|---|
| a) Reduce inputs like using a large amount of water and land in their operations. |
| b) Proper waste disposal. |
| c) Improving the manufacturing process. |
| d) All the above |

B) Fill in the blanks / Answer the following.**06**

- 1) Which geophysical method is used for detailed exploration of oil and gas?
- 2) The openings in the mine, which serve as a means of entry is known as _____.
- 3) _____ elements/minerals provide good clues in search for hidden ore bodies because they generally form large haloes.
- 4) A criterion covers the geological settings associated primarily with the age of various sedimentary series (or intrusions) enclosing a mineral.
- 5) Which of the mining method is most likely to destroy the habitat of wildlife?
- 6) _____ sampling which best suited to bedded, banded and vein type of deposits.

Q.2 Solve any Eight of the following.**16**

- a) Define Pathfinder.
- b) Name the geological criteria used for residual deposits.
- c) What is meant by tailing?
- d) Give two examples of ore deposits used to extracted by self-potential method.
- e) Name the instruments used for magnetic geophysical method.
- f) Name the ore deposits confined to definite stratigraphic division.

- g)** Write any two corrections data of magnetic method.
- h)** Give examples of magmagenic criteria.
- i)** Name the types of surface mining used in exploration.
- j)** Define normal and reversed magnetism.

- Q.3 A) Attempt any Two of the following. 10**
- a) Discuss the field procedure of seismic survey with suitable diagram.
 - b) Describe the geological criteria used for prospecting placer deposits.
 - c) Explain in brief the types of surface mining.
- B) Write short note on primary and secondary dispersion with suitable diagram. 06**
- Q.4 A) Attempt any Two of the following. 08**
- a) Describe any four sampling methods used in ore exploration.
 - b) Write note on mobility of elements and pathfinders.
 - c) Discuss the applications of gravity method.
- B) Describe the electrical configuration of resistivity survey with neat labelled diagram. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Discuss the impact of mining on the water resources, soil and air.
 - b) Discuss in brief the instrumentation, field procedure, data interpretation and applications of magnetic method.
 - c) Define mining. Explain the stages in the life of mine.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
MICROBIOLOGY (Special Paper - XII)
Industrial Microbiology (22221532-A)**

Day & Date: Saturday, 01-11-2025
Time: 09:00 AM To 12:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat labelled diagram 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 from the following 10

- 1) What is the purpose of the dye reduction test (MBRT) in milk?
 - a) Measurement of microbial load
 - b) Detection of food colorants
 - c) Assessment of food texture
 - d) Identification of foodborne pathogens
- 2) Who developed the method of preserving food using boiling water?
 - a) Peter Durand
 - b) Louis Pasteur
 - c) Francois Nicolas Appert
 - d) Charles Mitchell
- 3) Which of the following is a downstream process?
 - a) Product recovery
 - b) Screening
 - c) Media formulation
 - d) Sterilization of media
- 4) Alcoholic fermentation is carried by yeast known as _____.
 - a) Lactobacillus
 - b) Bacillus
 - c) Saccharomyces cerevisiae
 - d) Escherichia coli
- 5) Tests for proper pasteurization are based on the activity of which enzyme?
 - a) Lactas
 - b) Diastase
 - c) Phosphatase
 - d) Catalase
- 6) Streptomycin is produced by _____.
 - a) *Streptomyces noursei*
 - b) *Streptomyces nodosus*
 - c) *Streptomyces fradiae*
 - d) *Streptomyces griseus*

- 7) The yeast generated during the fermentation of beer is generally separated by _____
- | | |
|--------------------|-----------------|
| a) Centrifugation | b) Filtration |
| c) Cell disruption | d) All of these |
- 8) How long does it take to complete fermentation process in case of white wine?
- | | |
|-------------|--------------|
| a) 1-3 days | b) 3-5 days |
| c) 5-7 days | d) 7-11 days |
- 9) Salmonella infection causes _____
- | | |
|--------------|----------------------|
| a) Enteritis | b) Gastroenteritis |
| c) Hepatitis | d) None of the above |
- 10) Sterility testing is typically performed on which of the following pharmaceutical products?
- | | |
|----------------------------|-----------------------|
| a) Oral solid dosage forms | b) Injectable liquids |
| b) Inhalation products | c) All of the above |

B) Solve the following questions in one sentence**06**

- 1) Define beer.
- 2) Give the organism involved in Vit B12 production.
- 3) What is the principle of sterility test?
- 4) Name any two organisms involved in fruit spoilage.
- 5) Give the organism involved in production of California sherry.
- 6) Define bioassay.

Q.2 Solve any Eight of the following.**16**

- a) What is food infection?
- b) Give the composition of milk.
- c) What is the principle of MBRT test?
- d) Give the principle of distillation.
- e) Write the recovery of streptomycin fermentation.
- f) Enlist the organisms involved in lysine production.
- g) Give the types of wine.
- h) What are the different types of beer?
- i) Enlist the flocculating 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**

- a) Give the different sources of microorganisms in milk.
- b) What is food poisoning? Explain food poisoning by *Clostridium* spp.
- c) Explain any two down streaming process in fermentation

B) Write short note on**06**

Explain the production of Champaign wing.

- Q.4 A) Attempt any Two of the following. 08**
- a) Write an account on pyrogen test.
 - b) Explain the spoilage of wine.
 - c) Write an account on food as a substrate.

- B) Explain the production and application of Insulin as an example of rDNA product. 08**

- Q.5 Attempt any Two of the following. 16**
- a) What is Pasteurization? Describe the types of Pasteurization and Phosphatase test.
 - b) What is monoclonal antibody? Give in detail industrial production and application of monoclonal antibodies.
 - c) Write an account on principle and methods of food preservation.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
MICROBIOLOGY (Special Paper - XII)
Bioprocess Technology (22221532-B)**

Day & Date: Saturday, 01-11-2025
Time: 09:00 AM To 12:00 PM

Max. Marks: 80

- 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 log table and calculators is allowed.

Q.1 A) Select the correct alternative front the following

10

- 1) _____ microorganism produces β -Amylase.
 - a) *Bacillus amyloliquefaciens*
 - b) *Bacillus licheniformis*
 - c) *Aspergillus niger*
 - d) *Staphylococcus aureus*
- 2) _____ is not the property of the fermented food.

a) Highly Nutritious	b) Toxicity
c) Anti-toxicity	d) Anti-nutrient
- 3) Prebiotics are best described as _____
 - a) Foods that nourish beneficial gut bacteria
 - b) Digestive enzymes
 - c) Harmful bacteria in the gut
 - d) Probiotic supplements
- 4) When fermentation is stopped unintentionally, it is called as _____ fermentation.

a) Stuck	b) Inactive
b) Brandy	d) Stop
- 5) _____ is usually used as a chemical preservative.

a) Sodium benzoate	b) Sodium sorbate
c) Potassium benzoate	d) Potassium sorbate
- 6) _____ contributes to the conversion of cider-to-cider vinegar.

a) Acetic acid bacteria	b) Propionic acid bacteria
c) Budding yeast	d) Butyric acid bacteriabacteri

- 7) *Staphylococcus aureus* toxins are _____.
 - a) Mycotoxins
 - b) Neurotoxins
 - c) Cytotoxins
 - d) None of these
- 8) _____ is an upstream process.
 - a) Product recovery
 - b) Product purification
 - b) Media formulation
 - d) Cell lysis
- 9) Casein is converted to yoghurt because of _____.
 - a) Lactic acid
 - b) Salicylic acid
 - b) Benzoic acid
 - c) Picric acid
- 10) _____ is alternative name for freeze drying.
 - a) Lyophilisation
 - b) Cold pasteurization
 - c) Irradiation
 - d) Liposuction

B) Write the definition of the following.

06

- 1) Enlist name of organisms which produces streptomycin.
- 2) Types of amylase
- 3) What is precipitation?
- 4) Define the term fermentation.
- 5) What is biomass?
- 6) Define the term filtration.

Q.2 Solve any Eight of the following.

16

- a) What is whole broth processing?
- b) Write importance of mushroom.
- c) What is benefit of Dahi in diet?
- d) What are different raw materials for fermentation media preparation?
- e) What is mean by fermented broth recovery?
- f) How the biomass is separated from fermented broth?
- g) Which are fermented milk products?
- h) Define probiotics.
- i) What is meaning of bioassay?
- j) Define sterilization.

Q.3 A) Attempt any Two of the following.

10

- Describe ion exchange chromatography.
- Write the procedure in Idali making.
- Explain in detail Sterilization of Media.

B) Write in brief on food as substrate.

06

Q.4 A) Attempt any Two of the following.

08

- Write in detail about spoilage of fruits and vegetables.
- Explain in detail Amylase production.
- Write in detail precipitation and filtration in downstream processing.

B) Explain in detail about food preservation. **08**

Q.5 Attempt any Two of the following. **16**

- a)** Write in detail about spoilage of meat and poultry products.
- b)** Explain in detail solvent extraction and crystallization in downstream processing.
- c)** Write in brief about benefits of fermented dairy products.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
MICROBIOLOGY (Special Paper-XII)
Fermentation Technology (22221532-C)**

Day & Date: Saturday, 01-11-2025
Time: 09:00 AM To 12:00 PM

Max. Marks: 80

- Instructions:** 1) All questions are compulsory.
2) Draw neat and labelled diagrams wherever necessary.
3) Figure to the right indicates full marks.

Q.1 A) Choose the correct alternative and rewrite the sentences again. 10

- 1) _____ is the primary role of microorganisms in the bioreactor during industrial fermentation processes.
 - a) Filtration of impurities
 - b) Synthesis of antibiotics
 - c) Conversion of processed raw materials in to valuable products
 - d) Cooling of the fermentation broth
- 2) _____ of the following is/are an essential factor influencing the efficiency of industrial fermentation.
 - a) Oxygen Concentration b) Temperature
 - c) pH d) all of the above
- 3) _____ part of fermenter useful for thorough mixing of medium and inoculum.
 - a) Shaft b) Headspace
 - c) Impeller d) Sparger
- 4) _____ are the methods of strain improvement.
 - a) Protoplast Fusion b) Recombinant DNA Technology
 - c) Mutation d) All of the Above
- 5) The purification and recovery of the production after fermentation is called _____.
 - a) Upstream Process
 - b) Downstream Process
 - c) Submerged Fermentation
 - d) Surface Fermentation
- 6) _____ liter is the capacity of pilot plant fermenter.
 - a) 100-200 b) 1-2
 - c) 1000 d) more than 10000

- 7) _____ fermentation process is always done before starting of larger scale fermentation process.
- a) Scale down
 - b) Scale up
 - c) Scale in
 - d) None of the above
- 8) _____ of the following separation techniques is dependent on difference in volatility.
- a) Distillation
 - b) Crystallization
 - c) Magnetic Separation
 - d) Fractional Crystallization
- 9) _____ are the steps involved in liquid-liquid extraction.
- a) Mixing
 - b) Settling
 - c) Phase collection
 - d) Mixing, settling, phase collection
- 10) _____ is the main objective of Quality assurance.
- a) Proof of Fitness of Product
 - b) Performance of Quality test of Product
 - c) Customer Satisfaction
 - d) None of the Above

B) Fill in the blanks /definition /one sentence answer.**06**

- 1) Sterilization is mainly used for _____
- 2) _____ of the following reaction occurs during sterilization of media leading to Browning of media.
- 3) In Chromatography R_f stands for _____
- 4) TLC Stands for _____
- 5) If scale - up studies fail; proceed to larger-scale fermentation. (True / False)
- 6) Define Scale Down.

Q.2 Solve any Eight of the following.**16**

- a) Enlist the objectives of Strain Improvement.
- b) Define Fermentation Media.
- c) Define Response Surface Methodology.
- d) Define the scale-up process and enlist the objectives of it.
- e) Differentiate between batch and continuous sterilization.
- f) Define Quality Assurance.
- g) Enlist the applications of drying in the downstream processing of fermentation.
- h) Define Assay.
- i) Define Distillation.
- j) Define Auxotrophic mutant.

Q.3 A) Attempt any Two of the following.**10**

- a) Define Strain Improvement and write in short strain improvement by mutation.
- b) Define Media Optimization and write in short about one factor at a time method used in media optimization.

- c) Describe in short scale-up process and the critical parameters used for it.

B) Short note / Solve. 06

Define Sterilization and write in detail the common methods used for sterilization of fermentation media.

Q.4 A) Attempt any Two of the following. 08

- a) Describe in short about Ames test.
- b) Write in detail about the separation of fermented products using Ion exchange chromatography.
- c) Describe in short about Toxicity testing of fermented products.

B) Describe / Explain / Solve. 08

Define fermentation and describe in detail about levels of fermentation.

Q.5 Attempt any Two of the following. 16

- a) Describe in detail the separation of fermented product using cell disruption and filtration.
- b) Write in detail about the Sterility Testing and Pyrogen testing of fermented product.
- c) Describe in detail about detection and quantification of fermented product using biological method.

Seat No.	

Set	P

**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November - 2025
ELECTRONICS (Special Paper - XII)
Electronics Communication (22221540-B)**

Day & Date: Saturday, 01-11-2025
Time: 09:00 AM To 12:00 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 tables and calculators are allowed

Q.1 A) Choose the correct alternative and rewrite the sentences again. 10

- 1) The electronic communication that takes place in two way is ____
 - a) Multiplex
 - b) Simplex
 - c) Duplex
 - d) None of these
- 2) PCM stands for ____
 - a) Pulse Communication Modulation
 - b) Phase Communication Modulation
 - c) Phase Code Multiplexing
 - d) Pulse Code Modulation
- 3) A Yagi antenna is used for ____
 - a) High forward gain
 - b) A very large band width
 - c) Omni direction gain
 - d) All of these
- 4) A super heterodyne receiver has input signal of 15 MHz, the local oscillator is tuned to 18.5 MHz The IF is
 - a) 33.5 MHz
 - b) 3.5 MHz
 - c) 10.7 MHz
 - d) 455 KHz
- 5) ____ tone indicates that exchange is ready to accept the dialing.
 - a) Busy
 - b) Ring
 - b) Call wait
 - d) Dial
- 6) In communication unwanted signal is called ____ signal.
 - a) Noise
 - b) Demodulated
 - c) Modulated
 - d) Carrier
- 7) ASK stands for ____
 - a) Amplitude Signal Keying
 - b) Amplitude Shift Keying
 - c) Amplitude Sampling Keying
 - d) Analog Signal Keying

- 8) Line of sight communication takes by _____ wave
 - a) Ground
 - b) Sky
 - c) Direct
 - d) Surface
- 9) Television communication is _____ type of system
 - a) Simplex
 - b) Duplex
 - b) Full duplex
 - c) Half duplex
- 10) _____ is the dialing system is used in modern telephone communication.
 - a) Rotary
 - b) DTMF
 - c) Multi tone alphanumeric
 - d) Audio pulse

B) Write the definition of the following.

06

- 1) Define noise.
- 2) What are the types of Analog modulation technique?
- 3) List the different ionospheric layer during day.
- 4) Define aspect ratio.
- 5) Full form of DTMF.
- 6) Full form of VSB.

Q.2 Solve any Eight of the following.

16

- a) What are the types of electronic communication system?
- b) Define AM and FM.
- c) What is radio wave propagation?
- d) What is demodulation?
- e) What is local loop?
- f) Give the different ones used in Telephone communication.
- g) What is amplitude modulation?
- h) What are different layers of ionosphere?
- i) Define Frequency shift keying.
- j) Define Signal to Noise ratio.

Q.3 A) Attempt any Two of the following.

10

- What is noise in communication? What are its types?
- Explain in brief PWM and PPM.
- Concept of skip distance and virtual height.

B) Explain AM super heterodyne receiver with necessary block diagram.

06

Q.4 A) Attempt any Two of the following.

08

- Explain DTMF dialer system.
- Explain need and importance of modulation.
- Explain any four antenna characteristics.

B) What is modulation? What are its types? Explain FM in detail.

08

Q.5 Attempt any Two of the following.

16

- a)** What is radio wave propagation? What are its types? Explain Sky wave propagation.
- b)** Explain monochrome TV receiver with necessary block diagram.
- c)** What is need of telephone exchange and explain electronic telephone exchange with necessary block diagram.

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**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:
October/November – 2025
COMPUTER SCIENCE (Special Paper - XII)
Python Programming (22221536-A)**

Day & Date: Saturday, 01-11-2025
Time: 09:00 AM To 12:00 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 _____ is incorrect for set s={10,20,30,40}

a) print(len(s))	b) print(sum(s))
c) print(max(s))	d) print(s[0])
- 2) Triple double quotes or triple single quotes at the beginning and end of the block are used for _____

a) Strings	b) Constants
c) Multiline comments	d) Characters
- 3) The _____ is floor division operator.

a) /	b) //
c) %	d) None of these
- 4) The function can define in _____

a) Module	b) Class
c) Another function	d) All of these
- 5) What will be the output of the following Python code? all([2,4,0,6])

a) True	b) False
c) Error	d) 0
- 6) Multiple exceptions can be handled in a single except block by using _____

a) a tuple of exceptions
b) multiple try blocks
c) a single try block for each exception
d) the else block
- 7) The _____ method is used to ensure that a thread has completed its execution,

a) Start ()	b) Run ()
c) Exit ()	d) Join ()

- 8) How can race conditions be avoided in Python threading?
- a) By using the join () method
 - b) By using sleep () inside threads.
 - c) By using synchronization primitives like Lock.
 - d) By setting the daemon attribute to True.
- 9) The hasattr(obj,name) used to _____
- a) set an attribute
 - b) access the attribute of the object
 - c) delete an attribute
 - d) check if an attribute exists or not
- 10) What is output of following code?
- ```
import re
re.subn('A', 'X', 'AAAAAA', count=4)
```
- a) 'XXXXAA, 4'
  - b) ('AAAAAA', 4)
  - c) ('XXXXAA',4)
  - d) 'AAAAAA, 4'

**B) Fill in the blanks.****06**

- 1) The \_\_\_\_\_ is the return type of function id.
- 2) Python supports the creation of anonymous functions at runtime using \_\_\_\_\_
- 3) The \_\_\_\_\_ method is used to add element to a list in Python.
- 4) The \_\_\_\_\_ operator is overloaded by \_\_\_\_\_ invert\_() function.
- 5) Methods of a class that provide access to private members of the class are called as \_\_\_\_\_ and \_\_\_\_\_
- 6) To move the current position to the end of the file using the seek function, the offset parameter should be set to \_\_\_\_\_

**Q.2 Solve the following. (Any Eight)****16**

- a) What is type()? Give example.
- b) What is docstring?
- c) What is use of ABC class?
- d) How to define constructor? Give example.
- e) What is PVM? Describe in short.
- f) What is Daemon Threads?
- g) What is use of Super() Method?
- h) What is difference between a Function and a Method?
- i) What is difference between expand and append method of list?
- j) What is use of RE module?

**Q.3 A) Attempt the following. (Any Two)****10**

- a) What is threading? Explain thread Synchronization with example.
- b) What is difference between error and exception? Explain user define exception with example.
- c) Create a file having name sample.txt and contains 1000 random integer number between 101 to 10000. Also read file and print numbers at each line.

**B)** What are different types of parameters used in python? Explain each with example. **06**

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

- a) What is use of Membership operators and Identity operators? Explain with example.
- b) Explain assert and else suite in looping with example.
- c) What is different string formator? Explain with examples.

**B)** Write python program which overloads any 2 binary operators. **08**

**Q.5 Attempt the following. (Any Two)** **16**

- a) What are different method decorators? Explain each with example.
- b) What is use of inner class? Explain with example.
- c) What is MRO? Explain with example.?

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**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:  
October/November - 2025  
COMPUTER SCIENCE (Special Paper - XII)  
Kotlin Programming (22221536-B)**

Day & Date: Saturday, 01-11-2025  
Time: 09:00 AM To 12:00 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 tables and calculators are allowed

**Q.1 A) Choose the correct alternative and rewrite the sentences again. 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) To concatenate strings, we use the \_\_\_\_\_ operator.
 

|      |                  |
|------|------------------|
| a) + | b) #             |
| c) * | d) none of these |
- 5) keyword is used to declare a mutable variable
 

|          |                  |
|----------|------------------|
| a) var   | b) val           |
| b) const | d) None of these |
- 6) \_\_\_\_\_ is used to skip the current iteration in a loop.
 

|          |                  |
|----------|------------------|
| a) break | b) continue      |
| c) exit  | d) None of these |
- 7) Which function is used to convert a string to a double in Kotlin?
 

|                      |               |
|----------------------|---------------|
| a) parseDouble()     | b) toDouble() |
| c) convertToDouble() | d) asDouble() |

- 8) Which constructor is defined directly in the class header in Kotlin?
  - a) Primary constructor
  - b) Secondary constructor
  - c) Both
  - d) None of these
- 9) What is used to declare a subclass in Kotlin?
  - a) extends
  - b) inherits
  - c) implements
  - d) :
- 10) What is the purpose of the constructor keyword in Kotlin?
  - a) To define a primary constructor
  - b) To define a secondary constructor
  - c) To create an instance of a class
  - d) To initialize properties

**B) Fill in the blanks.****06**

- 1) In a when expression, each branch ends with a \_\_\_\_\_
- 2) Kotlin is a programming language developed by \_\_\_\_\_
- 3) A function that takes another function as a parameter is called as \_\_\_\_\_
- 4) \_\_\_\_\_ function is used to clear all elements from a mutable list in Kotlin.
- 5) A string enclosed with triple quotes (""") is called a \_\_\_\_\_ string.
- 6) Kotlin's \_\_\_\_\_ class provides a concise way to create classes that only hold data.

**Q.2 Solve any Eight of the following.****16**

- a) Write use of var and val.
- b) Write basic characteristics of Kotlin.
- c) What is Elvis's operator (? :) in Kotlin?
- d) What is a higher-order function in Kotlin?
- e) Write a note on ArrayList.
- f) What is a set in Kotlin?
- g) What is an abstract class in Kotlin?
- h) What is the use of the map function in Kotlin?
- i) How do you create a new Kotlin project in IntelliJ IDEA?
- j) Explain the reduce () function in Kotlin.

**Q.3 A) Attempt any Two of the following.****10**

- a) Explain the concept of visibility modifiers in Kotlin with examples.
- b) Write a program for function to calculate factorial using recursion.
- c) Explain data types in Kotlin in detail.

**B) Explain use of finally block in exception handling.****06****Q.4 A) Attempt any Two of the following.****08**

- a) Explain use of Super in Kotlin in detail.
- b) What are data classes in Kotlin?
- c) Explain the dictionary and map collection in Kotlin.



**B)** Write a Kotlin program by using Class with primary and secondary constructors. **08**

**Q.5 Attempt any Two of the following.** **16**

- a)** What is inheritance? Explain types.
- b)** Write a program to display list of prime nos between 2 to 2000.
- c)** Explain control flow statements in Kotlin with examples. (Any three)

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**B.Sc. (Plain) (Semester - V) (New) (CBCS) Examination:  
October/November - 2025**

**COMPUTER SCIENCE (Special Paper - XII)  
Data Warehousing and Mining (22221536-C)**

Day & Date: Saturday, 01-11-2025  
Time: 09:00 AM To 12:00 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 tables and calculators is allowed.

**Q.1 A) Multiple choice questions.**

**10**

- 1) Which schema organizes data into a fact table connected to multiple dimension tables?
  - a) Star schema
  - b) Snowflake schema
  - c) Fact constellation
  - d) Galaxy schema
- 2) Which technique is used for predicting continuous numeric values?
  - a) Classification
  - b) Predication
  - c) Clustering
  - d) Regression
- 3) Roll-up operation in OLAP \_\_\_\_\_.
  - a) Aggregates data to higher levels
  - b) Shows lower-level details
  - c) Rotates dimensions
  - d) Filters data
- 4) A Data \_\_\_\_\_ is not part of data preprocessing?
  - a) Transformation
  - b) Visualization
  - c) Cleaning
  - d) Integration
- 5) What is the main goal of clustering in data mining?
  - a) To predict future trends
  - b) To label data based on known outcomes
  - c) To group similar records without predefined labels
  - d) To discover frequent patterns in datasets
- 6) A credit card company wants to determine if a new transaction is fraud by comparing it with past transactions that are similar in amount, location, and time. The best algorithm to use is \_\_\_\_\_.
  - a) K-Nearest Neighbours
  - b) K-Means
  - c) Logistic Regression
  - d) Naive Bayes

- 7) \_\_\_\_\_ technique is used to combine multiple models.
- Clustering
  - Pruning
  - Ensemble Learning
  - Normalization
- 8) Which evaluation metric is used to assess classification models?
- Sum of squares
  - Euclidean distance
  - Z-score
  - Confusion matrix
- 9) \_\_\_\_\_ clustering technique generates a tree like structure.
- K-means
  - Hierarchical
  - DBSCAN
  - PCA
- 10) Web mining includes \_\_\_\_\_.
- Web content, structure, and usage mining
  - Only web content mining
  - Only web usage mining
  - Only classification of web pages

**B) Fill in the blank.****06**

- \_\_\_\_\_ is a subject-oriented, integrated, time-variant, non-volatile collection of data.
- Each connection link in an ANN is associated with \_\_\_\_\_, which carries information about the input signal.
- A \_\_\_\_\_ is a subset of a data warehouse focused on a specific business area or department.
- Grouping similar data objects is known as \_\_\_\_\_.
- A \_\_\_\_\_ operations in a decision tree helps in avoiding overfitting.
- Any subset of a frequent set is a frequent set is called \_\_\_\_\_.

**Q.2 Solve the following. (Any Eight)****16**

- Justify the following situation as a classification or prediction task and why: "A university wants to determine whether a student will pass or fail a final exam based on their attendance, assignment scores, and semester performance."
- What is outlier detection?
- What is data cube?
- Consider the price of 6 products in online store as 1000, 600, 850, 920, 420 and 120. Normalize the data by Using Min-Max Normalization with the range [0,1].
- What is the use of staging area?
- Define Closed Item sets.
- Define FP-Growth algorithm.
- What are unsupervised learning techniques with examples?
- Define dimensionality reduction. Why is it important?
- What is entropy?

**Q.3 A) Attempt the following. (Any Two) 10**

- a) Explain Text Data and Multimedia Data Mining.
- b) Apply the following binning techniques to smooth the given dataset using 3 equal-depth bins:  
Dataset: 3, 4, 5, 10, 20, 32, 43, 44, 46, 52, 59, 61. Perform smoothing using the following methods:
  - i) Smoothing by bin means
  - ii) Smoothing by bin medians
  - iii) Smoothing by bin boundaries
- c) Explain AdaBoost algorithm.

**B) Explain steps in KDD (Knowledge Discovery in Databases). 06**

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

- a) Differentiate linear and logistic regression.
- b) Explain k-Nearest-Neighbor Classifiers with an example.
- c) Explain cross-validation and its types.

**B) Explain Bayesian classification with example. 08**

**Q.5 Attempt the following. (Any Two) 16**

- a) Explain Support Vector Machine (SVM) algorithm in detail.
- b) Explain the architecture and components of a data warehouse.
- c) Consider the following transactions, use apriori algorithm with minimum support of 40% and minimum confidence 70% to find strong association rules.

| Transaction ID | Items                   |
|----------------|-------------------------|
| 1              | {Pen, Notebook}         |
| 2              | {Pen, Pencil, Eraser}   |
| 3              | {Notebook, Pencil}      |
| 4              | {Pen, Notebook, Pencil} |
| 5              | {Eraser, Notebook}      |

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**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
English Compulsory  
Literary Mindscapes Volume (22221600)**

Day & Date: Tuesday, 28-10-2025  
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 Answer the following questions by choosing the correct answer from the given options. 08**

- 1) According to Shastriji, whatever your station in future life, you should first of all think yourselves as \_\_\_\_\_.  
a) future leaders of India      b) citizens of India  
c) warriors for peace      d) citizens of USA
- 2) The lesson 'God Sees the Truth but Waits' is written by \_\_\_\_\_.  
a) Lal Bahadur Shastri      b) Vijay Bhatkar  
c) W. H. Davies      d) Leo Tolstoy
- 3) Who is the painter of duchess's portrait?  
a) Behrman      b) Fra Pandolf  
c) John Smith      d) Ben
- 4) The poem 'Ode to Beauty' was published in \_\_\_\_\_.  
a) 1818      b) 1946  
c) 1917      d) 1717
- 5) The poem 'Endless Time' explores the concept of \_\_\_\_\_.  
a) Death      b) Life  
c) Time      d) Place
- 6) Robert Frost was an \_\_\_\_\_ poet.  
a) British      b) Russian  
c) Indian      d) American
- 7) I \_\_\_\_\_ go for a morning walk. (Use appropriate adverb)  
a) but      b) and  
c) regularly      d) in
- 8) He said, "Suryakant is at home". (Make it reported speech)  
a) He said that Suryakant was at home.  
b) He said that Suryakant is at home.  
c) She said that Suryakant was at home.  
d) She said that Suryakant will be at home.

- Q.2 Answer the following questions briefly. (Any Four) 12**
- a) What are the dangers of separatism?
  - b) Sketch the character of Aksionov.
  - c) What is the poem 'My Last Duchess' about?
  - d) Explain the title of the poem 'Ode to Beauty'.
  - e) What is the theme of the poem 'Endless Time'?
  - f) What challenges did the poet and the tree face together in 'Tree at My Window'?
- Q.3 a) Write a detailed note on literacy skills. 10**
- OR**
- b) Write habits which show that you are conscious of the environment.**
- Q.4 Describe in detail the nature of Life Skills in your own words. 10**

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
PHYSICS (Special Paper - XIII)  
Electrodynamics (22221617)**

Day & Date: Wednesday, 29-10-2025  
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 Question.**

10

- The trajectory of charged particle entering in uniform magnetic field is a \_\_\_\_\_.
  - circle
  - parabola
  - cycloid
  - straight line
- Poisson's equations give \_\_\_\_\_.
  - nature of electric force
  - nature of electric field
  - nature of electric potential
  - nature of magnetic potential
- Generation of motional emf is principle of \_\_\_\_\_.
  - battery
  - photovoltaic cell
  - generator
  - capacitor
- Self inductance of a solenoid depends upon \_\_\_\_\_.
  - cross sectional area and number of turns per unit length of solenoid
  - only cross sectional area
  - only number of turns per unit length
  - type of solenoid
- The equation of continuity is in accordance with the law of conservation of \_\_\_\_\_.
  - charge
  - energy
  - momentum
  - velocity
- Mathematical formulation of empirical laws in electricity and magnetism are known as \_\_\_\_\_.
  - Ampere's equations
  - Maxwell's equations
  - Faraday's equations
  - Lorentz's equations
- The nature of electromagnetic wave is \_\_\_\_\_.
  - stationary
  - plane
  - longitudinal
  - transverse

- 8) The wave propagation vector is complex quantity in \_\_\_\_\_.
  - a) vacuum
  - b) air
  - c) dielectric
  - d) conductors
- 9) Incident and transmitted waves are \_\_\_\_\_ at the boundary of two dielectrics.
  - a) always in phase
  - b) out of phase
  - c) discontinuous
  - d) continuous
- 10) Total power radiated by electric dipole is proportional to \_\_\_\_\_.
  - a) frequency
  - b) square of frequency
  - c) cube of frequency
  - d) fourth power of frequency

**B) Fill in the blanks.****06**

- 1) Laplace's equation is applicable to \_\_\_\_\_.
- 2) The line integral of electric force per unit charge over a closed path is \_\_\_\_\_.
- 3) In vacuum, polarization and magnetization are \_\_\_\_\_.
- 4) The electromagnetic energy crossing unit area in unit time is called \_\_\_\_\_.
- 5) An oscillating charge can \_\_\_\_\_.
- 6) For a typical air glass interface where  $n_2 = 1.5$  and  $n_1 = 1$ , then transmission coefficient is \_\_\_\_\_.

**Q.2 Solve Any Eight of the following.****16**

- a) State Coulomb's law.
- b) Draw trajectory of motion charged particle in constant crossed uniform electric and magnetic field.
- c) Define mutual inductance and state its unit.
- d) State Faraday's law and Lenz's law.
- e) State Biot and Savart's law.
- f) State Ampere's circuital law.
- g) Define skin depth.
- h) State equation of continuity.
- i) Define reflection coefficient
- j) Define Retarded time.

**Q.3 A) Attempt Any Two of the following.****10**

- a) Obtain integral and differential forms of Faraday's law.
- b) Explain physical significance of Maxwell's equations.
- c) Obtain boundary conditions for electromagnetic field vectors.

**B) Write short note on total internal reflection.****06****Q.4 A) Attempt Any Two of the following.****08**

- a) Derive Gauss's law in differential form.
- b) Obtain expression for self inductance of solenoid.
- c) Show that electric field vector, magnetic field vector and wave propagation vector are orthogonal to each other.



**B)** Establish law of conservation of energy for electromagnetic field. **08**

**Q.5 Attempt Any Two of the following.** **16**

- a)** Explain trajectory of charged particle moves in constant uniform electric field.
- b)** Explain Maxwell's equations for time dependent electric and magnetic field in vacuum.
- c)** Derive an expression for radiation reaction for electric dipole.

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
CHEMISTRY (Special Paper-XIII)  
Physical Chemistry (22221609)**

Day & Date: Wednesday, 29-10-2025  
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

**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 A) Multiple Choice Question. 10**

- 1) Hydrochloric acid and water azeotropic mixture boils at \_\_\_\_ K.  
a) 283  
b) 381.6  
c) 183  
d) 290.6
- 2) The half-life of third order reaction is given by \_\_\_\_.  
a)  $t_{1/2} = 0.693/k$   
b)  $t_{1/2} = k/0.693$   
c)  $t_{1/2} = 2ka^2/3$   
d)  $t_{1/2} = \frac{3}{2}ka^2$
- 3) The term activity has represented by the equation \_\_\_\_.  
a)  $a = c \times \gamma$   
b)  $a = c \div \gamma$   
c)  $a = c - \gamma$   
d)  $a = c + \gamma$
- 4) Rotational spectrum are observed only in \_\_\_\_.  
a) liquids  
b) solids  
c) gases  
d) crystals
- 5) According to law of mass action, the rate at which a substance reacts is directly proportional to its \_\_\_\_.  
a) active mass  
b) active volume  
c) temperature  
d) None of these
- 6) A homogeneous mixture of two or more chemical substance is called as \_\_\_\_.  
a) solution  
b) solute  
c) solvent  
d) dilute solution
- 7) The molecularity of the reaction  $2\text{FeCl}_3 + \text{SnCl}_2 \rightarrow 2\text{FeCl}_2 + \text{SnCl}_4$  is \_\_\_\_.  
a) one  
b) two  
c) three  
d) four

- 8) In vibrational spectra, for overtone transitions \_\_\_\_\_.  
a)  $\Delta v = 0$   
b)  $\Delta v = \pm 1$  only  
c)  $\Delta v = \pm 2$  only  
d)  $\Delta v = \pm 2, \pm 3$ , etc
- 9) Boiling point of a solution of low vapour pressure will be \_\_\_\_\_.  
a) lower  
b) higher  
c) equal  
d) None of these
- 10) What effect does an increase in temperature of  $10^{\circ}\text{C}$  have as the rate of the reaction?  
a) halved  
b) doubled  
c) multiplied by 1.5  
d) multiplied by 2.5

**B) Fill in the blank/Definition/One sentence answer/One word answer/Give the name/predict the product etc.** **06**

- 1) The free energy change for a reaction at equilibrium is \_\_\_\_\_.
- 2) \_\_\_\_\_ diatomic molecule gives vibrational spectra.
- 3) The work function ( $A$ ) is defined by an equation \_\_\_\_\_.
- 4) Arrhenius equation is \_\_\_\_\_.
- 5) Phenol water system is an example of liquids which are \_\_\_\_\_ miscible.
- 6) The relation between free energy change, enthalpy change and entropy change is represented is \_\_\_\_\_ equation.

**Q.2 Solve Any Eight of the following. 16**

- a) What do you mean by stoke's and antistoke's lines?
- b) Define simultaneous reactions.
- c) What do you mean by boiling point of solution?
- d) Characteristics of third order reaction for graphical method.
- e) Define the term fugacity.
- f) What are ideal and non-ideal solutions?
- g)  $\text{CO}_2$  does not show rotational spectra but it shows vibrational spectra, explain.
- h) Define the term frequency.
- i) State law of mass action.
- j) Define free energy.

**Q.3 A) Attempt Any Two of the following. 10**

- Write a note on collision theory.
- Derive Gibb's-Helmholtz equation.
- Explain triethylamine- water system.

**B) Short note /Solve the following. 06**

A solution of CO in the inert solvent of  $\text{CCl}_4$  absorbs the radiation at the frequency is  $5.40 \times 10^{13} \text{ sec}^{-1}$ . Calculate the force constant for the bond in CO. ( $\mu$  for CO =  $1.40 \times 10^{-23} \text{ gm}$ ).

- Q.4 A) Attempt Any Two of the following.** **08**
- a) What is chain reaction? Specify with suitable example.
  - b) Write difference between ideal and non-ideal solution.
  - c) Write applications and limitations of rotational spectra.
- B) Describe/Explain/Solve.** **08**
- Derive Clausius Clapeyron equation.
- Q.5 Attempt Any Two of the following.** **16**
- a) Derive the equation of third order. If the rate of reaction gets doubled from 298K to 318K.  
Calculate  $E_a$  ( $R = 8.368$  joules).
  - b) Write significance of Gibb's free energy as  $H$ ,  $T$  &  $S$  are state functions. If latent heat of vaporization of water is 2282 joules/gm; calculate the b.p. of water at an atmospheric pressure of 528 mm ( $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ )
  - c) Explain concept of polarizability in Raman Spectra.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
BOTANY (Special Paper - XIII)  
Plant Pathology (22221601)**

Day & Date: Wednesday, 29-10-2025  
Time: 12:00 PM To 03:00 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 question.****10**

- 1) Which of the given is an example of fungal disease in plants?
  - a) Bud Blight
  - b) Powdery Mildew
  - c) Chlorosis
  - d) Curly top
- 2) Which of the given diseases is related to sugarcane?
  - a) Ergot
  - b) Cancer
  - c) Red rot
  - d) Late Blight
- 3) Which of the given disease is related to potatoes?
  - a) Downy mildew
  - b) Late blight
  - c) Tikka
  - d) Leaf rust
- 4) Tikka disease is related to which of the following crop?
  - a) Sugarcane
  - b) Rice
  - c) Grain
  - d) Peanut
- 5) Red rot of sugarcane is caused by \_\_\_\_\_.
  - a) *Colletotrichum falcatum*
  - b) *Acremonium sp.*
  - c) *Leptosphaera sacchari*
  - d) *Drechslera sacchari*
- 6) Little leaf of Brinjal is caused by \_\_\_\_\_.
  - a) Bacteria
  - b) Mycoplasma
  - c) Viruses
  - d) Fungi
- 7) Most destructive disease of grape is \_\_\_\_\_.
  - a) Powdery mildew
  - b) Hen & chicken diseases
  - c) downy mildew
  - d) Pink Berry
- 8) Wilt of pigeon pea is caused by \_\_\_\_\_.
  - a) *Fusarium udum*
  - b) *Gibberella indica*
  - c) *Rhizopus nigricans*
  - d) *Aspergillus flavus*

- 9) Bacterial blight of pomegranate is caused by \_\_\_\_\_.  
 a) *Xanthomonos compestris* pv. *Punicae*  
 b) *Xanthomonos axonopodis* pv. *Punicae*  
 c) *Pseudomonas axonopodis* pv. *Punicae*  
 d) *Pseudomonas compestris* pv. *Punicae*
- 10) Seed certification requires \_\_\_\_\_.  
 a) An improved variety                      b) Genetic purity  
 c) Physical purity                              d) All of the above.

**B) One sentence Answer.****06**

- 1) The blue colour tag is used for \_\_\_\_\_.  
 2) \_\_\_\_\_ group of pathogens is mostly reported from seed during storage.  
 3) \_\_\_\_\_ element causes interveinal chlorosis in leaves of plant.  
 4) The disease causing microorganisms is called \_\_\_\_\_.  
 5) \_\_\_\_\_ is causal organism of Brown rust of wheat.  
 6) \_\_\_\_\_ cause the Downy mildew disease on grapes.

**Q.2 Solve Any Eight of the following.****16**

- a) Write any two importance of plant diseases.  
 b) What are the symptoms of late blight of potato.  
 c) Write any two control measures of little leaf of brinjal.  
 d) Write symptoms of red rot of sugarcane.  
 e) Write scope of Aerobiology.  
 f) Give any two-control measure of Tomato mosaic virus.  
 g) Define seed certification.  
 h) Write symptoms of Citrus canker.  
 i) Write control measures of downy mildew of grapes.  
 j) Define disease forecasting.

**Q.3 A) Attempt Any Two of the following.****10**

- a) Write causal organism and symptoms of Tikka disease of groundnut.  
 b) Describe the classification of plant diseases based on symptoms.  
 c) Describe the importance of Aerobiology.

**B) Write a short note on.****06**

Seed Treatment

**Q.4 A) Attempt Any Two of the following.****08**

- a) Write causal organism symptoms of white rust of crucifers.  
 b) Write causal organism & control measures of smut of Jawar.  
 c) Write spread & severity of infection.

**B) Describe the following****08**

Write symptoms, causal organism, disease cycle and control measures of oily spot of pomegranate.

**Q.5 Attempt Any Two of the following.**

**16**

- a)** Describe the nature & concept of plant disease.
- b)** Describe the symptoms, causal organism, disease cycle and control measure of *Pigeon pea*.
- c)** Write the symptoms, causal organism, disease cycle and control measure of Brown Spot of maize.

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
ZOOLOGY (Special Paper - XIII)  
Animal Physiology: Life Sustaining Systems (22221625)**

Day & Date: Wednesday, 29-10-2025  
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) Multiple Choice Question.**

10

- The process of formation of ketone bodies is known as \_\_\_\_\_.
  - Ketogenesis
  - Kytogenesi
  - Ketolysis
  - Ketoneogenesis
- The partial pressure of O<sub>2</sub> in alveoli is \_\_\_\_\_ mmHg.
  - 141
  - 104
  - 105
  - 64
- Hamberger phenomenon is called \_\_\_\_\_ shift.
  - Phosphate
  - Nitrate
  - Chloride
  - Carbonate
- The breakdown of complex food material into simple form is called \_\_\_\_\_.
  - Digestion
  - Nutrition
  - Excretion
  - Emulsification
- Right auricle received \_\_\_\_\_ type of blood.
  - Oxygenated
  - Deoxygenated
  - Mixed
  - Dioxygenated
- \_\_\_\_\_ blood group is called as universal donor.
  - A
  - B
  - O
  - AB
- Major Stress hormone is \_\_\_\_\_.
  - Adrenaline
  - Glucagon
  - Epinephrine
  - Cortisol
- Sphygmomanometer instrument is used for measurement of \_\_\_\_\_.
  - Hb
  - BP
  - Pulse rate
  - Sugar



- 9) What is haematopoiesis?
- The process of bone formation
  - The process of blood cell production
  - The process of muscle tissue growth
  - The process of nerve cell development
- 10) Blood Pressure of healthy person is \_\_\_\_.
- 90/80
  - 120/80
  - 80/120
  - 90/60

**B) Fill in the blank/Definition/One sentence answer/One word answer/Give the name/predict the product etc. 06**

- Emulsification of fat
- Pacemaker
- A V Node
- Composition of blood
- Tidal volume
- Bowman's capsule

**Q.2 Solve Any Eight of the following. 16**

- Ultrastructure of kidney and its functional unit.
- Describe cardiac cycle.
- Describe ABO - Blood group system.
- S.A. Node
- Write the function of liver.
- Acidic chyme
- Role of ADH during urine formation
- Describe structure and functions of platelets.
- Name the hormones which regulate kidney function.
- Diagram of ECG

**Q.3 A) Attempt Any Two of the following. 10**

- Describe origin and conduction of heart beat.
- Describe the Bohrs effect.
- Describe Erythroblastosis fetalis.

**B) Write a short note on. 06**

Describe the ultrastructure of Nephron.

**Q.4 A) Attempt Any Two of the following. 08**

- Describe the phenomenon of blood clotting.
- Function of pancrease.
- Describe the physiology of urine formation.

**B) Write a short note on. 08**

Explain Yoga and Stress.

**Q.5 Attempt Any Two of the following.**

**16**

- a)** Describe the physiology of digestion in small intestine.
- b)** Describe nervous and chemical control of respiration.
- c)** Describe different cell types in leukocytes and their functions.

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**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
MATHEMATICS (Special Paper - XIII)  
Metric Spaces (22221633)**

Day & Date: Wednesday, 29-10-2025  
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 the correct alternative for each of the following. 10**

- 1) Which of the following is not metric on  $R$ ?
  - a)  $d(x, y) = |x| + |y|$
  - b)  $d(x, y) = \max\{|x|, |y|\}$
  - c) Both (a) and (b)
  - d) None of these
- 2) The metric space  $(R, d)$  or  $Rd$  is called \_\_\_\_\_ metric space.
  - a) Normal
  - b) Absolute
  - c) Usual
  - d) Discrete
- 3) In a metric space  $\langle M, \rho \rangle$  for all  $x, y, z \in M$  the triangle inequality is \_\_\_\_\_.
  - a)  $\rho(x, y) \leq \rho(x, z) + \rho(z, y)$
  - b)  $\rho(x, y) \geq \rho(x, z) + \rho(z, y)$
  - c)  $\rho(x, y) < \rho(x, z) + \rho(z, y)$
  - d)  $\rho(x, y) > \rho(x, z) + \rho(z, y)$
- 4)  $\lim_{x \rightarrow 0} \sin\left(\frac{1}{x}\right) = \underline{\hspace{2cm}}$ .
  - a) 1
  - b) -1
  - c) 0
  - d) Does not exist
- 5) Every open ball in  $R'$  is \_\_\_\_\_.
  - a) an open interval
  - b) half-open interval
  - c) closed interval
  - d) half-closed interval
- 6) In  $R, Q$  is \_\_\_\_\_.
  - a) dense
  - b) compact
  - c) complete
  - d) connected
- 7) Every compact metric space is \_\_\_\_\_.
  - a) complete and not bounded
  - b) complete and bounded
  - c) complete and totally bounded
  - d) totally bounded and not complete



**B)** State and prove Schwarz inequality. **06**

**Q.4 A) Attempt Any Two of the following.** **08**

- a) Show that a continuous function of a continuous function is continuous.
- b) If  $F_1$  and  $F_2$  are closed subset of a metric space  $M$ , then show that  $F_1 \cup F_2$  is closed.
- c) Show that in any metric space every convergent sequence is Cauchy.

**B)** Show that  $l^2$  is complete. **08**

**Q.5 Attempt Any Two of the following.** **16**

- a)** Fix  $n \in \mathbb{I}$ . If  $x = \langle x_1, x_2, \dots, x_n \rangle$  and  $y = \langle y_1, y_2, \dots, y_n \rangle$  are two ordered  $n$  - tuples of real numbers define

$$\varrho(x, y) = \left[ \sum_{k=1}^n (x_k - y_k)^2 \right]^{1/2} \quad \text{Then show that } \langle R^n, \varrho \rangle \text{ is a metric space.}$$

- b)** In a metric space  $\langle M, \varrho \rangle$  show that the subset  $A$  of  $M$  is totally bounded iff every sequence of points of  $A$  contains a Cauchy subsequence.
- c)** Show that  $f$  is continuous iff the inverse image of every open set is open.

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
STATISTICS (Special Paper - XIII)  
Statistical Inference - II (22221641)**

Day & Date: Wednesday, 29-10-2025  
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) A test which is at least as powerful as any other test of the same size is known as \_\_\_\_\_.  
a) M. P. test                      b) U. M. P. test  
c) L. R. test                        d) None of These
- 2) In Sequential Probability Ratio Test (SPRT) the sample size is \_\_\_\_\_.  
a) fixed                                b) a random variable  
c) fixed but small                  d) fixed but large
- 3) Neyman - Pearson lemma provides \_\_\_\_\_.  
a) Unbiased C. R.                  b) Most powerful C. R.  
c) Admissible C. R.                d) Minimal C. R.
- 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 ratio of two population's variances then the distribution used is \_\_\_\_\_.  
a) Chi-square                        b) t  
c) F                                        d) None of these
- 6) Most frequently used method of breaking the ties is \_\_\_\_\_.  
a) midrank method  
b) average statistics approach  
c) to omit tied values  
d) most favorable statistic approach
- 7) Test of  $H_0: \mu = 100$  against  $H_1: \mu < 100$  leads to \_\_\_\_\_.  
a) left tailed test                    b) right tailed test  
c) two tailed test                    d) None of these

- 8) 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
- 9) Accepting  $H_0$  when  $H_0$  is true is \_\_\_\_\_ error.  
 a) Type-II  
 b) Type-I  
 c) No error  
 d) None of these
- 10) 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

**B) Define the following.****06**

- 1) Null and alternative hypothesis
- 2) Type-I error
- 3) Power
- 4) Type-II
- 5) Run
- 6) Pivotal quantity

**Q.2 Answer Any Eight of the following.****16**

- a) State difference between MP test and UMP test.
- b) Define LRT.
- c) SPRT test
- d) ASN function
- e) Level of significance
- f) State assumptions of non-parametric tests.
- g) State confidence interval for  $\mu$  when  $\sigma^2$  is unknown in case of  $N(\mu, \sigma^2)$  distribution.
- h) Critical region
- i) State confidence interval for population variance  $\sigma^2$  when  $\mu$  is unknown.
- j) State confidence interval for population proportion  $P_1 - P_2$ .

**Q.3 A) Solve Any Two of the following.****10**

- a) Obtain  $100(1 - \alpha)\%$  confidence interval for the parameter  $\mu$  in case of  $N(\mu, \sigma^2)$  distribution, when  $\sigma^2$  is unknown.
- b) Describe the procedure of Mann-Whitney U-test.
- c) Obtain  $100(1 - \alpha)\%$  confidence interval for ratio of two population variances in case of normal distribution.

**B) Describe the procedure of Wilcoxon Signed-Rank test.****06**

**Q.4 A) Solve Any Two of the following. 08**

- a) Let  $X$  be a Bernoulli variate with p.m.f  
 $P(x, \theta) = \theta^x (1 - \theta)^{1-x}; x = 0, 1, 0 \leq x \leq 1$   
 Construct SPRT test for testing  $H_0: \theta = \theta_0$  against  $H_1: \theta = \theta_1$
- b) Obtain M.P. critical region for the distribution  
 $f(x) = \theta e^{-\theta x}; x \geq 0$   
 $= 0$ ; 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  $f(x)$ .
- c) Describe the procedure of median test.

- 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) State and prove Neyman- Pearson lemma.
- b) 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) type-I error  
 ii) type-II error  
 iii) Power of test
- c) State the procedure of Kolmogorov - Smirnov test for two independent samples.



Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
GEOLOGY (Special Paper - XIII)  
Photogeology & Remote Sensing (22221649)**

Day & Date: Wednesday, 29-10-2025  
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

**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 calculators is allowed.

### O.1 A) Multiple Choice Question.

10

- 1) Which among the following is having more wavelengths?
  - a) X-rays
  - b) Cosmic waves
  - c) Radio waves
  - d) Gamma rays
- 2) The changes in the features in the satellite imagery with time is called \_\_\_\_\_.
  - a) Spectral
  - b) Spatial
  - c) Temporal
  - d) None of these
- 3) Spaghetti structure is used to store \_\_\_\_\_ data in your computer.
  - a) Raster
  - b) Vector
  - c) Both a and b
  - d) None of these
- 4) Gamma rays in electromagnetic spectrum has \_\_\_\_\_.
  - a) Short wavelength and high frequency
  - b) Short wavelength and low frequency
  - c) Long wavelength and high frequency
  - d) Long wavelength and low frequency
- 5) Aerial photographs are classified as vertical and oblique based on \_\_\_\_\_.
  - a) Focal length of camera
  - b) Position of principle point
  - c) Position of fiducial points
  - d) Tilt angle of optic axis to ground surface
- 6) Which one of the following band composites is called as true colour composite?
  - a) Bands 1, 2 & 3
  - b) Bands 2, 3 & 4
  - c) Bands 3, 4 & 5
  - d) Bands 4, 5 & 6

- 7) Which of the following information is NOT printed on the aerial photographs?
- |               |          |
|---------------|----------|
| a) Serial No  | b) Clock |
| c) Wind speed | d) Date  |
- 8) Ultraviolet light is greatly absorbed by \_\_\_\_\_ in the atmosphere.
- |                 |             |
|-----------------|-------------|
| a) Oxygen       | b) Ozone    |
| c) Water vapour | d) Nitrogen |
- 9) Raster data is a type of \_\_\_\_\_ data.
- |              |                |
|--------------|----------------|
| a) Numerical | b) Non-spatial |
| c) Spatial   | d) Vector      |
- 10) 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 |

**B) Answer the following questions in a One Sentence.**

**06**

- 1) What is microwave?
- 2) What is IRS?
- 3) Name the errors occur in flying.
- 4) What is percentage of side overlap for aerial photographs?
- 5) Name types of sensor.
- 6) What is scattering?

**Q.2 Solve Any Eight of the following.**

**16**

- a) What is lateral overlap?
- b) What is photogrammetry?
- c) What is nadir?
- d) A unique reflectance pattern of individual object on the earth is called.
- e) Sandstone shows which tone colour in the aerial photograph.
- f) What will be the dip angle of horizontal bed?
- g) What is purpose of georeferencing?
- h) Which instrument can be used in the field to calibrate strike and dip of the bed?
- i) Which type of reflection occurs when electromagnetic radiation reflects from smooth surface?
- j) In false colour composite images shows healthy vegetation appear which colour.

**Q.3 A) Attempt Any Two of the following.**

**10**

- a) Describe in brief spectral reflectance curve.
- b) Explain temporal and spatial resolution.
- c) Describe non - spatial data.

**B) Write short note Electromagnetic radiation.**

**06**

- Q.4 A) Attempt Any Two of the following. 08**
- a) Describe pattern and texture in aerial photographs.
  - b) Advantages of vector data model.
  - c) Describe pocket stereoscope.

- B) Describe various drainage patterns. 08**

- Q.5 Attempt Any Two of the following. 16**
- a) Describe various platform of remote sensing.
  - b) What is raster data structure? Explain advantage and disadvantages.
  - c) What is resolution? Explain their types of resolution.

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
MICROBIOLOGY (Special Paper - XIII)  
Molecular Biology and Bioinformatics (22221657)**

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 tables and calculators is allowed.

**Q.1 A) Multiple choice questions. 10**

- 1) A cis-trans complementation test is carried out to identify \_\_\_\_\_.
  - a) If two mutations are allelic in nature
  - b) If two genes interact with one another
  - c) The number of genes influencing phenotype
  - d) To understand the dominance/recessive relationships between alleles
- 2) \_\_\_\_\_ is a sequence alignment tool.
  - a) PRINT
  - b) PROSITE
  - c) PIR
  - d) BLAST
- 3) \_\_\_\_\_ enzyme separates the two strands of DNA during replication.
  - a) Ligase
  - b) Gyrase
  - c) Helicase
  - d) Isomerase
- 4) Lac operon is an example of \_\_\_\_\_.
  - a) only positive regulation
  - b) only negative regulation
  - c) both positive and negative regulation
  - d) sometimes positive sometimes negative
- 5) A missense mutation is a type of \_\_\_\_\_ mutation.
  - a) Dot
  - b) Line
  - c) Point
  - d) Dash
- 6) \_\_\_\_\_ dye is used for visualizing DNA in electrophoresis.
  - a) Methylene blue
  - b) Ethidium
  - c) Giemsa's stain
  - d) ZNCF
- 7) Circular DNA without any helical coiling is called \_\_\_\_\_ DNA.
  - a) Relaxed
  - b) Supercoiled
  - c) Coiled
  - d) Helixed

- 8) \_\_\_\_\_ types of deoxynucleoside triphosphates are used in Sanger sequencing.
  - a) 2
  - b) 3
  - c) 4
  - d) 5
- 9) DNA fingerprinting was developed by \_\_\_\_\_.
  - a) Francis Crick
  - b) El. Khurana
  - c) Alec Jeffrey
  - d) James Watson
- 10) NCBI stands for \_\_\_\_\_.
  - a) National Center for Biotechnology Information
  - b) National Center for Biology Information
  - c) National Center for Biochemistry Information
  - d) National Center for Botany Information

**B) Fill in the blank/ Definition/ One sentence answer/ One word answer/ Give the name/ Predict the product etc.**

06

- 1) What is Phenotype?
- 2) Which technique was developed by Scientist Sanger?
- 3) What is Vector?
- 4) What is the process of formation of Protein from RNA is called as?
- 5) What is EMBL?
- 6) What is Mutation?

**Q.2 Solve Any Eight of the following.**

16

- a) Write down the role of Lac Z gene in Lac Operon.
- b) Function of DNA ligase enzyme.
- c) Intragenic Mutation.
- d) Write a full form of DDBJ.
- e) Write 2 examples of Restriction endonuclease.
- f) Define Phagemid.
- g) What is suppression mutation?
- h) What is Okazaki fragment?
- i) What are the applications of BLAST.
- j) What is bioinformatics?

**Q.3 A) Attempt Any Two of the following.**

**10**

- Describe in detail cis -trans test.
- Write note on Post transcriptional modifications.
- Describe in brief effect of mutation on translation.

**B)** Discuss in detail the concept of Lac operon.

06

**Q.4 A) Attempt Any Two of the following.**

08

- Give a brief account of Genetic recombination and Fate of Exonote.
- Give the concept and applications of Protein Engineering.
- Write a note on selection, detection and isolation of mutants.

- B)** Describe in detail the structural organization of the *E. coli* chromosome. **08**

**Q.5 Attempt Any Two of the following.** **16**

- a)** Describe in detail tools and techniques of Genetic Engineering.
- b)** What is electrophoresis? Explain in detail electrophoresis of DNA.
- c)** What is transcription? Discuss in detail Mechanism of transcription.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
ELECTRONICS (Special Paper - XIII)  
Power Electronics (22221673)**

Day & Date: Wednesday, 29-10-2025  
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 scientific calculator is allowed.

**Q.1 A) Choose correct alternative and rewrite the sentence. 10**

- 1) Power diode is \_\_\_\_\_ layer semiconductor power device.
  - a) one
  - b) two
  - c) three
  - d) four
- 2) The minimum value of current below which the SCR becomes turn off is a \_\_\_\_\_.
  - a) break over current
  - b) latching current
  - c) holding current
  - d) gate trigger current
- 3) If the firing angle is small then conduction angle is \_\_\_\_\_.
  - a) very less
  - b) large
  - c) equal
  - d) All of these
- 4) In SCR based series inverter \_\_\_\_\_ type of commutation is used.
  - a) Class A
  - b) Class B
  - c) Class C
  - d) Class F
- 5) \_\_\_\_\_ circuits are operated with higher frequency.
  - a) UPS
  - b) Inverters
  - c) SMPS
  - d) None of these
- 6) SIT is \_\_\_\_\_ controlled device.
  - a) current
  - b) voltage
  - c) both (a) and (b)
  - d) None of these
- 7) A PUT can be generally used as a \_\_\_\_\_.
  - a) saw-tooth oscillator
  - b) power amplifier
  - c) a rectifier circuit
  - d) filter
- 8) \_\_\_\_\_ of the following is not a characteristic of PUT.
  - a) Intrinsic stand-off ratio
  - b) Negative resistance
  - c) Peak-point voltage
  - d) Bilateral conduction

- 9) \_\_\_\_\_ is used for dc power to ac power conversion.
- |              |              |
|--------------|--------------|
| a) Rectifier | b) Inverter  |
| c) Chopper   | d) Amplifier |
- 10) UPS means \_\_\_\_\_
- |                               |
|-------------------------------|
| a) Uncontrolled Power Supply  |
| b) Uni-junction Power Supply  |
| c) Uncontrolled Pot Supply    |
| d) Uninterrupted Power Supply |

**B) Fill in the blanks.****06**

- 1) \_\_\_\_\_ is the additional layer in the power diode.
- 2) The magnitude of the latching current is always \_\_\_\_\_ the holding current.
- 3) Another name for class B commutation of SCR is \_\_\_\_\_.
- 4) The buried gate structure is fabricated in \_\_\_\_\_.
- 5) The firing angle is  $90^\circ$  then its conduction angle is \_\_\_\_\_.
- 6) In chopper circuit is also called as \_\_\_\_\_.

**Q.2 Solve Any Eight of the following.****16**

- a) Define turn on and turn off time of the power diode.
- b) State the disadvantages of SCR.
- c) State the principle of the phase control.
- d) Why free-wheeling diode is required in case of inductive load?
- e) Draw the circuit diagram of speed control of DC motor using SCR.
- f) State the advantages of GTO.
- g) Draw the constructional diagram and symbol of PUT.
- h) Define latching current of SCR.
- i) Give the classification of inverter based on the switching devices.
- j) Draw the circuit diagram of protection circuit against  $dv/dt$  and  $di/dt$ .

**Q.3 A) Attempt Any Two of the following.****10**

- a) Explain the working of power transistor.
- b) Describe the working of series inverter using SCR.
- c) Explain working of step-down chopper using SCR.

**B) Explain Battery charger circuit using SCR.****06****Q.4 A) Attempt Any Two of the following.****08**

- a) Explain working of Class D commutation.
- b) Explain full bridge inverter circuit using SCR.
- c) Explain in brief the working of Power MOSFET.

**B) With suitable diagram explain turn on and turn off process of GTO.****08**



**Q.5 Attempt Any Two of the following.****16**

- a)** What is controlled rectifier? Explain full wave-controlled rectifier with resistive load.
- b)** Explain working of IGBT with its constructional diagram.
- c)** Explain SCR turn ON circuits using RC and UJT along with its waveforms.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
COMPUTER SCIENCE (Special Paper - XIII)  
Network Security (22221665)**

Day & Date: Wednesday, 29-10-2025  
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 Question.****10**

- 1) \_\_\_\_\_ encryption algorithm is used in SSL/TLS?
  - a) DES
  - b) RSA
  - c) Blowfish
  - d) Triple-DES
- 2) Data encryption standard is a symmetric key \_\_\_\_\_ cipher.
  - a) stream cipher
  - b) block cipher
  - c) bit cipher
  - d) byte cipher
- 3) In cryptography, the order of the letters in a message is rearranged by \_\_\_\_\_.
  - a) transpositional ciphers
  - b) substitution ciphers
  - c) quadratic ciphers
  - d) None of these
- 4) In asymmetric key cryptography, the private key is kept by \_\_\_\_\_.
  - a) sender
  - b) receiver
  - c) sender and receiver
  - d) None of these
- 5) A digital signature is a mathematical technique which validates?
  - a) Authenticity
  - b) Integrity
  - c) Non-repudiation
  - d) All of the above
- 6) The information that gets transformed in encryption is \_\_\_\_\_.
  - a) Plain text
  - b) Parallel text
  - c) Encrypted text
  - d) Decrypted text
- 7) Which of the following is an objective of network security?
  - a) Confidentiality
  - b) Integrity
  - c) Availability
  - d) All of the above
- 8) ElGamal encryption system is \_\_\_\_\_.
  - a) symmetric key encryption algorithm
  - b) asymmetric key encryption algorithm
  - c) Not an encryption algorithm
  - d) block cipher method

- 9) Which type of encryption uses the same key for both encryption and decryption?
- a) Symmetric encryption
  - b) Asymmetric encryption
  - c) Hashing
  - d) None of the above
- 10) Which of the following is a type of substitution cipher?
- a) Caesar cipher
  - b) Playfair cipher
  - c) Rail fence cipher
  - d) Vigenere cipher

**B) Fill in the blank.****06**

- 1) The process of transforming plain text to unreadable text is \_\_\_\_\_
- 2) \_\_\_\_\_ is a block cipher.
- 3) Digital signature cannot provide \_\_\_\_\_ for the message.
- 4) The digest created by a hash function is normally called \_\_\_\_\_
- 5) The full form of SSL is \_\_\_\_\_
- 6) IDEA stands for \_\_\_\_\_

**Q.2 Answer Any Eight of the following.****16**

- a) What is Cryptography?
- b) What is a message authentication code?
- c) What are attacks?
- d) What is Kerberos?
- e) Define Message digests?
- f) What is Decryption?
- g) What is Passwords?
- h) What is Asymmetric Key Cryptographic?
- i) What is Cipher text?
- j) What is IP Security?

**Q.3 A) Attempt Any Two of the following.****10**

- a) Explain different principles of security.
- b) Explain substitution techniques in Cryptography.
- c) Explain RC5 Algorithm in detail.

**B) Short note on.****06**

- i) Steganography
- ii) Data Encryption Standard (DES)

**Q.4 A) Attempt Any Two of the following.****08**

- a) What is SHA-512 algorithm explain its working?
- b) Explain Message digests.
- c) Explain Biometrics in User Authentication.

**B) Explain A model for Network Security with diagram.****08**

**Q.5 Attempt Any Two of the following.**

**16**

- a)** What is Firewalls? Explain different types of firewalls.
- b)** What is Digital Signatures? Explain advantages and disadvantages.
- c)** What is Symmetric Key Cryptography? Explain advantage and disadvantages.

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
PHYSICS (Special Paper - XIV)  
Materials Science (22221618)**

Day & Date: Thursday, 30-10-2025  
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

**Instructions:**

- 1) All questions are compulsory.
- 2) Figures to the right indicates full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Use of log table or calculator is allowed.

**Q.1 A) Select the correct alternative: 10**

- 1) The reciprocal of conductivity is \_\_\_\_\_.  
a) Resistivity  
b) Capacity  
c) dielectric strength  
d) Inductivity
- 2) The dielectric strength is function of \_\_\_\_\_.  
a) Thickness  
b) Length  
c) Charge  
d) none of these
- 3) \_\_\_\_\_ polymer is prepared by condensation polymerization.  
a) PVC  
b) Nylon 66  
c) Starch  
d) Teflon
- 4) Low density polymers have \_\_\_\_\_ structure.  
a) Cross linked  
b) Linear  
c) Branched  
d) non-linear
- 5) Thermal conductivity of ceramics is \_\_\_\_\_.  
a) greater than metal  
b) Zero  
c) Infinity  
d) less than metal
- 6) The combination of two or more materials which have different properties from constituent materials are called \_\_\_\_\_.  
a) Polymer  
b) Crystalline  
c) Composite  
d) Amorphous
- 7) When grain size reduces to nanoscale, then the material becomes \_\_\_\_\_.  
a) Soft  
b) Elastic  
c) plastic  
d) stronger and harder

- 8) Sol-Gel is \_\_\_\_\_ method of synthesis of nanomaterials.
  - a) Physical
  - b) Hybrid
  - c) Chemical
  - d) Electrical
- 9) The materials which are used for structural application in the field of medicine are \_\_\_\_\_.
  - a) Metals
  - b) Composites
  - c) Biomaterials
  - d) Alloys
- 10) Size of nanoparticle is \_\_\_\_\_.
  - a) 10 - 20 nm
  - b) 5 - 10 nm
  - c) 20 - 30 nm
  - d) 100 - 200 nm

**B) Fill in the blanks.**

06

- 1) Time dependent permanent deformation is called \_\_\_\_.
- 2) Ceramics normally exhibit \_\_\_\_ nature.
- 3) Bakelite is obtained by reaction of formaldehyde with \_\_\_\_.
- 4) The tanning operations on skin of animal produces \_\_\_\_.
- 5) \_\_\_\_ technique is used to determine the crystal structure of material.
- 6) High energy ball milling is \_\_\_\_ method of synthesis of nanomaterials.

**Q.2 Solve any Eight of the following.**

16

- a) Define specific heat.
- b) What is difference between hardness and toughness?
- c) What is degree of polymerization?
- d) Define polymerization mechanism.
- e) What is ceramics?
- f) Write any two applications of composite materials.
- g) What is biomechanism?
- h) Explain the term deposition.
- i) Give any two examples of biomaterials.
- j) Give two Properties of nanomaterials.

**Q.3 A) Attempt any TWO of the following.**

10

- Explain electrical properties of the materials.
- Give five properties of polymers.
- Explain Co-precipitation method of nanomaterial synthesis.

**B)** Explain Rock Salt (NaCl) structure with suitable diagram.

06

**Q.4 A) Attempt any TWO of the following.**

08

- Explain magnetic properties of materials.
- Give four applications of polymers.
- Explain Co-precipitation method of nanomaterial synthesis.

**B)** Give four properties and four applications of biomaterials. **08**

**Q.5 Attempt any TWO of the following.** **16**

- a)** Give properties and applications of ceramics.
- b)** What is fiber-reinforced composites. Give five properties of composites.
- c)** Explain Chemical vapors deposition method of synthesis of nanomaterials.

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
CHEMISTRY (Special Paper-XIV)  
Inorganic Chemistry (22221610)**

Max. Marks: 80

**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.

10

- The hybridization of Ni in  $\text{Ni}(\text{CO})_4$  is \_\_\_\_\_.
  - $\text{dsp}^2$
  - $\text{sp}$
  - $\text{sp}^3$
  - $\text{sp}^2$
- In Bulk separation method for lanthanides, the concentrated ore is digested with hot and conc. \_\_\_\_\_.
  - Nitric acid
  - Hydrochloric acid
  - Phosphoric acid
  - Sulphuric acid
- Free electron theory for bonding in metals was introduced by \_\_\_\_\_.
  - Kammerlingh Onnes
  - Drude and Lorentz
  - Felix Bloch
  - Pauling
- $\text{XeO}_4$  has \_\_\_\_\_ geometry having \_\_\_\_\_ hybridization.
  - tetrahedral,  $\text{sp}^3$
  - square planar,  $\text{sp}^2\text{d}$
  - octahedral,  $\text{sp}^3\text{d}^2$
  - tetragonal,  $\text{sp}^3$
- Passivity removing reagents are \_\_\_\_\_.
  - oxidising agents
  - reducing agents
  - buffers
  - neutral solutions
- In accelerated projectile bombardment method for preparation of Transuranic elements, \_\_\_\_\_ is used as common projectile.
  - alpha particles
  - Neutron
  - $^{13}\text{C}$  ion
  - $^{12}\text{C}$  ion
- In alkyl aluminium compounds, the bridging Al-C-Al bonds are \_\_\_\_\_ terminal Al-C bonds.
  - shorter
  - equal
  - longer
  - None of these



- 8) The bond angle in sulphur trioxide molecule is \_\_\_\_\_ degree.
- a) 90                                      b) 109  
c) 180                                     d) 120
- 9) The part of metal having more restricted access for oxygen becomes \_\_\_\_\_ with respect to other part of metal and gets corroded.
- a) cathodic                                b) anodic  
c) non-metallic                          d) neutral
- 10) \_\_\_\_\_ is a reactive carrier gas mixture used in CVD method during preparation of 1-2-3 ceramic superconductor.
- a) Kr + O<sub>2</sub> + Water vapour        b) He + O<sub>2</sub> + Water vapour  
c) Ne + O<sub>2</sub> + Water vapour        d) Ar + O<sub>2</sub> + Water vapour

**B) Answer the following questions.**

06

- 1) When pentavalent impurity atoms are added to pure silicon crystal, \_\_\_\_\_ type extrinsic semiconductor is formed.
- 2) What are organometallic compounds?
- 3) Ethane and Diborane both are iso-electronic molecules.  
(True or False)
- 4) Molecular formula of 1-2-3 ceramic superconductor is \_\_\_\_\_.
- 5) In the nomenclature of organometallic compounds, M-L-M bridge bonding is indicated by suffix \_\_\_\_\_.
- 6)  ${}_{92}^{238}\text{U} + \text{_____} \longrightarrow {}_{99}^{246}\text{Es} + 6 {}_0^1\text{n}$

**Q.2 Solve any Eight of the following.**

16

- a) Explain in brief position of Actinides in periodic table.
- b) Give any two properties of metallic solids in brief.
- c) Explain in brief 3c-2e bonding in diborane.
- d) Define passivity and give their types.
- e) Give any two methods of synthesis of alkyl or aryl compounds of Beryllium.
- f) Write the outer electronic configuration of elements-Curium and Lawrencium.
- g) Give the applications of semiconductors.
- h) On the basis of VBT, explain the structure of  $P_4O_6$ .
- i) With an example, discuss a factor 'purity of metal' which affects its corrosion.
- j) Explain the structure of methyllithium.

**Q.3 A) Attempt ANY TWO of the following.**

10

- Explain the structure of Xenon hexafluoride ( $\text{XeF}_6$ ) on the basis of VBT.
- Illustrate the structure of  $\text{Fe}(\text{CO})_5$  with the help of VBT in detail.
- Describe ion exchange method for separation of Lanthanides from minerals.

**B) Write a note on different methods of protection of metals from corrosion.**

06

**Q.4 A) Attempt any Two of the following. 08**

- a) Explain neutron capture followed by  $\beta$ -decay method for preparation of Transuranic elements.
- b) What is corrosion? Write a short note on electrochemical theory of corrosion.
- c) Explain the formation of  $\text{SO}_2$  molecule on the basis of VBT.

**B) Describe superconductors. Give their applications. 08**

**Q.5 Attempt any Two of the following. 16**

- a) What are metallic solids? Discuss the classification of solids on the basis of band Theory (MOT).
- b) Discuss the structure of borazine.
- c) What are Lanthanons? Give names of some important minerals of Lanthanons and write atomic number, name of elements, symbol and electronic configuration of Lanthanons.

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
BOTANY (Special Paper - XIV)  
Plant Biotechnology (22221602)**

Day & Date: Thursday, 30-10-2025  
Time: 12:00 PM To 03:00 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.

**Q.1 A) Multiple choice questions.**

**10**

- 1) Explants used for tissue culture can be taken from \_\_\_\_\_.
  - a) Bud
  - b) Root tip
  - c) Nodal stem segment
  - d) All of these
- 2) PCR technique was first devised by \_\_\_\_\_.
  - a) Kary Mullis
  - b) Alwine
  - c) Alec Jeffreys
  - d) E. M. Southern
- 3) Which of the following bacterium is considered as natural genetic engineer?
  - a) *Agrobacterium tumefaciens*
  - b) *Agrobacterium radiobactor*
  - c) *Pseudomonas putida*
  - d) *Thermus aquaticus*
- 4) Surface sterilization of plant material is carried out by using \_\_\_\_\_.
  - a)  $\text{AgCl}_2$
  - b)  $\text{BaCl}_2$
  - c)  $\text{HgCl}_2$
  - d)  $\text{CaCl}_2$
- 5) \_\_\_\_\_ biological agent used for gene transfer methods.
  - a) Poly ethylene glycol
  - b)  $\text{CaCl}_2$
  - c) Dextran
  - d) *Agrobacterium*
- 6) \_\_\_\_\_ is an example of transgenic plant.
  - a) Jowar
  - b) Rose
  - c) Golden rice
  - d) Tabaco
- 7) \_\_\_\_\_ is the first step of cloning.
  - a) Ligation of DNA fragment
  - b) Isolation of the gene of interest
  - c) Transformation of host cells
  - d) Screening for recombinant clones

- 8) \_\_\_\_\_ is role of biotechnology in forestry.  
 a) Enhancing tree breeding      b) Improving wood quality  
 c) Tree improvement              d) All of these
- 9) \_\_\_\_\_ is the primary purpose of PCR in gene cloning.  
 a) To cut DNA at specific sites  
 b) To amplify a specific DNA sequence  
 c) To insert DNA into a vector  
 d) To separate DNA fragments by size
- 10) The Centre for Cellular and Molecular Biology (CCMB) situated in \_\_\_\_\_.  
 a) Mumbai                              b) Bangalore  
 c) Hyderabad                          d) Chennai

**B) Fill in the blanks.****06**

- 1) \_\_\_\_\_ are small, circular DNA molecules.  
 2) Particle bombardment (gene gun) is \_\_\_\_\_ method of gene delivery.  
 3) \_\_\_\_\_ blotting technique is used for DNA.  
 4) \_\_\_\_\_ are known as molecular glue.  
 5) A mass of unorganized plant cells that form in response to injury or during tissue culture is called \_\_\_\_\_.  
 6) The polymerase chain reaction can be understood as \_\_\_\_\_.

**Q.2 Solve the following. (Any Eight)****16**

- a) Define recombinant DNA technology  
 b) Define reporter genes  
 c) Define gene cloning  
 d) What is tissue culture?  
 e) Long form of RGCB  
 f) Define micropropagation  
 g) Enlist the methods of gene delivery  
 h) Long form of PCR  
 i) Define vector  
 j) What are transgenic plants?

**Q.3 A) Attempt the following. (Any Two)****10**

- a) Describe the method of Anther culture.  
 b) Explain the roll of biotechnology in agriculture.  
 c) Describe PCR mediated gene cloning.

**B) Write a note on DNA finger printing.****06****Q.4 A) Attempt the following. (Any Two)****08**

- a) Describe the techniques of tissue culture.  
 b) Write a note on enzymes involved in recombinant DNA technology.  
 c) Explain the role of biotechnological institutes.

**B)** Describe the any two methods of physical gene delivery. **08**

**Q.5 Attempt the following. (Any Two)** **16**

- a)** Describe the different steps of PCR technique.
- b)** Describe the transgenic plants studied by you.
- c)** Explain Agrobacterium mediated gene transfer.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
ZOOLOGY (Special Paper-XIV)  
Evolutionary Biology (22221626)**

Day & Date: Thursday, 30-10-2025  
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 Question. 10**

- 1) \_\_\_\_\_ proposed the theory of natural selection as the mechanism of evolution.
 

|                          |                          |
|--------------------------|--------------------------|
| a) Jean-Baptiste Lamarck | b) Charles Darwin        |
| c) Gregor Mendel         | d) Alfred Russel Wallace |
- 2) \_\_\_\_\_ is referred as the theory that life originated from the interaction of simple organic molecules.
 

|              |                         |
|--------------|-------------------------|
| a) Chemogeny | b) Darwinism            |
| c) Lamarkism | d) RNA World hypothesis |
- 3) According to \_\_\_\_\_ the organisms are evolved through inheritance of acquired characteristics.
 

|              |                      |
|--------------|----------------------|
| a) Darwinism | b) Neo-Darwinism     |
| c) Lamarkism | d) Organic evolution |
- 4) The codon AUG serves as the start codon and codes for which amino acid?
 

|             |               |
|-------------|---------------|
| a) Glycine  | b) Methionine |
| c) Arginine | d) Valine     |
- 5) Which of the following is the Hardy-Weinberg equation?
 

|                |                    |
|----------------|--------------------|
| a) $p^2+q^2=1$ | b) $p^2+2pq+q^2=1$ |
| c) $p+q=1$     | d) $p^2-2pq+q^2=1$ |
- 6) Which factor is most likely to disturb Hardy-Weinberg equilibrium?
 

|                          |                  |
|--------------------------|------------------|
| a) Large population size | b) Random mating |
| c) Genetic drift         | d) No selection  |
- 7) In a Hardy-Weinberg population, the sum of allele frequencies must always be:
 

|                   |                          |
|-------------------|--------------------------|
| a) Less than 1    | b) Equal to 1            |
| c) Greater than 1 | d) Varies with mutations |

- 8) The term speciation is defined as \_\_\_\_\_.
  - a) The extinction of a species
  - b) The evolution of a new species
  - c) The migration of organisms
  - d) The loss of genetic diversity
- 9) \_\_\_\_\_ factor is essential for allopatric speciation?
  - a) Reproductive isolation due to behaviour
  - b) Geographical separation
  - c) Hybridization between species
  - d) Genetic drift within the same population
- 10) "K-T" in K-T extinction stand for \_\_\_\_\_.
  - a) Cretaceous-Tertiary
  - b) Cenozoic-Tertiary
  - c) Carboniferous-Triassic
  - d) Cambrian-Triassic

**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) Define the term chemogeny.
- b) Palaeontology
- c) Survival of fittest
- d) Speciation
- e) Mass extinctions
- f) Phylogeny
- g) Migration
- h) Mutation
- i) Gene pool
- j) Define the term adaptive radiation.

**Q.3 A) Attempt any Two of the following.****10**

- a) Describe the term organic evolution with suitable examples.
- b) Explain the theory of Neo Darwinism.
- c) Describe the speciation with its type.

**B) Short note/Solve.****06**

Explain the Hardy-Weinberg law of equilibrium.

- Q.4 A) Attempt any Two of the following. 08**
- a) Describe the universal properties of genetic code.
  - b) Describe the features of Lamarckism.
  - c) Explain the causes and effects of K-T extinction.
- B) Describe/Explain/Solve. 08**
- Explain Socio-cultural evolution of man.
- Q.5 Attempt any Two of the following. 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.



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Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
MATHEMATICS (Special Paper - XIV)  
Numerical Analysis (22221634)**

Day & Date: Thursday, 30-10-2025  
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) Scientific calculator is allowed.

**Q.1 A) Choose correct alternative for each of the following.** **10**

- 1) The particular integral of  $u_{n+2} - 5u_{n+1} + 6u_n = 2^n$  is \_\_\_\_\_.
  - a)  $-\frac{n}{1!}2^{n-1}$
  - b)  $-\frac{n}{1!}2^n$
  - c)  $-\frac{n(n-1)}{2!}2^{n-2}$
  - d)  $-\frac{n}{2!}2^{n-2}$
- 2) The solution of  $u_{n+2} - 2u_{n+1} + u_n = 0$  is \_\_\_\_\_.
  - a)  $u_n = (c_1 + c_2n)(-1)^n$
  - b)  $u_n = (c_1 + c_2n)(1)^n$
  - c)  $u_n = (c_1 + c_2)(1)^n$
  - d)  $u_n = (c_1 + c_2)(-1)^n$
- 3) Homogeneous equation of the type  $F\left(\frac{y_{x+1}}{y_x}, x\right) = 0$  to the linear from  $F(u_x, x) = 0$  by putting \_\_\_\_\_.
  - a)  $\frac{y_x}{y_{x+1}} = u_x$
  - b)  $\frac{y_x}{y_{x+1}} = u_{x-1}$
  - c)  $\frac{y_{x+1}}{y_x} = u_x$
  - d)  $\frac{y_{x+1}}{y_x} = u_{x-1}$
- 4) If  $(1 + \Delta)(1 - \nabla) =$  \_\_\_\_\_.
  - a)  $\Delta - \nabla$
  - b)  $1 - \Delta\nabla$
  - c)  $1$
  - d)  $-1$
- 5) The relation between  $E$  and  $D$  is \_\_\_\_\_.
  - a)  $E = e^{-hD}$
  - b)  $D = E - 1$
  - c)  $D = 1 - E^{-1}$
  - d)  $E = e^{hD}$
- 6) If  $E\nabla =$  \_\_\_\_\_.
  - a)  $\Delta$
  - b)  $\nabla$
  - c)  $\delta$
  - d)  $\mu$

- 7) Interpolation is the technique of the estimating value of a function for any \_\_\_\_\_.  
 a) Intermediate value of function  
 b) Intermediate value of constant  
 c) Both (a) and (b)  
 d) Intermediate value of variable
- 8) Gauss backward interpolation formula is used interpolate value of  $y$  for \_\_\_\_\_.  
 a)  $0 < P < 1$   
 b)  $-1 < P < 0$   
 c)  $0 < P < \infty$   
 d)  $-\infty < P < 0$
- 9) If Trapezoidal rule, the function  $y = f(x)$  is taken to be \_\_\_\_\_.  
 a) parabola  
 b) ellipse  
 c) circle  
 d) straight line
- 10) The exact value of  $\int_0^6 \frac{dx}{x^2 + 1}$  is \_\_\_\_\_.  
 a) 1.4056  
 b) 2.4056  
 c) 3.4056  
 d) 4.4056

**B) Fill in the blanks of following.****06**

- 1) The Simpson's one-third rule obtained by  $n =$  \_\_\_\_\_ in general Quadrature formula.
- 2) The Lagrange's interpolation formula for unequal internal for ' $n$ ' points is a polynomial of degree \_\_\_\_\_.
- 3) If  $f(x) = e^x$  then  $\Delta^5 e^x =$  \_\_\_\_\_.
- 4) The equation  $\Delta^2 u_{n+1} + \Delta^2 u_n$  is of order \_\_\_\_\_.
- 5) If  $\delta =$  \_\_\_\_\_.
- 6) Find  $\nabla^2 y_8 =$  \_\_\_\_\_.

**Q.2 Attempt any Eight of the following.****16**

- a) Using newtons backward interpolation formula, find  $\frac{dy}{dx}$
- b) Find the difference table of the following data  
 $x:$  0   5   10   15   20  
 $y:$  0   3   14   69   228
- c) Find the polynomial  $f(x)$  by using Lagrange's formula for  
 $x_0 = 0$     $x_1 = 1$     $x_2 = 2$     $x_3 = 5$   
 $y_0 = 2$     $y_1 = 3$     $y_2 = 12$     $y_3 = 147$
- d) Evaluate  $\Delta^2 \left( \frac{2}{x+2} + \frac{3}{x+3} \right)$
- e) Prove that  $\mu = \frac{1}{2} (E^{1/2} + E^{-1/2})$
- f) If  $y = a(3)^x + b(-2)^x$  and  $h = 1$  prove that  $(\Delta^2 + \Delta - 6)y = 0$ .
- g) Derive the difference equation,  $y_n = a3^n + b5^n$
- h) Solve  $u_{n+3} - 2u_{n+2} - 5u_{n+1} + 6u_n = 0$

- i) Solve  $(E^2 - 4E + 3)y_x = 3^x$   
 j) State Trapezoidal rule.

**Q.3 A) Attempt any Two of the following.** **10**

- a) Prove that  $1 + \delta^2 \mu^2 = \left(1 + \frac{1}{2} \delta^2\right)^2$   
 b) Solve  $y_{n+2} - 2 \cos \alpha y_{n+1} + y_n = \cos n \alpha$

c) Evaluate  $\int_0^1 \frac{dx}{1+x}$  by

- i) Trapezoidal rule  
 ii) Simson's  $\left(\frac{1}{3}\right)^{\text{rd}}$  rule by  $h = \frac{1}{4}$

**B) State and prove Newton's forward interpolation formula.** **06**

**Q.4 A) Attempt any Two of the following.** **08**

a) Solve  $y_{x+1} y_x + (x+2)y_{x+1} + xy_x + x^2 + 2x + 2 = 0$

b) Give the value

|         |     |     |      |      |      |
|---------|-----|-----|------|------|------|
| $x:$    | 5   | 7   | 11   | 13   | 17   |
| $f(x):$ | 150 | 392 | 1452 | 2366 | 5202 |

Evaluate  $f(g)$  using Lagrange's formula

c) Prove that  $\Delta = \frac{1}{2} \delta^2 + \delta \sqrt{1 + \frac{\delta^2}{4}}$

**B) State and prove Simpson's  $\left(\frac{1}{3}\right)^{\text{rd}}$  rule.** **08**

**Q.5 Attempt any Two of the following.** **16**

a) Find the minimum and maximum value of  $y$  from the following table.

|      |   |      |     |      |    |       |
|------|---|------|-----|------|----|-------|
| $x:$ | 0 | 1    | 2   | 3    | 4  | 5     |
| $y:$ | 0 | 0.25 | 0.0 | 2.25 | 16 | 56.25 |

b) Find the cubic polynomial which take the following values

|         |   |   |   |    |
|---------|---|---|---|----|
| $x:$    | 0 | 1 | 2 | 3  |
| $f(x):$ | 1 | 2 | 1 | 10 |

Hence or other evaluate of  $f(4)$

c) Solve

- i)  $(E^2 - 4)y_x = x^2 - 1$   
 ii)  $y_{x+1} - y_x + xy_{x+1} y_x = 0$

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
STATISTICS (Special Paper - XIV)  
Probability Theory (22221642)**

Day & Date: Thursday, 30-10-2025  
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.

### O.1 A) Multiple Choice Question.

10

- 1) In Markov chain state  $j$  is said to be accessible from state  $i$  if \_\_\_\_\_.  
a)  $P_{ij}^{(n)} = 0$   
b)  $P_{jj}^{(n)} = 0$   
c)  $P_{ij}^{(n)} > 0$   
d) None of these
- 2) Convergence in law is also called as \_\_\_\_\_.  
a) convergence in probability  
b) convergence in distribution  
c) convergence in  $r^{\text{th}}$  mean  
d) almost sure convergence
- 3) A stochastic matrix is one in which each \_\_\_\_\_ is 1.  
a) Row sum  
b) Column sum  
c) Diagonal element  
d) Off diagonal element
- 4) In usual notations CDF of first order statistic is given by \_\_\_\_\_.  
a)  $[1 - F(y)]^n$   
b)  $n[1 - F(y)]^{n-1}f(y)$   
c)  $n[F(y)]^{n-1}f(y)$   
d) None of these
- 5) In stochastic process the parameter space may be \_\_\_\_\_.  
a) Discrete  
b) Continuous  
c) Both a & b  
d) Neither a nor b
- 6) For a random sample of size 2 from  $U(0,1)$  distribution, CDF of first order statistic is \_\_\_\_\_.  
a)  $y^2$   
b)  $2y(1 - y)$   
c)  $(1 - y)^2$   
d) None of these
- 7) Which one of the correct postulates for Poisson process \_\_\_\_\_.  
a) Independence  
b) Homogeneity in time  
c) Regularity  
d) All the above

- 8) 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
- 9) The probability density function of the largest order statistic  $X_{(n)}$  is \_\_\_\_\_.  
a)  $n[1 - F(x)]^{n-1}$   
b)  $n[F(x)]^{n-1}$   
c)  $n[F(x)]^{n-1}f(x)$   
d)  $n[1 - F(x)]^{n-1}f(x)$
- 10) W.L.L.N does not hold good for the sequence  $\{X_n\}$  of i.i.d r.v.  
a) Cauchy  
b) Chi-Square  
c) Normal  
d) Exponential

**B) Fill in the blanks.**

06

- 1) In usual notations traffic intensity is \_\_\_\_\_.
- 2) If  $\{X_n, n > 0\}$  be a sequence of iid  $p(1)$  r. vs. then  $\sqrt{n}(\bar{x}_n - 1)$  has \_\_\_\_\_ distribution.
- 3) In  $M/M/1: \infty/FCFS$  model the queue discipline is \_\_\_\_\_.
- 4) For a random sample of size 5 pdf of first order statistic is given by  $f(y_1) = \underline{\hspace{2cm}}$ .
- 5) If state 3 is absorbing state, then  $P_{32} = \underline{\hspace{2cm}}$ .
- 6) For Markov chain with 4 states,  $n^{\text{th}}$  step TPM will be of order \_\_\_\_\_.

**Q.2 Solve any Eight of the following.**

16

- a) State any two assumptions made while deriving probability distribution in queuing system.
- b) Give an example of continuous time discrete state stochastic process.
- c) Define size of queue.
- d) Define accessible states.
- e) Define convergence in probability.
- f) Define transient state and recurrent state of a Markov chain.
- g) Define queue length.
- h) Define irreducible Markov Chain.
- i) State the necessary and sufficient condition for existence of W.L.L.N.
- j) Define continuous time Markov chain.

**Q.3 A) Attempt any Two of the following.**

10

- a) Consider a Markov chain consists of three states with TPM

$$P = \begin{bmatrix} 1/2 & 1/2 & 0 \\ 1/2 & 1/4 & 1/4 \\ 0 & 2/3 & 1/3 \end{bmatrix}$$

- i) Find accessible states,
- ii) Find communicative states,
- iii) Find class of TPM,
- iv) Check whether Markov chain irreducible or not.

- b) Derive the distribution function of  $r^{\text{th}}$  order statistic.  
 c) Examine whether the WLLN holds for sequence  $\{X_n\}$  of independent random variable defined as follows

$$P[X_k = \pm 2^k] = 2^{-(2k+1)}, P[X_k = 0] = 1 - 2e^{-2k}$$

**B) Short note/Solve. 06**

Explain the classification of stochastic process with suitable examples.

**Q.4 A) Attempt any Two of the following. 08**

- a) Write a short note on Pure birth process.  
 b) 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.

- c) A random sample of size  $n$  is drawn from the distribution having

$$\text{p.d.f. } f(x) = \begin{cases} 3e^{-3x} & , x \geq 0 \\ 0 & , \text{o. w.} \end{cases}$$

Find the probability distribution of  $X_{(1)}$  and also obtain  $E(X_{(1)})$

**B) Examine whether WLLN holds for sequence  $[X_n]$  of a random variable defined as  $P[X_k = \pm\sqrt{k}] = \frac{1}{2\sqrt{k}}, P[X_k = 1] = \frac{1}{\sqrt{k}}$  08**

**Q.5 Attempt any Two of the following. 16**

- a) State and prove the theorem of WLLN for independently identically distributed random variables.  
 b) Let  $\{X_n, n \geq 1\}$  be a Markov chain with state space  $S = \{0,1,2\}$  and

$$\text{TPM is } P = \begin{bmatrix} 0.1 & 0.5 & 0.4 \\ 0.6 & 0.2 & 0.2 \\ 0.3 & 0.4 & 0.3 \end{bmatrix}$$

And initial probability distribution is  $P(X_0 = i) = 1/3; i = 0, 1, 2$

The Find:

- $P(X_2 = 2/X_1 = 1),$
  - $P(X_2 = 2, X_1 = 1/X_0 = 2),$
  - $P(X_2 = 2, X_1 = 1/X_0 = 2),$
  - $P(X_3 = 1, X_2 = 2, X_1 = 1/X_0 = 2),$
- c) Derive the probability density function of  $r^{\text{th}}$  order statistic.

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**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
GEOLOGY (Special Paper - XIV)  
Geomorphology and Geotectonic (22221650)**

Day & Date: Thursday, 30-10-2025  
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) Multiple choice questions.**

10

- 1) A landscape produced by the effect of many cycles of erosion of evolution is called as \_\_\_\_\_.  
a) Monocyclic                      b) Multicyclic  
c) Exhumed                        d) Resurrected
- 2) Which one of the following is endogenic process?  
a) Weathering                      b) Erosion  
c) Deposition                       d) None of these
- 3) What is the name of the Mesozoic supercontinent that consisted of all of the present continents?  
a) Eurasia                          b) Laurasia  
c) Pangaea                         d) Gondwanaland
- 4) Karst topography is related with \_\_\_\_\_ terrain.  
a) Sandstone                        b) Shale  
c) Conglomerate                   d) Limestone
- 5) According to sea-floor spreading, the age of the sea-floor should become younger towards \_\_\_\_\_.  
a) Constructive boundary        b) Conservation boundary  
c) Destructive boundary        d) All of the above
- 6) Which of the following are not associated with convergent plate margins?  
a) deep-focus earthquakes       b) rift valleys  
c) island arcs                       d) deep-sea trenches
- 7) Which among the following is called "Mushroom rocks"?  
a) Pedestal rocks                   b) Yardangs  
c) Ventifacts                       d) Desert pavements

- 8) Alluvial fans and alluvial cones, meanders and ox-bow lakes and natural levees are characteristics of \_\_\_\_\_ stage in the fluvial evolution.
  - a) Youth
  - b) Mature
  - c) Old
  - d) All of the above
- 9) At what type of plate boundary do deep-focus earthquakes occur \_\_\_\_\_.
  - a) Divergent
  - b) Convergent
  - c) Transform
  - d) All of these
- 10) Raised banks of meandering rivers formed by deposition of fine sand, silt and clay during overbank flooding are called \_\_\_\_\_.
  - a) Levee
  - b) Flood plain
  - c) Crevasse splay
  - d) Ox-bow lake

**B) Fill in the blanks.**

06

- 1) The removal of particles of dust and sand by strong winds is called \_\_\_\_.
- 2) The elevated land between two basins is known as \_\_\_\_.
- 3) \_\_\_\_ mountains form as a result of collision between Eurasia and India continents.
- 4) Alluvial deposits of roughly triangular shape that are deposited by major rivers at their mouths are called \_\_\_\_.
- 5) The term for wear and tear of the load sediments being transported by a moving natural agency through the process of mutual impacts is \_\_\_\_.
- 6) Volcanic island arcs are associated with \_\_\_\_ plate boundaries.

**Q.2 Solve any Eight of the following.**

16

- Define Uniformitarianism.
- Name the types of Diastrophism.
- List the parts of karst topography.
- Name the factors responsible for downslope mass movement.
- Give the example of continent - continent convergent plate boundaries.
- List the types of chemical weathering.
- Name the depositional features of rivers.
- What is mean by lithospheric plate?
- Name the endogenous processes.
- Draw the diagram with neat labelled parts of Destructive plate boundary.

**Q.3 A) Attempt any Two of the following.**

10

- Explain the difference between degradation and aggradation.
- Describe the process of formation of Himalayan mountains.
- Define rejuvenation. Discuss the types of rejuvenation.

**B)** Write short note on Sea floor spreading. Add note on Hot- spot with suitable diagram.

06



- Q.4 A) Attempt any Two of the following. 08**
- a) Write short note on palaeomagnetism.
  - b) Explain in brief the magmatism and seismic activity related to plate boundaries.
  - c) Discuss Topographic expressions of rejuvenation and poly (multi) cyclic relief.
- B) Describe in brief the geological work of river with suitable diagrams. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Define Continental drift. Explain the continental drifting with its evidences.
  - b) Explain the geological features related to convergent plate boundaries with neat labeled diagram.
  - c) Describe the types of chemical weathering with suitable examples.

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**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
MICROBIOLOGY (Special Paper - XIV)  
Microbiology Biochemistry (22221658)**

Day & Date: Thursday, 30-10-2025  
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

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

**Q.1 A) Rewrite the following sentences by choosing correct alternatives. 10**

- 1) Which of the following processes is performed by *Thiobacillus thiooxidans*?  
 a) converting sulphur to sulphates  
 b) converting sulphur to sulphides  
 c) converting sulphur to sulphites  
 d) converting organic sulphur to inorganic sulphur
- 2) Which enzyme catalyzes the conversion of pyruvate to acetyl-CoA?  
 a) Lactate dehydrogenase      b) Pyruvate kinase  
 c) Pyruvate dehydrogenase      d) Alanine transaminase
- 3) Which of these is not produced by the pentose phosphate pathway?  
 a) NADPH      b) Ribose-5-phosphate  
 c) Glucose-6-P      d) Arabinose
- 4) NAG and NAM of peptidoglycan layer is linked by \_\_\_\_\_.  
 a) beta-(1,4) glycosidic linkage  
 b) alpha-(1,4) glycosidic linkage  
 c) alpha-(1,6) glycosidic linkage  
 d) beta-(1,6) glycosidic linkage
- 5) The immobilized enzyme produced by micro encapsulation technique provides \_\_\_\_\_.  
 a) An extremely large surface area  
 b) Smaller surface area  
 c) High amount of solvent  
 d) Relatively smaller surface area

- 6) What is the purpose of ammonium sulphate precipitation in enzyme purification?
  - a) To break disulphide bonds
  - b) To remove salts
  - c) To precipitate protein based on solubility
  - d) To denature protein
- 7) The nature of an enzyme is \_\_\_\_\_.
  - a) Carbohydrate
  - b) Lipid
  - c) Vitamin
  - d) Protein
- 8) \_\_\_\_\_ is a positive regulator in arabinose operon.
  - a) ara A
  - b) ara B
  - c) ara C
  - d) ara D
- 9) The substrate binds to active site by \_\_\_\_\_ bonds during catalysis.
  - a) Hydrogen
  - b) Hydrophobic
  - c) Covalent
  - d) Disulphide
- 10) The enzymes having allosteric sites, other than catalytic site which is used for binding for regulatory metabolites is referred to as \_\_\_\_\_.
  - a) Isoenzyme
  - b) Biosensor
  - c) Allosteric enzymes
  - d) Effectors

**B) Answer in one sentence.****06**

- 1) Define enzyme.
- 2) Define Isozyme.
- 3) What is the significance of enzyme assay?
- 4) What is the coenzyme?
- 5) Enlist sulfur containing amino acids.
- 6) Define active site.

**Q.2 Solve any Eight of the following.****16**

- a) What are Ribozymes?
- b) How are intracellular enzymes extracted?
- c) Give the significance of  $V_{max}$  and  $K_m$ .
- d) What is lock and key model of mechanism of enzyme action?
- e) What is GOGAT?
- f) What is specific activity of enzyme?
- g) What is the net gain of ATP in TCA cycle?
- h) What is the primary function of the enzyme thymidylate synthase in pyrimidine metabolism?
- i) What is a cofactor?
- j) Enlist properties of enzymes.

- Q.3 A) Attempt any Two of the following. 10**
- a) Write an account on pyruvate as the key metabolite.
  - b) What are allosteric enzymes? Explain the mechanism of action with an example.
  - c) Explain purification of enzyme depending on electric charge.
- B) Write a short note on immobilisation of enzymes- methods and applications. 06**
- Q.4 A) Attempt any Two of the following. 08**
- a) Explain pentose phosphate pathway.
  - b) Write an account on carbon assimilation.
  - c) Describe in detail arabinose operon.
- B) Explain the steps in biosynthesis of peptidoglycan. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Explain factors affecting on catalytic efficiency of enzymes.
  - b) Write an account on assimilation of Nitrogen.
  - c) Write an essay on ' Bioluminescence '.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
ELECTRONICS (Special Paper - XIV)  
Embedded System Design (22221674)**

Day & Date: Thursday, 30-10-2025  
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

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

**Q.1 A) Select the correct alternative. 10**

- 1) For developing the firmware for 8051 based embedded system \_\_\_\_\_ IDE is needed.
 

|                     |                |
|---------------------|----------------|
| a) Pony Prog        | b) Flash Magic |
| c) Keil microVision | d) Micro C     |
- 2) In case of DC motor interfacing with 8051 microcontroller the motor driver is needed, which IC is normally used?
 

|          |          |
|----------|----------|
| a) L293D | b) BT136 |
| c) MCT2E | d) 7447  |
- 3) In C \_\_\_\_\_ is an example of iteration.
 

|             |                         |
|-------------|-------------------------|
| a) for      | b) while                |
| c) do-while | d) All of the mentioned |
- 4) Embedded C programs are typically designed for \_\_\_\_\_.
 

|                                 |
|---------------------------------|
| a) Real-time systems            |
| b) General-purpose applications |
| c) Web development              |
| d) Database management          |
- 5) Which C Programming function has having highest priority for execution?
 

|            |            |
|------------|------------|
| a) main()  | b) print() |
| c) input() | d) scan()  |
- 6) For serial communication in 8051 normally the baud rate used is \_\_\_\_\_.
 

|          |                 |
|----------|-----------------|
| a) 9600  | b) 4900         |
| c) 18000 | d) all of these |
- 7) The #include <stdio.h> is \_\_\_\_\_.
 

|                             |                          |
|-----------------------------|--------------------------|
| a) Pre-processor directive  | b) Inclusion directive   |
| c) File inclusion directive | d) None of the mentioned |

- 8) \_\_\_\_\_ Data type is best suited for storing a character in Embedded C.
  - a) unsigned int
  - b) int
  - c) float
  - d) char
- 9) The programming language used to program embedded system is \_\_\_\_\_.
  - a) Assembly
  - b) C
  - c) Java
  - d) both assembly and C
- 10) What is the typical range of values for an 8-bit unsigned integer in Embedded C?
  - a) 0 to 255
  - b) -128 to 127
  - c) 0 to 511
  - d) -255 to 255

**B) Answer the following.**

06

- 1) Give the sample of Input statement in C programming.
- 2) How many numbers of keywords are utilized for 8051 using C programming.
- 3) In 8051 Timer programming using C, who reflect the completion or overflow of counting?
- 4) The C pre-processors are specified with which symbol.
- 5) Define of embedded system?
- 6) How many number of columns and row are in smart LCD 16x2?

**Q.2 Solve any Eight of the following.**

16

- a) Sketch structure of embedded system.
- b) What is the result of the bitwise AND operation 5 & 3?
- c) What is the primary purpose of a timer in embedded systems?
- d) State the arithmetic operations used in C language.
- e) State the data types available in C language.
- f) Sketch the switch interfacing to 8051 circuit.
- g) State the meaning of 'void()' function in embedded C programming.
- h) State the features of C programming.
- i) What is loop?
- j) What will be the output of the following code?  

```
int a = 10;
{ int a = 20;
printf("%d", a); }
```

**Q.3 A) Attempt any Two of the following.**

10

- Explain embedded C program for generation of square of at Port0.
- With suitable diagram explain minimum hardware requirement for embedded system.
- Sketch the interfacing of 16x2 LCD to microcontroller.

**B)** With suitable diagram describe an interfacing of ADC to microcontroller 8051. **06**

**Q.4 A) Attempt any Two of the following.** **08**

- a) Write a note on embedded system with its applications.
- b) Write a note on endlessloop.
- c) What is software delay? Write embedded C program for generation of square of at port P1 using software delay.

**B)** Describe in detail the designing of an embedded system for temperature measurement. **08**

**Q.5 Attempt any Two of the following.** **16**

- a) Explain interfacing of DAC to 8051.
- b) What is loop statement in C programming? Discuss the following loops with suitable example.
  - i) for loop
  - ii) while loop
  - iii) do while loop
- c) What is 'if' control statement in C programming? Describe in detail 'if' control statements with suitable example.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
COMPUTER SCIENCE (Special Paper - XIV)  
Linux and Shell Programming (22221666)**

Day & Date: Thursday, 30-10-2025  
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.

**Q.1 A) Multiple choice questions. 10**

- 1) \_\_\_\_\_ shell was released by AT&T as an improvement to the Bourne shell.
 

|                       |                  |
|-----------------------|------------------|
| a) Bourne Again Shell | b) C-Shell       |
| c) Korn-shell         | d) None of these |
- 2) Linux command creates a link to the current file (not a full copy of the file).
 

|       |       |
|-------|-------|
| a) cp | b) ln |
| c) mv | d) cd |
- 3) The \$? character in Linux \_\_\_\_\_.
  - a) stores exit status of previous command
  - b) matches all characters
  - c) matches any single character
  - d) appends output to a file
- 4) The >> character in Linux \_\_\_\_\_.
  - a) starts a comment, ignored by shell script
  - b) matches all characters
  - c) matches any single character
  - d) appends output to a file
- 5) How do you print the first 10 lines of a file named 'file.txt'?
 

|                      |                      |
|----------------------|----------------------|
| a) head -10 file.txt | b) first-10 file.txt |
| c) cat-10 file.txt   | d) print-10 file.txt |
- 6) How can a variable be assigned in a Bash script?
 

|                       |                      |
|-----------------------|----------------------|
| a) variable= value    | b) variables:= value |
| c) variables:="value" | d) variable="value"  |



- 7) What is the purpose of the 'for' loop in shell scripting?
  - a) Repeats a command indefinitely
  - b) Executes commands based on conditions
  - c) Iterates through a list of items
  - d) Checks file permissions
- 8) Where can we configure a host and allow all connections from all other hosts?
 

|                          |                     |
|--------------------------|---------------------|
| a) /etc/hosts/hosts.conf | b) /etc/hosts.allow |
| c) /etc/hosts.deny       | d) /etc/hosts       |
- 9) In Vi editor, how can we move to the end of a line?
 

|      |       |
|------|-------|
| a) j | b) \$ |
| c) 0 | d) 1  |
- 10) Which among the commands can be used to mount a CDROM in Linux?
 

|                     |                     |
|---------------------|---------------------|
| a) mount /dev/cdrom | b) mount /mnt/cdrom |
| c) Both a and b     | d) None of these    |

**B) Fill in the blanks.****06**

- 1) \_\_\_\_\_ Linux command deletes the source file and creates copy of the source file in a new name.
- 2) \_\_\_\_\_ command is used to stop a process in Linux.
- 3) \_\_\_\_\_ statement used to read a file line by line in a shell script.
- 4) In a shell script, \_\_\_\_\_ statement is used to store the output of a command into a variable.
- 5) \_\_\_\_\_ command changes password for given user.
- 6) In Linux, \_\_\_\_\_ command tests whether given condition is true or false.

**Q.2 Solve any Eight of the following.****16**

- a) What is the difference between more and less commands?
- b) What are the different types of file systems in Linux?
- c) Define while loop with example.
- d) What is the function of a boot loader in Linux?
- e) Define gunzip.
- f) What is the use of the chkconfig command?
- g) How will you create file?
- h) What is a premature termination of process?
- i) How are DHCP server and client configured on Linux?
- j) What are Linux distributions?

**Q.3 A) Write a short note on any Two of the following.****10**

- a) Compare mounting and unmounting of a file system. Explain with example.
- b) Explain listing Command in details.
- c) Explain the different types of shells available in Linux and their uses.

**B)** List out filter commands. Explain grep command with example in details. **06**

**Q.4 A) Attempt any Two of the following.** **08**

- a) How do you bring jobs to the foreground from the background? Explain with example.
- b) What are the roles and responsibilities of a system administrator?
- c) Explain sort command with an example in detail.

**B)** What are users and groups in Linux? Explain how you can manage them. Explain with example. **08**

**Q.5 Attempt any Two of the following.** **16**

- a) Explain find command with an example in detail.
- b) Explain the role of the kernel and shell in the Linux operating system and discuss its primary functions.
- c) Write a menu driven shell script
  - i) To change the ownership of a file
  - ii) To create symbolic link file Bsc to Msc file
  - iii) To rename the file "One.txt" to "Two.txt"
  - iv) To append data at end of bsc file
  - v) To kill a process with its given ID
  - vi) To remove directory with its subdirectories

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**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:**  
**October/November - 2025**  
**PHYSICS (Special Paper - XV)**  
**Atomic, Molecular Physics and Quantum Mechanics (22221619)**

Day & Date: Friday, 31-10-2025  
 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 or calculator is allowed.  
 4) Neat diagrams must be drawn whenever necessary.

**Q.1 A) Choose and write a correct answer from given four alternatives. 10**

- 1)  $m_j$  can have only \_\_\_\_\_ values, from  $-j$  to  $+j$ , excluding zero.
  - a)  $j(j+1)$
  - b)  $2j+1$
  - c)  $\sqrt{j(j+1)}$
  - d)  $\sqrt{(2j+1)}$
- 2) In stark effect the number of split energy levels, corresponding to given  $j$  value is given by \_\_\_\_\_.
  - a)  $\frac{(2j+1)}{2}$
  - b)  $2j+1$
  - c)  $2(2j+1)$
  - d)  $2(j+1)$
- 3) Electronic spectra of diatomic molecules occurs in \_\_\_\_\_ region.
  - a) UV-vis
  - b) microwave
  - c) infra-red
  - d) X-ray
- 4) The normalization condition of the wave function  $\Psi$  is given by \_\_\_\_\_.
  - a)  $\int_{-\infty}^{\infty} \Psi^* \Psi dv = 0$
  - b)  $\int_{-\infty}^{\infty} \Psi^* \Psi dv = 1$
  - c)  $\int_{-\infty}^{\infty} \Psi^* \Psi dv \leq 0$
  - d)  $\int_{-\infty}^{\infty} \Psi^* \Psi dv \geq 0$
- 5) The separation between two successive energy levels in harmonic oscillator is \_\_\_\_\_.
  - a)  $\hbar\omega$
  - b)  $\frac{\hbar\omega}{2}$
  - c)  $\frac{3\hbar\omega}{2}$
  - d)  $2\hbar\omega$

- 6) The Hamiltonian operator is given by \_\_\_\_\_.
  - a)  $\hat{H} = -i\hbar\nabla$
  - b)  $\hat{H} = i\hbar\frac{\partial}{\partial t}$
  - c)  $\hat{H} = \frac{\hbar^2}{2m}\nabla^2 + V(r)$
  - d)  $\hat{H} = \frac{\hbar^2}{2m}\nabla^2 - V(r)$
- 7) Eigen value of  $L_z$  is \_\_\_\_\_.
  - a)  $m^2\hbar$
  - b)  $m\hbar$
  - c)  $m\hbar^2$
  - d)  $mh$
- 8) Pure rotational spectra occur in \_\_\_\_\_ region.
  - a) ultraviolet
  - b) infra-red
  - c) microwave
  - d) X-ray
- 9)  $^2P_{3/2}$  state has \_\_\_\_\_.
  - a)  $l = 1, s = \frac{1}{2}, j = \frac{3}{2}$
  - b)  $l = 0, s = \frac{1}{2}, j = \frac{3}{2}$
  - c)  $l = 1, s = -\frac{1}{2}, j = \frac{3}{2}$
  - d)  $l = 0, s = -\frac{1}{2}, j = \frac{3}{2}$
- 10) In the spectra of alkali metals, the doublet separation decreases with \_\_\_\_\_.
  - a) increase in atomic number
  - b) increases in principal quantum number (n)
  - c) decreases in orbital angular momentum quantum number (l)
  - d) None of these

**B) Fill in the blank/ Definition/One sentence answer/ One word answer/ Give the name/ Predict the product etc.**

06

- 1) The doublet separations increase with \_\_\_\_\_.
- 2) First order Stark effect is one in which the term shift is proportional to \_\_\_\_\_.
- 3) The spectral lines are close doublets called \_\_\_\_\_.
- 4) State angular momentum operator.
- 5) State Schrodinger's wave equation in three regions in case of potential well.
- 6) The spacing between P and R branch lines is \_\_\_\_\_.

**Q.2 Solve any Eight of the following.**

16

- Write the spectral series for Li.
- Draw a neat energy level diagram for Na spectral series.
- State the selection rule for Paschen Back effect.
- What are stokes and anti-stokes lines.
- Explain Electronic spectra of Diatomic molecules.
- Write boundary conditions of Potential well.
- Define Operator.
- Obtain eigen value equation for the kinetic energy of the particle moving in the x-direction.

- i) Find Eigen value of Eigen function  $e^{-2ix}$  of operator  $\frac{d^2}{dx^2}$
- j) Write the salient features of the spectra of alkali metals.

**Q.3 A) Attempt any two of the following. 10**

- a) Write a note on Frank Condon principle.
- b) Write a note on Zero-point energy.
- c) By separation of variables in spherical polar co-ordinates  $\Psi(r, \theta, \phi) = R(r)\Theta(\theta)\Phi(\phi)$ , derive three separate equations for  $R$ ,  $\Theta$  and  $\Phi$  from Schrodinger equation.

**B) Write the selection for doublets. Discuss both qualitative and quantitative intensity rules used to calculate relative intensity of spectral lines in doublet with example. 06**

**Q.4 A) Attempt any two of the following. 08**

- a) Write a note on Stark effect in Hydrogen.
- b) Explain the physical significance of  $\Psi$ .
- c) Find the eigen value of  $L^2$ .

**B) Give the classical theory of Raman effect and show that Raman shift is equal to 08**

- i) frequency of vibration of molecule
- ii) double the frequency of rotation of the molecule

**Q.5 Attempt any two of the following. 16**

- a) Derive Schrodinger's time dependent wave equation for matter wave in one dimension.
- b) Explain anomalous Zeeman effect and obtain an expression for the term shift.
- c) Using steady state Schrodinger's wave equation obtain the energy eigen values and eigen functions for the motion of a particle in one dimensional rigid box.

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**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
CHEMISTRY (Special Paper - XV)  
Organic Chemistry (22221611)**

Day & Date: Friday, 31-10-2025  
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.

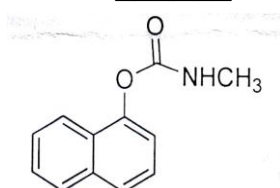
**Q.1 A) Choose the most correct alternative for each of the following. 10**

- 1) Five membered Heterocycle containing nitrogen and sulphur is \_\_\_\_\_.  
a) Oxazole  
b) Pyrazole  
c) Indole  
d) Thiazole
- 2) The drug which are used to get relief from pain without loss of consciousness are known as \_\_\_\_\_.  
a) Anesthetics  
b) Analgesic  
c) Hypnotics  
d) Sedative
- 3) Ozonolysis of vitamin A gives \_\_\_\_\_.  
a) Geronic acid  
b)  $\beta$ -ionine  
c) Isoprene unit  
d) None of the above
- 4) Penicillin G on hydrolysis by hot dil HCl gives \_\_\_\_\_.  
a)  $\text{CO}_2$   
b) Penicillamine  
c) Penilloaldehyde  
d) All of the above
- 5) Weerman's reaction can be used for \_\_\_\_\_.  
a) Chain lengthening of carbohydrates  
b) Chain shortening of carbohydrates  
c) Conversion of fructose to Glucose  
d) Conversion of Glucose to fructose
- 6) Vat dyes are water \_\_\_\_\_ dyes.  
a) Soluble  
b) Insoluble  
c) Partly soluble  
d) Colloidal
- 7) In pyridine the nitration takes place at \_\_\_\_\_ positions.  
a) One  
b) Two  
c) Three  
d) Four

- 8) Sucrose on hydrolysis gives a mixture of \_\_\_\_\_.  
 a) Glucose + Fructose                      b) Fructose + Fructose  
 c) Glucose + Galactose                      d) Glucose + Glucose
- 9) The  $\beta$ -ionone unit is present in the vitamin \_\_\_\_\_.  
 a) Vitamin-A                                      b) Vitamin-B  
 c) Vitamin-C                                      d) Vitamin-D
- 10) Which of the following is antidiabetic drug?  
 a) Ethambutol                                      b) Tolbutamide  
 c) Phenobarbitone                                      d) Isoniazide

**B) Fill in the blanks.****06**

- 1) Name the following insecticide \_\_\_\_\_.



- 2) The deficiency of Vitamin A causes \_\_\_\_\_ disease.  
 3) Mutarotation catalyzed by \_\_\_\_\_.  
 4) Pyridine on heating with sodamide gives \_\_\_\_\_.  
 5) The dye which acquires binding material during dyeing is known as \_\_\_\_\_.  
 6) \_\_\_\_\_ is antitubercular drugs.

**Q.2 Solve any Eight of the following.****16**

- a) Explain why pyrrole is weak base.  
 b) Prove the presence of five double bonds in Vitamin A.  
 c) What are agrochemicals? Give only structure and uses of Indole 3-acetic acid.  
 d) Give the synthesis of Isoniazide.  
 e) Give any two methods of synthesis of pyridine.  
 f) Give structure and uses of cellulose.  
 g) Define the term antimalarials and antineoplastic agents.  
 h) Explain good qualities of dyes.  
 i) Define the term  
     i) Stomach insecticides  
     ii) Acaricides  
 j) How will you prove adrenaline is derivative of catechol?

**Q.3 A) Attempt any Two of the following.****10**

- a) Establish open chain structure of D (+) Glucose.  
 b) Explain the classification of dyes on the basis of chemical constitutions.  
 c) Give the synthesis of Chloromycetin and their uses.

- B)** Give synthesis of methoxychlor and ethophan. **06**
- Q.4 A) Attempt any Two of the following. 08**
- a) Explain the electrophilic substitution reactions of pyrrole.
  - b) How will you convert Glucose in to Fructose?
  - c) Write any four qualities of an ideal drugs.
- B)** What are dyes? Explain Witts theory of chromophore and auxochrome. Gives synthesis of malachite green. **08**
- Q.5 Answer any Two of the following. 16**
- a)** What is the action of following on Quinoline.
- i)  $\text{Na}/\text{NH}_3$
  - ii)  $\text{NaNH}_2/\Delta$
  - iii)  $\text{SO}_3/\text{H}_2\text{SO}_4$ ;  $220^\circ\text{C}$
  - iv)  $\text{C}_6\text{H}_5\text{Li}$
  - v)  $\text{H}_2$ . Pt/ $\text{CH}_3\text{COOH}$
  - vi) Conc.  $\text{H}_2\text{SO}_4/\text{HNO}_3$
  - vii)  $\text{C}_4\text{H}_9\text{Li}$
  - viii)  $\text{H}_2/\text{Ni}$ ,  $150^\circ\text{C}$
- b)** What are carbohydrates? Explain the size of ring structure of D-Glucose by methylation method.
- c)** What are hormones? Discuss structure of Thyroxine on the basis of analytical ground.



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**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
BOTANY (Special Paper - XV)  
Cell Biology (22221603)**

Day & Date: Friday, 31-10-2025  
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) Multiple Choice Question. 10**

- 1) The purpose of the fine focus knob of microscope \_\_\_\_\_.  
a) To move the stage up and down  
b) To make large adjustments to focus  
c) To adjust the focus for fine detail  
d) To change the objective lens
- 2) The \_\_\_\_\_ part of electron microscope focuses the electron beam.  
a) Condenser lens                      b) Objective lens  
c) Electromagnetic lenses          d) Stage
- 3) Crossing over occurs between \_\_\_\_\_.  
a) Two daughter nuclei  
b) Two different bivalents  
c) Non sister chromatids of bivalents  
d) Sister chromatids of bivalents
- 4) The process of photosynthesis is operated by \_\_\_\_\_.  
a) Mitochondria                      b) Ribosomes  
c) Nucleus                              d) Chloroplast
- 5) The cell organelle, \_\_\_\_\_ operates process of protein synthesis.  
a) Endoplasmic reticulum          b) Ribosome  
c) Lysosome                              d) Vacuole
- 6) Out of following, \_\_\_\_\_ have prokaryotic cell.  
a) Animal                                  b) Bacteria  
c) Plant                                      d) All of Above
- 7) The primary function of the cytoskeleton is \_\_\_\_\_.  
a) Synthesizing proteins  
b) Storing genetic material  
c) Providing structural support and maintaining cell shape  
d) Transporting nutrients

- 8) The function of peroxisomes in a cell is \_\_\_\_\_.
  - a) Breakdown of fatty acids and detoxification of harmful substances
  - b) Energy production through ATP
  - c) Protein synthesis
  - d) Storage of genetic material
- 9) Structural unit of a chromosome is \_\_\_\_\_.
  - a) Nucleotide
  - b) Gene
  - c) Chromatin
  - d) Ribosome
- 10) At the end of meiosis, \_\_\_\_\_ daughter cells are produced.
  - a) 2
  - b) 4
  - c) 8
  - d) 6

**B) Fill in the blanks/True False.****06**

- 1) Outermost protective covering of plant cell is called \_\_\_\_\_.
- 2) Ribosome plays role in the process of \_\_\_\_\_ synthesis.
- 3) In microscope, lens closer to the eye is called \_\_\_\_\_.
- 4) Initial magnification of object provided by \_\_\_\_\_ lens.
- 5) Number of Chromosome in human is \_\_\_\_\_.
- 6) Meiosis occurs in \_\_\_\_\_ cell.

**Q.2 Answer the following. (Any Eight)****16**

- a) State one use of an electron microscope.
- b) Give the name of any two microscopes.
- c) What is the function of the cell wall in prokaryotic cells?
- d) What is cell?
- e) Draw neat labelled diagram of nucleus.
- f) What is the centromere in a chromosome?
- g) Define acrocentric chromosomes.
- h) Why is karyotyping important in genetics?
- i) What is cytokinesis?
- j) What is the cell cycle?

**Q.3 A) Write short notes any Two of the following.****10**

- a) Write a note on phase contrast microscope.
- b) Explain in brief eukaryotic cell.
- c) Write the composition of cell membrane.

**B) Write a short note on Karyotype.****06****Q.4 A) Attempt the following. (Any Two)****08**

- a) Write a note on Lamp brush chromosome.
- b) How to prepare Sample for electron microscopy.
- c) Write significance of Mitosis.

**B) Explain types of Endoplasmic reticulum with suitable diagram****08**

**Q.5 Attempt the following. (Any Two)**

**16**

- a) Explain in brief prokaryotic cell with neat labelled diagram.
- b) Describe in brief ultrastructure and significance of Chloroplast.
- c) What is meiosis? Explain it with suitable diagram.

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**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
ZOOLOGY (Special Paper - XV)  
Animal Behavior and Chronobiology (22221627)**

Day & Date: Friday, 31-10-2025  
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

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

**Q.1 A) Choose the correct alternative.**

10

- Behavior aimed at opposite sex of the same species and designed to stimulate copulation is called \_\_\_\_\_.
  - Courtship
  - Kin selection
  - Group selection
  - Altruism
- In male choice, when a single male mates with many females this situation is called as \_\_\_\_\_.
  - Polyandry
  - Homogeny
  - Polygyny
  - Homology
- The multidisciplinary branch of science that deals with study of biological rhythm is \_\_\_\_\_.
  - Chronomodelling
  - Ethnology
  - Chronology
  - Chronobiology
- Non reproductive sterile female in honey bee colony are called \_\_\_\_\_.
  - Queen
  - Worker
  - Drone
  - Alate
- Our sleep - wake cycle follows a \_\_\_\_\_rhythm.
  - Infradian
  - Circadian
  - Circannual
  - Ultradian
- The branch of biology which deals with study of animal is called as \_\_\_\_\_.
  - Ethology
  - Ecology
  - Applied zoology
  - Enthology
- \_\_\_\_\_, hormone is produced in response to darkness.
  - Growth hormone
  - Prolactin
  - Testosterone
  - Melatonin

- 8) \_\_\_\_\_ is considered as dominant pacemaker of many circuit in rhythms in many mammals.
- Sino-auricle node
  - Anterior-ventricular node
  - Amygdala
  - Supra- chiasmatic nuclei (SCN)
- 9) Pavlov's dog associated \_\_\_\_\_ with the arrival of food and begin to salivate.
- Human
  - Dish
  - Bell
  - Telephone
- 10) When a euglena swims towards light, it shows \_\_\_\_\_.
- Positive phototaxis
  - Negative phototaxis
  - Negative geotaxis
  - Positive chemotaxis

**B) Fill in the blanks.****06**

- Nest building in bird is an example of \_\_\_\_\_ behavior.
- Give an example of eusocial animal \_\_\_\_\_.
- \_\_\_\_\_ biologist discovered the meaning of dance language of honey bee.
- When an animal no longer responds to repeated stimulus, it has become \_\_\_\_\_ to the stimulus.
- Moth flying towards light is an example of \_\_\_\_\_ behavior.
- \_\_\_\_\_ is given credit for developing concept of imprinting.

**Q.2 Solve any eight of the following.****16**

- Role of pheromones in communication
- Tidal rhythms
- Give two examples of learned behavior
- Chronopharmacology
- Male rivalry
- Lunar rhythms
- Sexual dimorphism
- Asymmetry of sex
- Orthokinesis
- Geotaxis behavior

**Q.3 A) Attempt any Two of the following.****10**

- Explain characteristics of biological rhythms.
- Describe chronotherapy.
- Explain types of learning.

**B) Describe role of melatonin in biological rhythms.****06**

**Q.4 A) Attempt any Two of the following. 08**

- a) Describe Ivan Pavlov's contribution in behavioral biology and give its significance.
- b) Describe intersexual competition.
- c) Explain proximate causes of behavior with suitable examples.

**B) Describe adaptive significance of biological clock. 08**

**Q.5 Attempt any Two of the following. 16**

- a) Describe Territorial behavior.
- b) Explain social behavior in honey-bee.
- c) Describe photoperiod and regulation of seasonal reproduction in vertebrates.

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**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
MATHEMATICS (Special Paper - XV)  
Integral Calculus (22221635)**

Day & Date: Friday, 31-10-2025  
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 the correct alternatives for each of the following. 10**

1)  $\int_0^{\infty} \frac{dx}{x}$  is \_\_\_\_\_.

- |               |                  |
|---------------|------------------|
| a) Convergent | b) Oscillatory   |
| c) Divergent  | 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)  $\int_0^{\infty} \sin x \, dx$  is an improper integral of \_\_\_\_\_.

- |                |                    |
|----------------|--------------------|
| a) Second kind | b) Third kind      |
| c) First kind  | d) Proper integral |

4) If  $\int_a^{\infty} |f(x)| \, dx$  is convergent then the integral  $\int_a^{\infty} f(x) \, dx$  is \_\_\_\_\_.

- |                             |                       |
|-----------------------------|-----------------------|
| a) Conditionally convergent | b) Uniform convergent |
| c) Absolutely convergent    | d) Divergent          |

5)  $\int_0^{\infty} e^{-ax} x^{n-1} \, dx = \underline{\hspace{2cm}}$ .

- |                           |                               |
|---------------------------|-------------------------------|
| a) $\frac{\sqrt{n}}{a^n}$ | b) $\frac{\sqrt{n}}{a}$       |
| c) $\sqrt{n}$             | d) $\frac{\sqrt{n}}{a^{n-1}}$ |

- 6) If  $0 < p < 1$  the  $\overline{P} \quad \overline{1-P} = \underline{\hspace{2cm}}$ .
- a)  $\frac{1}{\sin p\pi}$                       b)  $\frac{\pi/2}{\sin p\pi}$   
 c)  $\frac{\pi}{\sin p\pi}$                       d)  $\frac{p\pi}{\sin p\pi}$
- 7)  $\beta(m+1, n) = \underline{\hspace{2cm}}$ .
- a)  $\beta(m, n+1)$                       b)  $\frac{\Gamma m \Gamma n}{\Gamma m+n}$   
 c)  $\frac{m}{(m+n)}\beta(m, n)$                       d)  $\frac{1}{2}$
- 8)  $\int_0^2 \int_0^{3y} y dy dx = \underline{\hspace{2cm}}$ .
- a) 3                      b) 8  
 c) 9                      d) 4
- 9)  $\int_0^\pi \int_0^{a(1+\cos\theta)} r dr d\theta = \underline{\hspace{2cm}}$ .
- a)  $3\pi a^2$                       b)  $\frac{3}{4}\pi a^2$   
 c)  $\frac{3}{5}\pi a^2$                       d) None of these
- 10) To change a given double integration from cartesian to polar co-ordinate we use the formula  $\underline{\hspace{2cm}}$ .
- a)  $dx dy = d\theta dr$                       b)  $dx dy = r d\theta dr$   
 c)  $dx dy = r^2 dr d\theta$                       d)  $r dx dy = d\theta dr$

**B) Fill in the blank.****06**

- 1)  $\int_0^{\pi/2} \sin^5 \theta \cos^3 \theta d\theta = \underline{\hspace{2cm}}$ .
- 2) Value of  $\sqrt{2}$  is  $\underline{\hspace{2cm}}$ .
- 3) Value of  $\int_1^2 \int_0^{3y} y dy dx = \underline{\hspace{2cm}}$ .
- 4) Evaluate  $\int_1^2 \int_0^x \frac{dx dy}{x^2 + y^2} = \underline{\hspace{2cm}}$ .
- 5)  $\int_0^\infty \sin x dx$  is an improper integral of  $\underline{\hspace{2cm}}$  kind.



6) The improper integral  $\int_a^b \frac{dx}{(b-x)^p}$  converges if \_\_\_\_\_.

**Q.2 Solve the following. (Any Eight)**

**16**

a) Define Beta and Gamma function.

b) Show that  $\int_0^\infty \frac{1}{2} = \sqrt{\pi}$

c) Evaluate  $\int_0^\infty e^{-x^4} dx$

d) Show that  $\beta(m, n) = \beta(n, m)$ .

e) Evaluate  $\int_0^1 \int_{x^2}^{2-x} y dy dx$

f) Solve  $\int_1^{\log 8} \int_0^{\log y} e^{x+y} dx dy$

g) Solve  $\int_0^{\pi} \int_0^{a \sin \theta} r d\theta dr$

h) Define proper integral of first kind.

i) Test the converges of  $\int_0^1 \frac{dx}{x^3}$

j) Find the limit of integration  $\iint f(x, y) dy dx$  over the region  $y = 0, x = 2$  and  $y = x^2$ .

**Q.3 A) Attempt the following. (Any Two)**

**10**

a) Find the using double integration the area enclosed between  $y^2 = 4ax$  and  $x^2 = 4ay$ .

b) Prove that  $\int_0^\pi \sin^m \theta \cos^n \theta d\theta = \frac{\int_{\frac{m+1}{2}}^{\frac{n+1}{2}}}{2 \int_{\frac{m+n+2}{2}}$

c) Prove that the improper integral of the first kind  $\int_0^\infty \frac{dx}{x^p}$  converges iff  $p > 1$

**B)** Solve  $\iint xy dx dy$  over the frist quadrant of  $x^2 + y^2 = a^2$

**06**

**Q.4 A) Attempt the following. (Any Two)**

**08**

a) Test the Converges of  $\int_0^2 \frac{\log x}{\sqrt{2-x}} dx$

b) Evaluate  $\int_0^1 \frac{x^{m-1} + x^{n-1}}{(1+x)^{m+n}} dx$

c) Change the order of integration  $\int_0^{2a} \int_{x^2/4a}^{(3a-x)} f(xy) dx dy$

**B)** Show that  $\sqrt{\pi} \Gamma(2m) = 2^{2m-1} \Gamma(m) \Gamma(m + \frac{1}{2})$  **08**

**Q.5 Attempt the following. (Any Two)**

**16**

**a)** State and prove Abel's test for improper integral of a product of two function.

**b)** Solve the following.

1) Evaluate  $\Gamma(-\frac{1}{2})$ ,  $\Gamma(-\frac{3}{2})$

2) Show that  $\beta(m, n) = \frac{\Gamma(m) \Gamma(n)}{\Gamma(m+n)}$

**c)** Using the transformation  $\frac{x^2}{y} = u$ ,  $\frac{y^2}{x} = v$ . Find  $\iint x^2 y^2 dx dy$  over area bounded by four parabola  $y^2 = 4x$ ,  $y^2 = 8x$ ,  $x^2 = 4y$ ,  $x^2 = 8y$

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**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
STATISTICS (Special Paper - XV)  
Designs of Experiments (22221643)**

Day & Date: Friday, 31-10-2025  
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 CRD, treatments are assigned to experimental units \_\_\_\_\_.  
a) In sequence                                      b) Randomly  
c) By blocks                                              d) By rows and columns
- 2) The technique of ANOVA is mainly used to \_\_\_\_\_.  
a) Compare means                                      b) Estimate variance  
c) Test proportions                                      d) Test independence
- 3) In RBD, the error variance is reduced because \_\_\_\_\_.  
a) Replication                                              b) Blocking  
c) Randomization                                              d) Confounding
- 4) In LSD, total degrees of freedom are split into \_\_\_\_\_.  
a) Rows, Columns, Treatments, Error  
b) Treatments, Error only  
c) Blocks, Replication, Error  
d) None of these
- 5) Efficiency of LSD over CRD is usually \_\_\_\_\_.  
a) Less than 100%                                      b) More than 100%  
c) Equal to 100%                                      d) Zero
- 6) In ANOCOVA,  $\beta$  represents \_\_\_\_\_.  
a) Slope of regression                                      b) Error variance  
c) Block effect                                              d) Interaction effect
- 7) The number of interactions in a  $2^3$  factorial experiment is \_\_\_\_\_.  
a) 1                                                              b) 3  
c) 4                                                              d) 7

- 8) Confounding is generally applied to \_\_\_\_\_.
  - a) Main effects
  - b) Lower order interactions
  - c) Higher order interactions
  - d) Replications
- 9) In a uniformity trial, variance per unit area is estimated by \_\_\_\_\_.
  - a) t-test
  - b) F-test
  - c) Empirical formula
  - d) Chi-square test
- 10) The ANOVA table partitions total variation into \_\_\_\_\_.
  - a) Mean, Variance, Error
  - b) Treatment, Error
  - c) Replication, Interaction, Error
  - d) Total, Treatments, Blocks, Error

**B) Fill in the blanks / Definitions / One sentence answers.****06**

- 1) The \_\_\_\_\_ is the smallest division of experimental material.
- 2) In RBD, number of blocks is equal to number of \_\_\_\_\_.
- 3) In LSD, the number of degrees of freedom for error is \_\_\_\_\_.
- 4) Efficiency of a design is expressed as \_\_\_\_\_  $\times 100$
- 5) In ANOCOVA, the test of  $\beta = 0$  is done using \_\_\_\_\_ distribution.
- 6) In a  $2^2$  factorial experiment, there are \_\_\_\_\_ main effects.

**Q.2 Solve the following. (Any Eight)****16**

- a) Explain the terms experimental unit, treatment, and layout of experiment.
- b) Define CRD and explain its applications.
- c) Derive the ANOVA table for RBD.
- d) Write a note on "Empirical formula for variance per unit area".
- e) Distinguish between CRD and LSD.
- f) Explain the analysis of LSD with missing observation.
- g) Discuss the applications of ANOCOVA in real life.
- h) Write assumptions of factorial experiments.
- i) Explain the concept of confounding.
- j) Write a short note on efficiency of a design.

**Q.3 A) Attempt the following. (Any Two)****10**

- a) Explain the analysis of variance in LSD with example.
- b) Derive the expected mean sum of squares in RBD.
- c) Discuss the role of concomitant variable in ANOCOVA.

**B) Short Note.****06**

Derive the efficiency of LSD over CRD.

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

- a) Explain the analysis of  $2^2$  factorial experiment with F-test.
- b) Construct layout of total confounding in  $2^3$  factorial experiment.
- c) Discuss the assumptions and interpretation of ANOCOVA in CRD.

**B) Describe / Explain / Solve.****08**

Prepare the ANOVA table for partial confounding in  $2^3$  factorial experiment.

**Q.5 Attempt the following. (Any Two)****16**

- a)** Explain the principles of DOE with suitable examples.
- b)** Discuss in detail the layout, model, and assumptions of RBD.
- c)** Explain  $2^3$  factorial experiment with concept of interaction effects.

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**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
GEOLOGY (Special Paper - XV)  
Environmental Geology (22221651)**

Day & Date: Friday, 31-10-2025  
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

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

**Q.1 A) Multiple Choice Question.****10**

- 1) If the catchment terrain is made up of sedimentary rocks, the possibility of flood is \_\_\_\_\_ at downstream as compared to igneous rock terrain.
  - a) more
  - b) less
  - c) not effective
  - d) very less
- 2) On a topographic map, closely spaced contours are the probable zones of \_\_\_\_\_ hazard.
  - a) Flood & landslide
  - b) Landslide
  - c) Flood
  - d) Subsidence
- 3) Impact of any disaster will be more if \_\_\_\_\_ is not good.
  - a) Planning
  - b) Preparedness
  - c) Mitigation
  - d) All as in a, b & c
- 4) In a country like India, role of \_\_\_\_\_ is very important for reducing impact of disaster in a long-term preparedness phase.
  - a) People,
  - b) Local administration
  - c) Government
  - d) Experts
- 5) Large scale animal grazing in sloping hilly terrain may cause \_\_\_\_\_ hazard.
  - a) Flood & landslide
  - b) Landslide
  - c) Flood
  - d) Subsidence
- 6) Energy reflectance (albedo) of acidic rocks is \_\_\_\_\_ as compared to forests.
  - a) same
  - b) more
  - c) less
  - d) dull

- 7) If prolonged time duration of moderate intensity of rainfall is same on Igneous & poorly consolidated sedimentary rocks, sedimentary terrain may cause \_\_\_\_\_ flood downstream than igneous rock terrain.
  - a) early
  - b) late
  - c) same time
  - d) no
- 8) Earthquake disaster \_\_\_\_\_ predicted.
  - a) cannot be
  - b) can be
  - c) is easily
  - d) is early
- 9) War activity in hilly terrain can trigger \_\_\_\_\_ commonly.
  - a) Tsunami
  - b) Cyclone
  - c) Landslide
  - d) Tsunami & flood
- 10) Major sustainable energy can be \_\_\_\_\_.
  - a) Thermal
  - b) Hydro power
  - c) Fuel
  - d) Solar

**B) Fill in the blanks.**

06

- 1) Extreme cold climate is found at \_\_\_\_\_ regions.
- 2) Deserts are geographic regions where very scanty or no \_\_\_\_\_ is seen.
- 3) Buildings on slopes may cause \_\_\_\_\_ hazard.
- 4) Landslided material in river may cause \_\_\_\_\_ afterwards.
- 5) Long form for geospatial tool, GIS, is \_\_\_\_\_.
- 6) Slope modification is solution for controlling \_\_\_\_\_ hazard.

**Q.2 Solve any Eight of the following.**

16

- a) Define environment.
- b) Define Hydrosphere.
- c) Define Lithosphere.
- d) Define Biosphere.
- e) Define Atmosphere.
- f) What kind of polar environment is like?
- g) What is an Avalanche?
- h) What is Earthquake?
- i) Define Flood.
- j) Define Landslide.

**Q.3 A) Answer any Two of the following.**

10

- Write the control measures of landslide. Draw diagrams.
- Write preparedness for Avalanche.
- Write the anthropogenic causes of flood.

**B)** Write short note on need of conventional energy resource management.

06

- Q.4 A) Attempt any Two of the following. 08**
- a) What are demerits of conventional energy resources? Explain with any two examples.
  - b) What are advantages of non-conventional energy resources? Give examples.
  - c) What are geological parameters for preparedness of volcanic hazard?
- B) Describe the preparedness parameters for landslide hazard. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Describe in detail the Earthquake hazard.
  - b) Describe in detail the solutions for landslide & subsidence hazards. Draw diagrams.
  - c) Describe the conventional & non-conventional energy generation that uses water as sources.



Max. Marks: 80

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

- Organisms growing under high atmospheric pressure are called \_\_\_\_\_.  
a) Halophilic                      b) Osmophilic  
c) Barophilic                     d) Alkalophilic
- \_\_\_\_\_ is waste product of sugar industry.  
a) Molasses                        b) Whey  
c) SWC                              d) CSL
- \_\_\_\_\_ is involved in degradation of oil on water surface.  
a) Bacillus                          b) E-coil  
c) Proteus                          d) Pseudomonas
- Droplet nuclei are smaller than \_\_\_\_\_.  
a) 0.1 mm                          b) 0.01 mm  
c) 0.001 mm                      d) 0.1 micron
- Strength of sewage is measured by \_\_\_\_\_ test.  
a) BOD                              b) MPN  
c) MBRT                            d) SPC
- Thiobacillus ferrooxidans is involved in bioleaching of \_\_\_\_\_.  
a) Copper                          b) Iron  
c) Gold                              d) Uranium
- Microorganisms Survives at hot springs of water are called \_\_\_\_\_.  
a) Barophilic                      b) Osmophilic  
c) Halophilic                       d) Thermophilic
- Oxidation tanks are used for \_\_\_\_\_ sewages treatment.  
a) Primary                         b) Secondary  
c) Tertiary                         d) Final

- 9) The term Eutrophication was firstly used by scientist \_\_\_\_\_.  
a) Weber                                      b) Naumann  
c) Marson                                     d) Pasteur
- 10) Sieve device method is used for examination of microorganisms in \_\_\_\_\_.  
a) Water                                        b) Sewage  
c) Soil                                          d) Air

**B) Answer the following.**

06

- 1) Define COD.
- 2) Give the sources of microorganisms in Air.
- 3) Define Eutrophication.
- 4) What is bioleaching?
- 5) Define Acidophiles.
- 6) What is carbon credit?

**Q.2 Solve any Eight of the following.**

16

- a) What is infections dust?
- b) Which leaching agent is used for extraction of copper from its ore?
- c) What is BOD?
- d) What is marine microbiology?
- e) What is concept of biosafety?
- f) What is bioremediation?
- g) Define Osmophiles.
- h) What is whey?
- i) Define Bioaerosol.
- j) Define psychrophiles.

**Q.3 A) Attempt any Two of the following.**

10

- a) Types of fresh water bodies
- b) Thermophilic microorganisms
- c) Concept of carbon sequestration

**B)** Describe in detail bioleaching of iron.

06

**Q.4 A) Attempt any Two of the following.**

08

- Describe in brief microorganisms in Air.
- Describe characteristics and treatment of sugar industry waste.
- Describe in brief bioremediation of mercury.

**B) Describe in detail methods to study air borne microorganisms.**

08

**Q.5 Attempt any Two of the following.**

16

- Describe in detail oil recovery methods.
- Describe in detail regulatory framework of biosafety in India.
- Describe in detail Eutrophication.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
ELECTRONICS (Special Paper - XV)  
Electronics Instrumentation (22221675)**

Day & Date: Friday, 31-10-2025  
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) Multiple Choice Question.****10**

- 1) The IC AD620 has \_\_\_\_\_ pins.
 

|       |       |
|-------|-------|
| a) 10 | b) 16 |
| c) 6  | d) 8  |
- 2) In a 4-20 mA loop, \_\_\_\_\_ the 4 mA represent.
 

|                          |                             |
|--------------------------|-----------------------------|
| a) Maximum sensor signal | b) Zero signal or live zero |
| c) Fault condition       | d) Full-scale signal        |
- 3) \_\_\_\_\_ can reduce electromagnetic interference in sensitive circuits.
 

|                                   |
|-----------------------------------|
| a) Using long unshielded wires    |
| b) Increasing circuit impedance   |
| c) Proper grounding and shielding |
| d) Reducing capacitance           |
- 4) \_\_\_\_\_ is the main function of a Data Acquisition System (DAS).
 

|                                                             |
|-------------------------------------------------------------|
| a) Store data manually                                      |
| b) Display analog signals                                   |
| c) Collect, process, and store data from physical phenomena |
| d) Reduce power consumption                                 |
- 5) The signal conditioning systems are required to perform \_\_\_\_\_ process in all the measurement devices.
 

|                   |                  |
|-------------------|------------------|
| a) Linear         | b) non-linear    |
| c) both a) and b) | d) None of these |
- 6) In X-Y recorders, the self-balancing potentiometers plot emf as a function of \_\_\_\_\_.
 

|                |              |
|----------------|--------------|
| a) Another emf | b) Frequency |
| c) Time        | d) Pressure  |

- 7) The \_\_\_\_\_ method is employed in magnetic tape recording.
  - a) direct recording
  - b) frequency modulation
  - c) pulse code modulation
  - d) All of these
- 8) In case of DMM, to measure the value of unknown resistance the \_\_\_\_\_ source is utilized.
  - a) constant voltage
  - b) constant current
  - c) variable voltage
  - d) variable current
- 9) The standard glass pH electrode is of \_\_\_\_\_ electrode.
  - a) Potentiometric
  - b) Ampeometric
  - c) Variable capacitive
  - d) Variable inductive
- 10) The signal is stored on a magnetic tape in the form of \_\_\_\_\_.
  - a) Optical pulses
  - b) Mechanical vibrations
  - c) Magnetic flux changes
  - d) Electric charge

**B) One sentence answer.****06**

- 1) Give advantages of Digital storage oscilloscope.
- 2) What is the function of an ADC in a data acquisition system?
- 3) What is the purpose of a multiplexer in data acquisition?
- 4) Why is shielding important in electronic instrumentation?
- 5) Enlist the names of Display unit.
- 6) List out the basic components of a Magnetic recorder.

**Q.2 Solve any Eight of the following.****16**

- a) General block diagram for electronics instrument design for measurement.
- b) What is Recorder?
- c) Draw block diagram of Conductivity meter.
- d) What is Grounding?
- e) What is need of DAS?
- f) Give the salient features of AD 620.
- g) Give the need of Programmable Instrumentation Amplifiers.
- h) What is 4-20mA current transmission?
- i) What is NRZ recording?
- j) Draw the block diagram of AC signal conditioning techniques.

**Q.3 A) Attempt any Two of the following.****10**

- a) Explain X-T Recorder.
- b) Describe Pin description of Precision amplifiers AD594/595.
- c) Explain Instrumentation Amplifier.

**B) Write a note on Compact data logger.****06****Q.4 A) Attempt any Two of the following.****08**

- a) Explain pH meter.
- b) Explain Isolation amplifiers.
- c) Explain Function Generator.

**B)** Explain Digital multimeter. **08**

**Q.5 Attempt any Two of the following.** **16**

- a)** Explain principle and working of LCR Q Meter with Block diagram.
- b)** Explain principle and working of Analog CRO with Block diagram.
- c)** Explain Multi channel DAS.

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**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
COMPUTER SCIENCE (Special Paper - XV)  
ASP.Net Core MVC (22221667)**

Day & Date: Friday, 31-10-2025  
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.

**Q.1 A) Multiple Choice Question.****10**

- 1) The starting controller and action in ASP.NET Core MVC are determined in the \_\_\_\_\_ file.
  - a) Program.cs
  - b) RouteConfig.cs
  - c) appsettings.json
  - d) Main.cs
- 2) The \_\_\_\_\_ EF Core class is used to build a model during OnModelCreating().
  - a) ModelDesigner
  - b) DbBuilder
  - c) ModelBuilder
  - d) DbInitializer
- 3) The \_\_\_\_\_ method is commonly used to load related data through navigation properties.
  - a) Find()
  - b) Add()
  - c) FirstOrDefault()
  - d) Include()
- 4) The \_\_\_\_\_ file helps to set environment-specific configuration like Development, Production etc.
  - a) web.config
  - b) launchSettings.json
  - c) global.json
  - d) settings.env
- 5) The main purpose of a ViewComponent in ASP.NET Core MVC is \_\_\_\_\_.
  - a) Load stylesheets
  - b) Replace layout
  - c) Render reusable view logic
  - d) Provide JavaScript files
- 6) In a school application, how would you represent a many-to-many relationship between Students and Courses using Latest EF Core.
  - a) Add a List<Course> in Student and a List<Student> in Course
  - b) Add a separate join table manually
  - c) No navigation properties required
  - d) Use @model directive

- 7) The connection string usually stored in \_\_\_\_\_ file an ASP.NET Core project.
  - a) web.config
  - b) launchSettings.json
  - c) appsettings.json
  - d) Main.cs
- 8) The \_\_\_\_\_ type is returned when using *return Content("Hello World")* in an action method.
  - a) View
  - b) HTML
  - c) JSON
  - d) Plain Text
- 9) The \_\_\_\_\_ method defines a custom route with constraints.
  - a) UseCustomRoute()
  - b) UseRouting()
  - c) MapControllerRoute()
  - d) SetRouteConstraints()
- 10) To create a custom HTML helper method, it must return \_\_\_\_\_.
  - a) HtmlString
  - b) StringBuilder
  - c) HtmlTag
  - d) MvcHtmlString

**B) Fill in the blanks.****06**

- 1) The \_\_\_\_\_ is default view engine used in ASP.NET Core MVC.
- 2) The \_\_\_\_\_ class returns an empty response from a controller.
- 3) In an ASP.NET MVC project, the HTML and Razor code for the user interface is typically written in the \_\_\_\_\_ folder.
- 4) The \_\_\_\_\_ attribute allows binding of values from the request header.
- 5) The \_\_\_\_\_ Strongly Typed HTML Helpers is used to generate a drop-down list in a form.
- 6) By default, sessions are stored at \_\_\_\_\_.

**Q.2 Solve any Eight of the following.****16**

- a) What is Strongly Typed HTML Helpers? Give example.
- b) What are data annotations? Give example of all Display and Formatting Attributes.
- c) Which packages are required to generate PDF? Give steps to generate PDF.
- d) What is Database First Approach? Write command used in this approach.
- e) What is use of Compare annotations? Where it is used? Give example.
- f) What is seeding? Why it is important?
- g) What are differences between ViewData and TempData?
- h) What is ViewModel? When ViewModel is used?
- i) What is dependency injection?
- j) What is partial view?

**Q.3 A) Attempt any Two of the following.****10**

- a) What are different ways to Generate a Link? Explain with example.
- b) What is DbContext Class? Explain responsibilities of the DbContext class with how to create and use a DbContext class.

- c) What are different types of relationship used in ASP.Net core MVC? Explain Mant-To-Many and self-reference relationship with example.

**B)** Why use Tag Helpers Instead of HTML Helpers? Explain how to create custom Tag helper with example. **06**

**Q.4 A) Attempt any Two of the following. 08**

a) What is use of Validation Helpers? Explain all Validation Helpers with examples.

b) What are features of Entity Framework Core? Explain in detail.

c) Explain view component with example.

**B)** Write down code for import and export the Employee model in Excel format. **08**

**Q.5 Solve any Two of the following. 16**

a) What is cookies? Explain with example how to read, write and delete cookies?

b) Explain NET Core Project File Structure in detail.

c) Create web application which demonstrate all types of status result and content result.



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**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
PHYSICS (Special Paper - XVI)  
Electronics (22221620)**

Day & Date: Saturday, 01-11-2025  
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.  
4) Use of Log table and Calculator is allowed.

**Q.1 A) Multiple Choice Question.**

10

- 1) The input bias current in an ideal OP-AMP is \_\_\_\_\_.
  - a) Zero
  - b) Very small
  - c) Constant
  - d) Infinite
- 2) The output of a Schmitt trigger is typically \_\_\_\_\_.
  - a) continuous
  - b) a square wave
  - c) sinusoidal
  - d) a triangular wave
- 3) \_\_\_\_\_ is used to control the threshold voltage in IC 555 timer.
  - a) Pin 2
  - b) Pin 6
  - c) Pin 3
  - d) Pin 4
- 4) An SCR is a \_\_\_\_\_.
  - a) 3 terminal device
  - b) DC circuit device
  - c) Unidirectional device
  - d) Bidirectional device
- 5) The TRIAC is similar to a \_\_\_\_\_.
  - a) SCR
  - b) Diode
  - c) MOSFET
  - d) BJT
- 6) An LED display is primary used to \_\_\_\_\_.
  - a) Store date
  - b) Emit light for visual display
  - c) Convert digital signals into analog signals
  - d) Regulate current
- 7) The operation of MOSFET is controlled by \_\_\_\_\_.
  - a) Base current
  - b) Gate voltage
  - c) Source current
  - d) Collector current

- 8) LVDs are commonly used in \_\_\_\_\_ applications.
- Electric vehicles
  - home lighting systems
  - Renewable energy systems
  - All of the above
- 9) An inverting amplifier has  $R_2 = 2M\Omega$  and  $R_1 = 2K$ , its gain is \_\_\_\_\_.
- 1000
  - $10^{-3}$
  - 1000
  - $-10^{-3}$
- 10) The SCR is made of \_\_\_\_\_ junctions.
- Four
  - Three
  - Two
  - Five

**B) Solve the following questions.****06**

- The IC 555 timer has how many pins?
- Which type of current can a TRAIC have?
- Write the formula for duty cycle.
- Which gas is commonly used in a Gas Discharge Plasma Display?
- What material is used to construct LED's?
- What is the typical output format of voltage to frequency generator?

**Q.2 Solve the following: (Any Eight)****16**

- Define the term holding current and breakover voltage.
- A square wave signal has a period of 10 ms, and the signal stays for 4 ms during each cycle. What is the duty cycle of the signal?
- Draw the pin connection of IC 555 timer.
- Give the comparison between D- MOSFET and E-MOSFET.
- What are the characteristics of LCD?
- Draw the symbols of diac and traic.
- Distinguish between astable and monostable multivibrator.
- An OP-AMP is used in non-inverting mode with  $R_1 = 1K\Omega$ ,  $R_2 = 22K\Omega$ ,  $V_{CC} = 16V$ , Calculate output voltage for
  - $V_i = 260V$
  - $V_i = 4V$
- What do you understand by Nixie?
- What is timer?

**Q.3 A) Answer the following: (Any Two)****10**

- Explain OP-APM as a Schmitt trigger.
- Write a short on liquid crystal display.
- Explain characteristics of SCR.

**B) Write a short note on characteristics of DMOSFET versus JFET's.****06**

- Q.4 A) Attempt the following. (Any Two) 08**
- a) Explain monostable operation of IC 555 timer.
  - b) Explain the concept of comparator.
  - c) Describe some important applications of a traic.
- B) Explain the following terms. 08**
- a) Input bias current ( $I_B$ )
  - b) CMRR
  - c) PSRR
  - d) Slew rate (SR)
- Q.5 Attempt the following. (Any Two) 16**
- a) Derive an expression for voltage gain of a closed loop non-inverting amplifier using OP-AMP.
  - b) Explain circuit operation of D-MOSEFT.
  - c) Explain with diagram the operation of a seven segment display using gaseous discharge.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
CHEMISTRY (Special Paper - XVI)  
Analytical and Industrial Organic Chemistry (22221616-A)**

Day & Date: Saturday, 01-11-2025  
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 the gas chromatography \_\_\_\_\_ is used as mobile phase.
 

|             |             |
|-------------|-------------|
| a) Methanol | b) Nitrogen |
| c) Hexane   | d) Water    |
- 2) 1,3-Butadiene and styrene on polymerization gives \_\_\_\_\_.
 

|                  |                   |
|------------------|-------------------|
| a) Polyurethane  | b) Bakelite resin |
| c) Buna-N Rubber | d) Buna-S Rubber  |
- 3) The soap molecule having positively charged hydrophilic tail is known as \_\_\_\_\_.
 

|                     |                  |
|---------------------|------------------|
| a) Invert Soap      | b) Anionic Soap  |
| c) Amphoteric Soaps | d) Neutral Soaps |
- 4) Green Chemistry is set to achieve \_\_\_\_\_ principles.
 

|       |       |
|-------|-------|
| a) 10 | b) 12 |
| c) 6  | d) 8  |
- 5) The polymers which on stretching undergo elongation and regain its original shape when force is removed are known as \_\_\_\_\_.
 

|                  |                  |
|------------------|------------------|
| a) Elastomers    | b) Thermoplastic |
| c) Thermosetting | d) None of these |
- 6) \_\_\_\_\_ is used in Dental Caries and in Cosmetics.
 

|             |                  |
|-------------|------------------|
| a) Teepol   | b) Igepon-I      |
| c) Deriphat | d) Turkeyred oil |
- 7) In phase transfer catalysis generally \_\_\_\_\_ salt is used.
 

|                                 |
|---------------------------------|
| a) Quaternary ammonium salt     |
| b) NaCN                         |
| c) $(\text{NH}_4)_2\text{SO}_4$ |
| d) NaCl                         |

- 8) Vulcanization is carried by heating raw rubber with \_\_\_\_\_.
  - a) Phosphorous
  - b) Sulphur
  - c) Carbon
  - d) Nitrogen
- 9) In production of ethanol on industrial scale fermentation is brought about by \_\_\_\_\_.
  - a) Bacillus bacteria
  - b) Yeast
  - c)  $\text{NaHCO}_3$
  - d) Soda ash
- 10) The Silica gel is used in column chromatography as \_\_\_\_\_.
  - a) Eluent
  - b) Adsorbent
  - c) Column support
  - d) Mobile phase

**B) Fill in the blank/Definition/One sentence answer/ One word answer.**

06

- 1) \_\_\_\_\_ is the monomer of natural rubber.
- 2) \_\_\_\_\_ is the general formula of toilet soap.
- 3) Sodium hyposulphite is used as \_\_\_\_\_ in soap.
- 4) \_\_\_\_\_ have emerged as non-volatile, polar, stable ionic solvents in recent time.
- 5) In column chromatography, \_\_\_\_\_ is used as a mobile phase.
- 6)  $\text{SeO}_2$  is \_\_\_\_\_ type of reagent.

**Q.2 Solve any Eight of the following.**

16

- a) What are ionic liquids? Give two examples.
- b) Define the terms.
  - i) Rectified spirit
  - ii) Absolute alcohol
- c) What is meant by  $R_f$  Value? Mention Factors affecting  $R_f$  value of solute.
- d) What is addition polymerization? Give its types.
- e) Write synthesis and uses of polyvinyl chloride
- f) What are soaps? Give different types of soap.
- g) Write the product of given by the reaction of  $\text{LiAlH}_4$  on crotonaldehyde and 2-nitro propane.
- h) Write any two synthetic applications of selenium dioxide.
- i) What is molasses approximately how much sugar is present in it?
- j) Explain any four principles of green chemistry.

**Q.3 A) Attempt any Two of the following.**

10

- Define polymers; explain in detail classification of polymers based on  
i) Origin ii) composition
- Write a note on phase transfer catalysis.
- Distinguish (Compare) Soaps & Detergents.

**B)** What is chromatography? Give its principle for the separation and discuss experimental technique of Thin Layer Chromatography.

06

- Q.4 A) Attempt any Two of the following. 08**
- a) Give Synthesis and uses of BuNA-n rubber.
  - b) Write a note on raw materials used in soap industry.
  - c) What is fermentation? What are major and by products of alcohol and sugar industry?
- B) What are different type of polymerization? Explain different steps involved in radical addition polymerization. Give synthesis and uses of polystyrene. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Discuss various steps involved in refining of sugar.
  - b) What is gas chromatography? Give its principle, working and instrumentation. Mention its applications.
  - c) What is saponification? Write general reaction for saponification. Explain in detail manufacture of soap by hot or boiled process.

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Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
CHEMISTRY (Special Paper - XVI)  
Applied Organic Chemistry (22221616-B)**

Day & Date: Saturday, 01-11-2025  
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

- Green Chemistry has \_\_\_\_\_ principles.
  - Thirteen
  - Twelve
  - Fourteen
  - Fifteen
- The salts with melting point less than 100 °C are called \_\_\_\_\_.
  - Ionic Solids
  - Noble Gases
  - Ionic Liquids
  - Eutectic Solvents
- Acid compounds are detected with \_\_\_\_\_ reagent.
  - NaOH
  - Sat. NaHCO<sub>3</sub>
  - Sat. Na<sub>2</sub>CO<sub>3</sub>
  - 1:1 HCl
- \_\_\_\_\_ is the main ingredient of talcum powder.
  - Magnesium silicate
  - Asbestos
  - Ferric chloride
  - Aluminium chloride
- The alcohols present in sandalwood oil are \_\_\_\_\_.
  - Eugenols
  - Catechols
  - Santalols
  - Pyrogallols
- \_\_\_\_\_ is the first discovered antibiotic.
  - Penicillin
  - Amoxicillin
  - Streptomycin
  - Chloramphenicol
- Cellulose fibers contain \_\_\_\_\_ groups.
  - Acid
  - Amino
  - Hydroxy
  - Ester
- Eucalyptus oil contains \_\_\_\_\_.
  - Santalol
  - Eugenol
  - Eucalyptol
  - Carvacrol

- 9) \_\_\_\_\_ is the main compound present in permanent hair dye.
- a) p-amino benzoic acid                      b) o-salicylaldehyde  
c) p-phenylene diamine                      d) EDTA
- 10) Antioxidants are used in lipstick to avoid \_\_\_\_\_ of oils.
- a) Acidity                                              b) Basicity  
c) Rancidity                                              d) Plasticity

**B) Fill in the blank.****06**

- 1) \_\_\_\_\_ is the oxidising agent commonly used in permanent hair dyes.
- 2) Phenols are soluble in \_\_\_\_\_.
- 3) Beyond catalysis, zeolites are used in \_\_\_\_\_.
- 4) The carcinogen sometimes found in talcum powder is \_\_\_\_\_.
- 5) The chemical name of vitamin B12 is \_\_\_\_\_.
- 6) \_\_\_\_\_ is a natural vat dye imparted as its water soluble leucobase.

**Q.2 Solve any Eight of the following. (Any Eight)****16**

- a) Write any two principles of Green chemistry.
- b) Mention only names of two surfactants used in shampoo.
- c) Write the reactions involved in detection of acid compound.
- d) Write names of any two examples of artificial flavours.
- e) Write the structure of vitamin B12.
- f) Write the names of any two sizing ingredients.
- g) Give any two uses of sandalwood oil.
- h) Give preparation of 2-phenyl ethanol.
- i) Write any two uses of Suntan lotions.
- j) Draw the structure of eugenol.

**Q.3 A) Attempt of the following. (Any Two)****10**

- a) How will you separate acid + neutral binary mixture? Explain with reactions.
- b) Write a short note on ultrasound assisted reactions.
- c) Give preparation of shampoo and shaving creams.

**B) Explain industrial importance of rose oil and sandalwood oil.****06****Q.4 A) Attempt any Two of the following. (Any Two)****08**

- a) Explain applications of zeolites as catalyst and ionic liquids as reaction medium.
- b) Give any two uses of each
- i) talcum powder
- ii) lipstick
- c) Give any two uses of each
- i) jasmine
- ii) civetone

**B) Explain aerobic and anaerobic fermentation processes.****08**



**Q.5 Attempt of the following. (Any Two)**

**16**

- a)** Explain separation of mixture using aqueous medium and ether.
- b)** Give preparation and uses of hair dye and hair sprays.
- c)** Write preparation and uses of eugenol and geraniol.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
BOTANY (Special Paper - XVI)  
Nursery, Gardening and Horticulture (22221608-A)**

Day & Date: Saturday, 01-11-2025  
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) Leading flower producing state is \_\_\_\_\_.  
 a) Tamil Nadu                      b) Kerala  
 c) Andhra Pradesh                  d) Karnataka
- 2) \_\_\_\_\_ among the given cities is known as Garden city.  
 a) Bangaluru                      b) Delhi  
 c) Pune                              d) Chennai
- 3) Mulberry cultivation is referred as \_\_\_\_\_.  
 a) Apiculture                      b) Sericulture  
 c) Mori-culture                      d) Sylviculture
- 4) During the germination of seeds, the seed coat ruptures due to \_\_\_\_\_.  
 a) Massive imbibition of water  
 b) Differentiation of cotyledons  
 c) A sudden increase in cell division  
 d) Massive glycolysis
- 5) The proteinaceous part of maize endosperm is \_\_\_\_\_.  
 a) Peripheral layer                  b) Scutellum  
 c) Apophysis                      d) Aleurone layer
- 6) Seed dormancy allows the plants to \_\_\_\_\_.  
 a) Develop healthy seeds  
 b) Reduce viability  
 c) Overcome unfavourable climatic conditions  
 d) Prevent deterioration of seeds
- 7) \_\_\_\_\_ of these compounds can induce seed dormancy.  
 a) Potassium nitrate                  b) ABA  
 c) Gibberellins                      d) Ethylene

- 8) Root suckers are \_\_\_\_\_.
  - a) Insects that suck nutrients from the roots of plants
  - b) Shoots that arise from roots to form new plant
  - c) New plant parts that arise from the branches of fruit trees
  - d) Roots of neighbouring plants that share water with another plant
- 9) The following is not a plant growth regulator \_\_\_\_\_.
  - a) Acetic acid
  - b) Auxins
  - c) Gibberellins
  - d) Ethylene
- 10) A common example of stem tuber is \_\_\_\_\_.
  - a) Ginger
  - b) Garlic
  - c) Onion
  - d) Potato

**B) Answer the following: One sentence only.**

06

- 1) Enlist any three plant species suitable for bonsai.
- 2) Enlist any three monocot seeds.
- 3) Enlist types of gardening.
- 4) Write down the names of any two cut flowers.
- 5) What is nursery?
- 6) Enlist any three dicot seeds.

**Q.2 Solve any Eight of the following.**

16

- Define biopesticide.
- What is gardening?
- What is mean by landscaping?
- Define budding.
- Define grafting.
- Define cut flowers.
- Define seed.
- Define weed.
- What is bonsai?
- Enlist types of simple fruits.

**Q.3 A) Write a short note on any Two of the following.**

10

- Scope of Bonsai art
- 'T' budding
- Seed certification

**B)** Explain in brief applications computer in landscaping.

06

**Q.4 A) Attempt any Two of the following.**

08

- Explain in brief scope of nursery.
- Explain in brief biopesticides & its applications.
- Explain in brief significance of vegetative reproduction.

- B) Answer the following.** **08**
- a) Comment upon need of weed control
  - b) Comment upon seed banks

- Q.5 Attempt any Two of the following.** **16**
- a) Explain in detail vegetative method of propagation - Layering & its type.
  - b) Explain in detail importance of flower shows and exhibitions.
  - c) Explain in detail seed dormancy with respect to causes and methods of breaking dormancy.

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**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
BOTANY (Special Paper - XVI)  
Biostatistics (22221608-B)**

Day & Date: Saturday, 01-11-2025  
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) A \_\_\_\_\_ t-test is used to compare a single sample.
 

|                 |                |
|-----------------|----------------|
| a) three sample | b) two sample  |
| c) one sample   | d) five sample |
  
- 2) \_\_\_\_\_ numeric variable are ones that can take only a certain set of value.
 

|             |               |
|-------------|---------------|
| a) Discrete | b) Continuous |
| c) Nominal  | d) Ordinal    |
  
- 3) The examples of continuous distributed numeric variable are \_\_\_\_\_.
 

|                      |                 |
|----------------------|-----------------|
| a) Body mass         | b) Height       |
| c) Cholesterol level | d) All of these |
  
- 4) A \_\_\_\_\_ is most commonly applied when the test statistic would follow a normal distribution.
 

|                    |                  |
|--------------------|------------------|
| a) chi square test | b) t-test        |
| c) z-test          | d) none of these |
  
- 5) In null hypothesis there is no difference between 110:90 and Mendel's monohybrid ratio \_\_\_\_\_.
 

|            |          |
|------------|----------|
| a) 9:3:3:1 | b) 9:3:4 |
| c) 13:3    | d) 9:7   |
  
- 6) A statistical method is treated as a branch of science which deals with \_\_\_\_\_.
 

|                                        |
|----------------------------------------|
| a) Collection and presentation of data |
| b) Analysis                            |
| c) Interpretation of data              |
| d) All the above                       |
  
- 7) A variable taking only particular values is called as \_\_\_\_\_.
 

|                      |               |
|----------------------|---------------|
| a) Variable discrete | b) Continuous |
| c) Nominal           | d) Ordinal    |

- 8) Speed of a vehicle is an example of \_\_\_\_\_.  
 a) Discrete variable                      b) Continuous  
 c) Nominal                                      d) Ordinal
- 9) Primary data means \_\_\_\_\_.  
 a) Original data                              b) It may be result of survey  
 c) It may be result of enquiry              d) All the above
- 10) The Greek letter 'Chi' is written as \_\_\_\_\_ letter.  
 a) X                                              b) Y  
 c) B                                              d) C

**B) Fill in the blanks of the following:****06**

- 1) Secondary data have sources like \_\_\_\_\_.
- 2) In column charts, bars are \_\_\_\_\_.
- 3)  $\bar{x}$  sign is used for \_\_\_\_\_.
- 4) Standard deviation was first worked out by \_\_\_\_\_.
- 5) Median is denoted by \_\_\_\_\_ sign.
- 6) In a throw of coin \_\_\_\_\_ is the probability of getting head.

**Q.2 Solve the following. (Any Eight)****16**

- a) Define data.
- b) What is measurement?
- c) Write the definition of mode.
- d) Give the definition of variables.
- e) Define mean.
- f) Write the definition of range.
- g) Give the definition of mean deviation.
- h) Define Probability.
- i) Give the definition of central tendency.
- j) Write the definition of secondary data.

**Q.3 A) Attempt the following. (Any Two)****10**

- a) Explain the Types of data studied by you.
- b) Give the Limitation studied by you.
- c) Describe the significance of statistical inferences.

**B) Write a Short note of the following.****06**

Student t-test.

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

- a) Explain the chi square test studied by you.
- b) Describe the classification of data.
- c) Give the measures of probability.

**B) Explain the following:****08**

Explain the Merits and Demerits of measure of central tendency.

**Q.5 Attempt the following. (Any Two)**

**16**

- a)** Give the application of probability in biological sciences.
- b)** Describe the Co-efficient of variations.
- c)** Discuss the statistical method of investigation.

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November – 2025  
ZOOLOGY (Special Paper - XVI)  
Applied Zoology (22221628)**

Max. Marks: 80

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

## 10

- 1) In honey bees Drone are \_\_\_\_\_.  
a) Sterile male                      b) Fertile male  
c) Worker bee                        d) Queen
- 2) \_\_\_\_\_ is the term used for breeding of fish in specially constructed tanks and ponds.  
a) Vermiculture                      b) Agriculture  
c) Horticulture                        d) Pisciculture
- 3) \_\_\_\_\_ species produces silk of the superior quality.  
a) Attacus atlas                        b) Bombyx mori  
c) Attacus ricin                         d) Antheraea assamensis
- 4) \_\_\_\_\_ is not the economic importance of fish.  
a) Source of food                      b) Source of water  
c) Good source of vitamins        d) Polishing agent
- 5) The generic name of lac insect is \_\_\_\_\_.  
a) Fish                                  b) Honey bee  
c) Kerria lacca                        d) Prawn
- 6) Honey is \_\_\_\_\_.  
a) Nectar of flower  
b) Nectar store in honey sac  
c) Nectar mix with saliva and Store in honey sac  
d) Nectar and Water sucked by honey bee
- 7) \_\_\_\_\_ is the common transgenic animal.  
a) Pig                                    b) Fox  
c) Crow                                 d) Hyena
- 8) Silk fiber obtained from \_\_\_\_\_.  
a) Sheep                                b) Cotton ball  
c) Cocoon                               d) Jute stalk



9) \_\_\_\_\_ is given major importance in dairy farm management.

- a) Increase in yield and quality of milk
- b) Increase in the number of cattle
- c) Increase in the number of cows
- d) Increase in the number of buffaloes

10) Cod liver oil is rich in \_\_\_\_\_.

- a) Vitamin A and D
- b) Vitamin B and C
- c) Vitamin B and E
- d) Vitamin E and K

**B) Give answer in One sentence.**

**06**

- 1) Which insect is used in lac culture?
- 2) What is mean by poultry?
- 3) What are the common dairy animals?
- 4) What is fish culture?
- 5) Which country is largest producer of silk?
- 6) Which bee is called Indian bee?

**Q.2 Solve the following. (Any Eight)**

**16**

- a) Describe diseases of cattle.
- b) State the medicinal value of honey.
- c) Life cycle of lac insect.
- d) Milk products.
- e) Rearing methods of poultry.
- f) Natural enemies of honey bee.
- g) Prawn culture.
- h) State the law and regulation fishery.
- i) Breeding ponds.

**Q.3 A) Attempt the following. (Any Two)**

**10**

- a) Describe the types of preservation of fish.
- b) Describe different types of diseases of silkworm.
- c) Describe the rearing method of poultry.

**B) Explain byproducts of fish.**

**06**

**Q.4 A) Attempt the following. (Any Two)**

**08**

- a) Give an account of transgenic animals and its significance.
- b) Explain natural enemies of silkworm and their control.
- c) Describe the importance of bee colonies in crop pollination.

**B) Explain the different types of method in beekeeping.**

**08**

**Q.5 Attempt the following. (Any Two)**

**16**

- a) Explain types of fishing crafts and gears.
- b) Describe the lac culture.
- c) Describe the poultry breed.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
MATHEMATICS (Special Paper - XVI)  
Graph Theory (22221640-A)**

Day &amp; Date: Saturday, 01-11-2025

Max. Marks: 80

Time: 12:00 PM To 03:00 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.

**Q.1 A) Select the correct alternative. 10**

- 1) In pseudo graph \_\_\_\_\_ are allowed.
  - a) only loops
  - b) only multiple edges
  - c) both loops and multiple edges
  - d) None of these
- 2) If  $G$  has  $n$  vertices and is regular of degree  $r$  then  $G$  has \_\_\_\_\_ edges.
 

|                    |                   |
|--------------------|-------------------|
| a) $\frac{r}{n}$   | b) $\frac{n}{2}$  |
| c) $\frac{r+n}{2}$ | d) $\frac{rn}{2}$ |
- 3) A vertex with zero out degree is called as \_\_\_\_\_.
 

|                   |                  |
|-------------------|------------------|
| a) source         | b) sink          |
| c) initial vertex | d) None of these |
- 4) Repeated vertex is not allowed in \_\_\_\_\_.
 

|            |          |
|------------|----------|
| a) Walk    | b) Trail |
| c) Circuit | d) Path  |
- 5) Sum of degrees of the vertices in undirected graph is \_\_\_\_\_.
 

|          |                  |
|----------|------------------|
| a) Even  | b) Odd           |
| c) Prime | d) None of these |
- 6) 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 of the vertices |
| c) No vertices       | d) None of these                |

- 7) A tree with \_\_\_\_\_ vertex is called trivial tree.  
a) one                                      b) two  
c) three                                    d) four
- 8) Every tree is \_\_\_\_\_ graph.  
a) Simple                                  b) Multi  
c) Pseudo                                 d) All of these
- 9) The hexa decimal number  $25F7_{(16)}$  is equivalent to decimal number \_\_\_\_\_.  
a) 9719                                    b) 9791  
c) 9971                                    d) 7991
- 10) The binary number  $1010101111_2$  is equivalent to octal number \_\_\_\_\_.  
a) 2537                                    b) 2357  
c) 2735                                    d) 2573

**B) Fill in the blank.**

06

- 1) A vertex is called pendent if and only if it has degree \_\_\_\_\_.
- 2) Complete graph  $K_n$  is Eulerian if  $n =$  \_\_\_\_\_.
- 3) A tree with 'n' vertices has \_\_\_\_\_ edges.
- 4) In a rooted tree if vertex  $u$  has no children, then  $u$  is called as \_\_\_\_\_.
- 5) Convert  $0.4375_{(10)}$  to octal is \_\_\_\_\_.
- 6) The binary number  $110101_{(2)}$  is equivalent to decimal number \_\_\_\_\_.

**Q.2 Solve any Eight of the following.**

16

- a)** Define complete and regular graph.

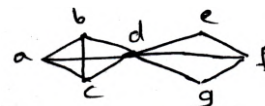


- b)** Find any two subgraph of

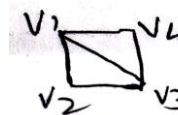
- c)** Draw a graph of chemical molecules methane.

- d) Draw a wheel  $W_4$ .

- e)** Find diameter of graph.



- f) Write Adjacency matrix**



- g)** Find spanning tree of



- h)** Draw binary tree representation of  $(a + b) * (c/d)$

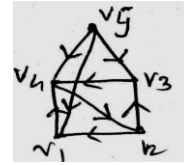
- i) Convert 27. A3C<sub>(16)</sub> to binary.

- j) Convert  $437.4375_{(10)}$  to octal.

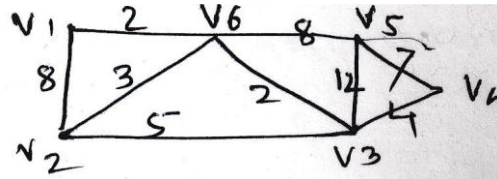
**Q.3 A) Attempt any Two of the following.****10**

- a) Show that the maximum number of edges in simple graph with 'n' vertices is  $\frac{n(n-1)}{2}$

- b) Find in degree and out degree of each vertex



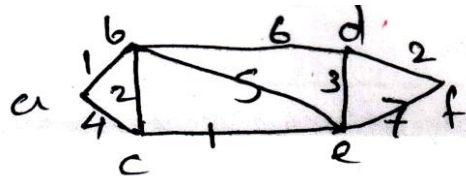
- c) Find the minimal spanning tree of the righted graph using primes algorithm.

**B) Convert****06**

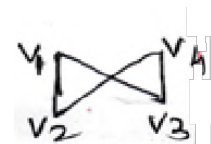
- a)  $39.B8_{(16)}$  to decimal  
b)  $21.673_{(8)}$  to Binary

**Q.4 A) Attempt any two of the following.****08**

- a) Write short note on polish prefix and postfix notation.  
b) Apply Dijkstra's algorithm to find the shortest path between the indicated vertices in the given weighted graph from *a* to *f*



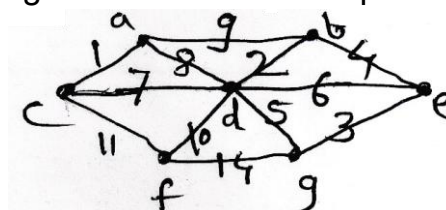
- c) Find number of walk of length 3 from  $V_2$  to  $V_4$

**B) Convert****08**

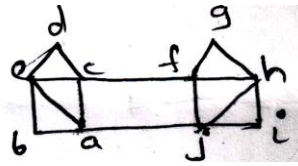
- a)  $33.24_{(8)}$  to binary  
b)  $3D59_{(16)}$  to octal  
c)  $1011010010111_{(2)}$  to Hexadecimal  
d)  $0.78125_{(10)}$  to Hexadecimal

**Q.5 Attempt any two of the following.****16**

- a) By using Kruskal's Algorithm find minimal spanning tree of graph.

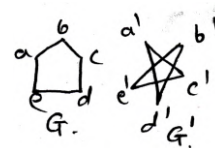


- b) By using Fleury's algorithm find Euler's circuit in graph.

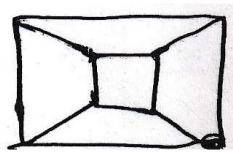


c)

- i) Show that the graphs are isomorphic



- ii) Verify Euler's formula for graph.



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Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
STATISTICS (Special Paper - XVI)  
Quality Management (22221648- A)**

Day & Date: Saturday, 01-11-2025  
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 not a tool used in quality control?
  - a) Control chart
  - b) Pareto chart
  - c) Fishbone diagram
  - d) Balance sheet
- 2) Which of the following is not a characteristic of quality control?
  - a) Prevents defects from occurring
  - b) Focuses on the end product
  - c) Determines the root cause of defects
  - d) Improves the overall process
- 3) Which of the following is not a type of process control chart?
  - a) X-bar chart
  - b) Range chart
  - c) Histogram chart
  - d) P-chart
- 4) What is the purpose of Statistical Process Control (SPC)?
  - a) To prevent defects from occurring
  - b) To identify the root cause of defects
  - c) To improve the overall process
  - d) All of the above
- 5) 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)  $N^*P_a + n^*(1 - P_a)$
- 6) Which of the following is a tool used to quantify the relationship between two variables?
  - a) Scatter diagram
  - b) Control chart
  - c) Pareto chart
  - d) Cause-and-effect diagram

- 7) Which of the following is not a component of the Plan-Do-Check-Act (PDCA) cycle?
  - a) Plan
  - b) Measure
  - c) Check
  - d) Act
- 8) Which of the following is a common tool used in quality control?
  - a) Statistical process control
  - b) Root cause analysis
  - c) Failure mode and effects analysis
  - d) All of the above
- 9) Which charts are particularly more effective for sample size One?
  - a) P-charts
  - b) C-charts
  - c)  $\bar{X}$  & S chart
  - d) CUSUM Chart
- 10) Which of the following is not a step in the Six Sigma DMAIC process?
  - a) Define
  - b) Measure
  - c) Analyze
  - d) Control

**B) Fill in the blanks.****06**

- 1) Control limit is defined as \_\_\_\_\_.
- 2) Average Sample number for single sampling plan is \_\_\_\_\_.
- 3) Deming's philosophy had \_\_\_\_\_ principles.
- 4) Consumer's risk is probability of \_\_\_\_\_.
- 5) DMAIC is often associated with \_\_\_\_\_.
- 6) TQM stands for \_\_\_\_\_.

**Q.2 Solve any Eight of the following.****16**

- a) What is the meaning of quality?
- b) Mention the basic features of TQM?
- c) What is check sheet?
- d) What is meant by "cost of quality"?
- e) What is histogram?
- f) How do obtain frequency curve?
- g) Explain scatter plot or diagram in short.
- h) What are the five phases of six sigma process?
- i) Define sample inspection.
- j) What is ATI?

**Q.3 A) Attempt any Two of the following.****10**

- a) Write a note on magnificent tool of quality- Control Chart.
- b) Define OC curve.
- c) State the control limits of EWMA control chart for monitoring process mean.

- B)** In a single sampling plan if sample size  $n = 10$ , acceptance number  $C = 2$ , and lot quality  $p = 0.08$ , find the probability of accepting the lot by using binomial distribution.

**06**

- Q.4 A) Attempt any Two of the following. 08**
- a) Explain PDCA cycle for continuous improvement.
  - b) Write the procedure of Double Sampling Plan.
  - c) Write a short note on Average Outgoing Quality (AOQ).
- B) Explain Exponential Weighted Moving Average Control Chart (EWMA). 08**
- Q.5 Attempt any Two of the following. 16**
- a) Explain DMAIC Cycle.
  - b) What is the value of upper control limit and lower control limit for the period  $i \leq 3$  for a EWMA chart which has value  $\lambda = 0.10, L = 2.7, \sigma = 1$  and the value of  $\mu_0 = 10$ .
  - c) Explain the algorithm of CUSUM chart.



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Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
STATISTICS (Special Paper - XVI)  
Time Series Analysis and Reliability Theory (22221648-B)**

Day & Date: Saturday, 01-11-2025  
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 moving average method, we cannot find trend values of some \_\_\_\_\_.  
 a) end points                                      b) middle points  
 c) starting and end periods                  d) starting periods
- 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) smooth out 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) Prosperity, Recession, Depression and Recovery in a business is an example of \_\_\_\_\_.
  - a) Irregular variations
  - b) Secular trend
  - c) Cyclical variations
  - d) Seasonal variations
- 8) A fire in a factory delaying production for some weeks is \_\_\_\_\_.
  - a) Irregular variations
  - b) Secular trend
  - c) Cyclical variations
  - d) Seasonal variations
- 9) Seasonal variations are \_\_\_\_\_.
  - a) short term variation
  - b) long term variation
  - c) sudden variation
  - d) None of the above
- 10) Secular trend in time series is of nature \_\_\_\_\_.
  - a) Increasing
  - b) Decreasing
  - c) Stagnant
  - d) All the above

**B) Fill in the blanks.****06**

- 1) In time series values are arranged in \_\_\_\_\_ order.
- 2) In time series additive model gives  $Y = \underline{\hspace{2cm}}$ .
- 3) In time series multiplicative model gives  $Y = \underline{\hspace{2cm}}$ .
- 4) Increase sales due to Diwali is due to \_\_\_\_\_ component time series.
- 5) Ratio to moving average method is used to estimate \_\_\_\_\_ component.
- 6) The link relative is defined as \_\_\_\_\_.

**Q.2 Define any Eight of the following.****16**

- a) Trend
- b) Define 'time series' and give illustrations of time series from various fields.
- c) Write the difference between seasonal variations and cyclical variations.
- d) Write four components of time series.
- e) Write note on irregular variations.
- f) What do you mean by stationarity?
- g) Define autocorrelation function.
- h) Explain the term 'season'.
- i) Describe the term 'Business cycle'.

**Q.3 A) Attempt any Two of the following.****10**

- a) Describe the moving average method.
- b) Discuss the importance and utility of time series analysis in various fields.
- c) Describe the procedure of Run test.

**B)** Describe the procedure of curve fitting least square method. **06**

**Q.4 A) Attempt any Two of the following.** **08**

- a) Describe the procedure of single exponential smoothing.
- b) Explain how to fit AR (1) model.
- c) Explain progressive 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 simple average method assuming that trend is absent.

| Year        | Quarters No. |    |     |    |
|-------------|--------------|----|-----|----|
|             | I            | II | III | IV |
| <b>2017</b> | 37           | 41 | 33  | 35 |
| <b>2018</b> | 37           | 39 | 36  | 36 |
| <b>2019</b> | 40           | 41 | 33  | 31 |
| <b>2020</b> | 33           | 44 | 40  | 40 |

- b) Describe the procedure of link relative method.
- c) Describe the procedure of 'double exponential smoothing'.

Set P

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November – 2025  
GEOLOGY (Special Paper - XVI)  
Geochemistry (22221652)**

Day & Date: Saturday, 01-11-2025  
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**

- Elements are those of the B subgroup whose ions have 18-electron in the outer shell are: \_\_\_\_\_.
  - Siderophile
  - Chalcophile
  - Lithophile
  - Atmosphere
- The meteorites consist of average 50% metal and 50% silicate are \_\_\_\_\_.
  - Siderites
  - Siderolites
  - Aerolites
  - Tektites
- Quartz and Tridymite are the example of: \_\_\_\_\_.
  - Polymorphism
  - Isomorphism
  - Diadochy
  - None of these
- Uranium-238 decays to which of the following daughter isotopes?
  - Rubidium-87
  - Uranium-235
  - Lead-206
  - Nitrogen-14
- Which one of the following aerolites are \_\_\_\_\_.
  - Iron meteorites
  - Iron-stony meteorites
  - Stony meteorites
  - Metallic meteorites
- An emulsion is a colloidal solution of a \_\_\_\_\_ dispersed in another liquid.
  - Solid
  - Liquid
  - Gas
  - Medium
- \_\_\_\_\_ isotopes have proven to be a particular useful tracer to indicate whether magma that formed an igneous rock originated in the crust or the mantle.
  - Strontium
  - Lead
  - Neodymium
  - All the above

- 8) Who introduced the Geochemical classification of the elements?
  - a) Goldschmidt (1923)
  - b) Clarke (1924)
  - c) Ringwood (1975)
  - d) Cameron (1737)
- 9) Which of the minor element is admitted by potassium minerals?
  - a) Strontium
  - b) Barium
  - c) Lead
  - d) Rubidium
- 10) The type of chemical bond that forms when atoms give away or take electrons is called as \_\_\_\_\_.
  - a) Molecular bond
  - b) Covalent bond
  - c) Ionic bond
  - d) Compound bond

**B) Fill in the blanks.****06**

- 1) In cosmic abundance of the elements, which element shows abundance peak at atomic number 26?
- 2) In meteorite, the metal phase is discontinuous and the silicates are mainly plagioclase feldspar and pyroxene sometimes with accessory olivine is \_\_\_\_\_.
- 3) Meteorites showing Widmanstätten structure are known as \_\_\_\_\_.
- 4) When minor element has a similar ionic radius but a higher charge than that of a major element, it is said to be \_\_\_\_\_ by the crystal lattice containing the major elements.
- 5) According to Clarke (1971), \_\_\_\_\_ is the most abundant sedimentary rocks in average composition of crust.
- 6) Which method is used for dating relatively recent geological event?

**Q.2 Solve the following. (Any Eight)****16**

- a) List the four atmophile elements of geochemical classification.
- b) Name any four stable isotopes of oxygen.
- c) Define Camouflaged.
- d) List the kinds of solid solution substitution.
- e) Give the any two examples of polymorphs.
- f) Define the term Adsorption
- g) Give the two examples of Ionic bonding.
- h) Name any two examples of aerosol.
- i) List the four most abundant elements in average composition of crust.
- j) Name the lighter planets of the Solar system.

**Q.3 A) Attempt the following. (Any Two)****10**

- a) Write note on Siderolite type of meteorite.
- b) Discuss in detail the geological applications of Isotopes.
- c) Describe in brief cosmic abundance of elements with suitable diagram.

**B) Write short note on geochemical cycle with suitable diagram.****06**

- Q.4 A) Attempt the following. (Any Two) 08**
- a) Define colloids. Explain in types of colloids with suitable example.
  - b) Discuss in short the average chemical composition of igneous rocks.
  - c) Explain the carbon dating method in detail.

- B) Describe the types of chemical bonding with coordination number. 08**

- Q.5 Attempt the following. (Any Two) 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.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November – 2025  
MICROBIOLOGY (Special Paper - XVI)  
Medical Microbiology (22221664-A)**

Day & Date: Saturday, 01-11-2025  
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 first step in microbial infection is \_\_\_\_\_.  
 a) Toxin production                      b) Invasion  
 c) Adhesion                                d) Colonization
- 2) Which bacterium is acid-fast?  
 a) Staphylococcus aureus              b) Mycobacterium tuberculosis  
 c) Vibrio cholera                          d) Pseudomonas aeruginosa
- 3) Yellow fever is caused by a: \_\_\_\_\_.  
 a) Bacterium                                b) Fungus  
 c) Virus                                        d) Rickettsia
- 4) Live attenuated vaccines are: \_\_\_\_\_.  
 a) Safer than toxoids  
 b) Heat-inactivated  
 c) Weakened forms of pathogens  
 d) DNA fragments
- 5) Which of the following inhibits cell wall synthesis?  
 a) Streptomycin                          b) Chloramphenicol  
 c) Penicillin                                d) Rifampicin
- 6) Mechanism of action of AZT is: \_\_\_\_\_.  
 a) Protein synthesis inhibition  
 b) Reverse transcriptase inhibition  
 c) Cell wall synthesis inhibition  
 d) DNA replication inhibition
- 7) Which test measures MIC for antibiotics?  
 a) Gram staining                          b) Broth dilution  
 c) ELISA                                      d) Latex agglutination





**Q.5 Attempt the following. (Any Two)**

**16**

- a)** Describe broth dilution and diffusion methods with significance.
- b)** Write a detailed note on chemotherapeutic agents acting on protein synthesis.
- c)** Discuss the characters, pathogenesis, diagnosis, symptoms, prophylaxis and treatment of *Pseudomonas aeruginosa*.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November – 2025  
MICROBIOLOGY (Special Paper - XVI)  
Clinical Microbiology (22221664-B)**

Day & Date: Saturday, 01-11-2025  
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 question.****10**

- 1) The first step in microbial infection is \_\_\_\_\_.  
 a) Toxin production                      b) Invasion  
 c) Adhesion                                  d) Colonization
- 2) Which method is primarily used for the disposal of sharps like needles?  
 a) Composting  
 b) Microwaving  
 c) Autoclaving and shredding  
 d) Open burning
- 3) Yellow fever is caused by a: \_\_\_\_\_.  
 a) Bacterium                                  b) Fungus  
 c) Virus                                          d) Rickettsia
- 4) The Gram stain technique is an example of \_\_\_\_\_ diagnostic method.  
 a) Cultural                                      b) Biochemical  
 c) Morphological                              d) Serological
- 5) Which of the following inhibits cell wall synthesis?  
 a) Streptomycin                              b) Chloramphenicol  
 c) Penicillin                                    d) Rifampicin
- 6) Incineration is mainly used for the disposal of: \_\_\_\_\_.  
 a) Recyclable plastics  
 b) Infectious waste and pathological waste  
 c) Glassware  
 d) Sharp metallic instruments
- 7) Which test measures MIC for antibiotics?  
 a) Gram staining                              b) Broth dilution  
 c) ELISA                                          d) Latex agglutination

- 8) Mucormycosis is caused by: \_\_\_\_\_.  
a) Candida                      b) Mucor  
c) Aspergillus                d) Histoplasma
- 9) Which of the following is used against malaria?  
a) Amphotericin B            b) Tinidazole  
c) Chloroquine                d) Nystatin
- 10) Antibiotic resistance occurs due to: \_\_\_\_\_.  
a) Viral interference          b) Mutation and gene transfer  
c) Immunization              d) Antigenic shift

**B) Fill in the blank/Definition.**

06

- 1) In biomedical waste management, \_\_\_\_\_ color bag is typically used for disposing of infectious waste.
- 2) *Pseudomonas aeruginosa* is commonly associated with \_\_\_\_\_.
- 3) A positive coagulase test is a major diagnostic feature of \_\_\_\_\_ organism.
- 4) \_\_\_\_\_ is a toxic proteinaceous substance secreted by bacteria.
- 5) *Plasmodium* is transmitted by \_\_\_\_\_.
- 6) \_\_\_\_\_ chemotherapeutic agent disrupts folic acid synthesis.

**Q.2 Solve the following. (Any Eight)**

16

- a) Define pathogenicity.
- b) List two examples of bacterial toxins.
- c) What are etiological agents?
- d) Name two antibiotics that inhibit protein synthesis.
- e) What is a clinical specimen?
- f) What is the mechanism of action of sulfonamides?
- g) Define Gas gangrene.
- h) Define Virulence.
- i) Define Antibiotic and give two examples.
- j) Define Nosocomial Infections.

**Q.3 A) Attempt the following. (Any Two)**

10

- Describe the pathogenicity mechanism of viral infections.
- Differentiate between exotoxins and endotoxins.
- Describe in short diagnosis and treatment of Mucormycosis.

**B) Describe in detail the pathogenesis, diagnosis, and treatment of malaria.**

06

**Q.4 A) Attempt the following. (Any Two)**

08

- Define biomedical waste and explain in short types of biomedical waste.
- Explain the characteristics of an ideal chemotherapeutic agent.
- Discuss the mechanism of action of antifungal agents.

**B) Describe different mechanisms of antibiotic resistance with examples. 08**

**Q.5 Attempt the following. (Any Two)**

**16**

- a) Describe broth dilution and diffusion methods with significance.
- b) Write a detailed note on chemotherapeutic agents acting on protein synthesis.
- c) Discuss the characters, pathogenesis, diagnosis, symptoms, prophylaxis and treatment of *Vibrio cholerae*.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November – 2025  
MICROBIOLOGY (Special Paper - XVI)  
Health Microbiology (22221664 - C)**

Day & Date: Saturday, 01-11-2025  
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 question.****10**

- 1) Live attenuated vaccines are made by \_\_\_\_\_.  
 a) Killing the pathogen                      b) Weakening the pathogen  
 c) Using toxins                                  d) Using DNA fragments
- 2) The basic principle of microbial adhesion involves \_\_\_\_\_.  
 a) Capsule production  
 b) Pili and fimbriae attachment  
 c) Enzyme secretion  
 d) Toxin production
- 3) The etiological agent of cholera is \_\_\_\_\_.  
 a) *Vibrio cholerae*                              b) *Salmonella typhi*  
 c) *Clostridium tetani*                           d) *Staphylococcus aureus*
- 4) Remdesivir is used against \_\_\_\_\_.  
 a) Bacterial infections                      b) Fungal infections  
 c) Viral infections                              d) Protozoal infections
- 5) Mechanism of antibiotic resistance includes \_\_\_\_\_.  
 a) Enzyme production                      b) Reduced permeability  
 c) Efflux pumps                                  d) All of the above
- 6) Characteristics of an ideal chemotherapeutic agent include \_\_\_\_\_.  
 a) Broad-spectrum activity                      b) Low toxicity to host  
 c) High stability                                  d) All of the above
- 7) Streptomycin acts on \_\_\_\_\_.  
 a) Cell wall synthesis                      b) Protein synthesis  
 c) DNA replication                              d) Membrane disruption
- 8) Mucormycosis is caused by: \_\_\_\_\_.  
 a) *Candida*                                          b) *Mucor*  
 c) *Aspergillus*                                      d) *Histoplasma*

- 9) \_\_\_\_\_ of the following is used against malaria.
- |                   |               |
|-------------------|---------------|
| a) Amphotericin B | b) Tinidazole |
| c) Chloroquine    | d) Nystatin   |
- 10) Amphotericin B is an \_\_\_\_\_.
- |                    |                       |
|--------------------|-----------------------|
| a) Antiviral drug  | b) Antibacterial drug |
| c) Antifungal drug | d) Antiprotozoal drug |

**B) Fill in the blank/Definition.****06**

- 1) The diagnostic stain used for acid-fast bacteria is \_\_\_\_\_.
- 2) *Pseudomonas aeruginosa* is commonly associated with \_\_\_\_\_.
- 3) Vaccines made using genetic engineering are called \_\_\_\_\_.
- 4) \_\_\_\_\_ is the mechanism where microbes stick to host cells.
- 5) *Clostridium perfringens* produces \_\_\_\_\_ toxin causing gas gangrene.
- 6) \_\_\_\_\_ method measures antibiotic susceptibility by measuring inhibition zones.

**Q.2 Solve the following. (Any Eight)****16**

- a) Define pathogenicity.
- b) List two examples of bacterial toxins.
- c) What are toxoids?
- d) Name two antibiotics that inhibit protein synthesis.
- e) What is a subunit vaccine?
- f) What is the mechanism of action of sulfonamides?
- g) Define Gas gangrene.
- h) Define Virulence.
- i) Define Antibiotic and give two examples.
- j) Define Nosocomial Infections.

**Q.3 A) Attempt the following. (Any Two)****10**

- a) Describe the mechanism of bacterial invasion.
- b) Differentiate between exotoxins and endotoxins.
- c) Describe in short diagnosis and treatment of Mucormycosis.

**B) Describe in detail the pathogenesis, diagnosis, and treatment of malaria.****06****Q.4 A) Attempt the following. (Any Two)****08**

- a) Discuss advantages and disadvantages of bioweapons.
- b) Explain the characteristics of an ideal chemotherapeutic agent.
- c) Discuss the mechanism of action of antifungal agents.

**B) Describe different mechanisms of antibiotic resistance with examples.** **08**

**Q.5 Attempt the following. (Any Two)**

**16**

- a)** Describe broth dilution and agar diffusion methods with significance.
- b)** Write a detailed note on chemotherapeutic agents acting on protein synthesis.
- c)** Discuss the characters, pathogenesis, diagnosis, symptoms, prophylaxis and treatment of *Mycobacterium Leprae*.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
ELECTRONICS (Special Paper - XVI)  
Virtual Instrumentation (22221680 - A)**

Day & Date: Saturday, 01-11-2025  
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) The \_\_\_\_\_ function assembles a cluster from individual elements and also allows one to replace elements in an existing order.
  - a) Bundle
  - b) Unbundle
  - c) Bundle by name
  - d) Unbundle by name
- 2) Lab VIEW can command plug-in data acquisition devices to generate \_\_\_\_\_ signals.
  - a) analog
  - b) digital
  - c) Both a) and b)
  - d) None of these
- 3) Virtual instrument is composed of a \_\_\_\_\_.
  - a) sensor module
  - b) processing module
  - c) output
  - d) All of these
- 4) Lab VIEW stands for \_\_\_\_\_.
  - a) Laboratory Virtual Instrument Engineering Workbench
  - b) Laboratory Visual Instrument Engineering Workbench
  - c) Laboratory Virtual Instrument Engine Workbench
  - d) Laboratory Virtual Instrument Electronics Workbench
- 5) Quad unsigned integer numbers have \_\_\_\_\_ bits of storage.
  - a) 16
  - b) 32
  - c) 64
  - d) 128
- 6) A bridge circuit uses \_\_\_\_\_ method of measurement.
  - a) relative
  - b) comparison
  - c) absolute
  - d) differential
- 7) \_\_\_\_\_ is the default format for numeric objects.
  - a) Virtual precision
  - b) Single precision
  - c) Double precision
  - d) External precision



- 8) Software Layer Diagram consists \_\_\_\_\_.
  - a) Application software
  - b) Test and Data management software
  - c) Measurement and control software
  - d) All of these
- 9) Unknown capacitance value is obtained by \_\_\_\_\_.
  - a) using a vibration galvanometer
  - b) comparison with standard
  - c) using capacitance of other ratio arms
  - d) using a tuned detector
- 10) A sensor module principally consists of \_\_\_\_\_.
  - a) input
  - b) signal conditioning part
  - c) A/D convertor
  - d) All of these

**B) State True or False.****06**

- 1) Each cluster contains a double component.
- 2) Virtual Instrumentation Software architecture is the lower level of functions in the LabVIEW instrument driver.
- 3) Sizing an array shows the number of elements in the array on front panel.
- 4) The Property Node execute if an error occurs before it executes.
- 5) The Property Node does not execute if an error occurs before it executes.
- 6) True Quad unsigned integer numbers have 128 bits of storage.

**Q.2 Solve any Eight of the following.****16**

- a) Name the three palettes of LabVIEW.
- b) Define Local & Global variables.
- c) Name the different operations of cluster.
- d) Define strings and mention any uses of strings.
- e) Mention any four operations carried on an array.
- f) What is the need of IDE for development of Virtual Instrumentation system?
- g) Define loop.
- h) State the default auto index of FOR and WHILE Loops.
- i) Explain PSPICE.
- j) What is subscript in LabVIEW?

**Q.3 A) Attempt any Two of the following.****10**

- a) Explain advantages of LabVIEW.
- b) Explain the advantages of Virtual Instruments versus Traditional Instruments.
- c) Explain designing of virtual instrumentation using LabVIEW for temperature controlling.

**B) Virtual instrumentation programming techniques of LabVIEW.****06**

- Q.4 A) Attempt any Two of the following. 08**
- a) What is array? Explain array functions in LabVIEW.
  - b) Explain role of different hardware's and software's in VI.
  - c) Explain clusters and its function in detail.
- B) What is DAS? Explain DAS for Measurement of physical parameters with block VI diagram. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Explain formula nodes for virtual instrumentation.
  - b) Explain the steps to creating and saving Sub-VI in LabVIEW.
  - c) Discuss in detail about different structures with examples.
    - i) Case structure
    - ii) Sequence structure
    - iii) Event structure

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**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
ELECTRONICS (Special Paper - XVI)  
Modern Communication Systems (22221680- B)**

Day & Date: Saturday, 01-11-2025  
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 stretching of the light pulse at o/p of fiber is called as \_\_\_\_\_.
  - a) Reflection
  - b) Scattering
  - c) Modal dispersion
  - d) Refraction
- 2) The uplink frequency is \_\_\_\_\_ downlink frequency.
  - a) equal to
  - b) two times
  - c) less than
  - d) greater than
- 3) \_\_\_\_\_ signals are used for satellite communication.
  - a) Microwave
  - b) Light
  - c) IF
  - d) RF
- 4) \_\_\_\_\_ is the principle is used in the working of an optical fiber.
  - a) Dispersion
  - b) Total Internal Reflection
  - c) Refraction
  - d) Diffraction
- 5) The mobile handset consists of \_\_\_\_\_.
  - a) Transmitter
  - b) Logic unit
  - c) Control unit
  - d) All of these
- 6) \_\_\_\_\_ wireless technology is used to exchange data between devices over short distances.
  - a) Bluetooth
  - b) Wi-Fi
  - c) NFC
  - d) Zigbee
- 7) The problem of overcrowding radio spectrum is solved by \_\_\_\_\_ waves.
  - a) Sky
  - b) Micro
  - c) Space
  - d) Direct

- 8) In mobile phones SIM stands for \_\_\_\_\_.  
 a) system identity module  
 b) source identity module  
 c) subscriber identity module  
 d) substitute identity module
- 9) In radar system \_\_\_\_\_ connects single antenna to transmitter and receiver.  
 a) Duplexer  
 b) Local oscillator  
 c) Mixer  
 d) None of these
- 10) \_\_\_\_\_ communication allows simultaneous two-way data transmission.  
 a) Simplex  
 b) Full duplex  
 c) Half duplex  
 d) All of these

**B) Fill in the blanks.****06**

- 1) Protocol is nothing but \_\_\_\_\_.  
 2) In \_\_\_\_\_ topology if the central hub breaks, the whole network goes down.  
 3) \_\_\_\_\_ produces monochromatic and coherent light.  
 4) If bit deviation is 2 milli second, then bit rate is \_\_\_\_\_.  
 5) In optical communication \_\_\_\_\_ convert light signals into electrical signals.  
 6) Wi-Fi uses \_\_\_\_\_ frequency bands to deliver data.

**Q.2 Solve any Eight of the following.****16**

- a) State the condition for total internal reflection.  
 b) State the function of intrinsic layer in pin diode.  
 c) What is MODEM? What are its types?  
 d) Define uplink and downlink frequency in satellite communication.  
 e) What is cavity resonator?  
 f) What do you mean by computer networking? What are its types?  
 g) State the application of the Internet.  
 h) What is roll of control unit in cell phone?  
 i) Define cell in a mobile communication.  
 j) Compare single mode and multimode optical fiber.

**Q.3 A) Attempt any Two of the following.****10**

- a) With constructional diagram explain working of Gunn diode.  
 b) Explain block diagram of earth station in satellite communication.  
 c) Explain Waveguide.

**B) Give the construction and working of the LASER diode.****06****Q.4 A) Attempt any Two of the following.****08**

- a) What is splicing? What are its types?  
 b) Explain cell phone with necessary block diagram.  
 c) Discuss the applications of satellite communication.

**B)** With concept of velocity modulation explain working of Klystron tube. **08**

**Q.5** **Attempt any Two of the following.** **16**

- a)** Explain pulsed radar system with the help of block diagram.
- b)** What is optical fiber? What are its types? Explain Step Index fiber.
- c)** With suitable diagram explain Bus and Star topologies.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025  
COMPUTER SCIENCE (Special Paper - XVI)  
Advanced Python (22221672-A)**

Day & Date: Saturday, 01-11-2025  
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) How can you execute a stored procedure in MySQL?
  - a) CALL procedure\_name()
  - b) EXEC procedure\_name()
  - c) START procedure\_name()
  - d) None of these
- 2) From \_\_\_\_\_ you can not create a DataFrame in Pandas Python.
 

|                |               |
|----------------|---------------|
| a) Python list | b) Excel file |
| c) CSV file    | d) Image file |
- 3) \_\_\_\_\_ is an advantage of using Django.
  - a) High security features
  - b) Built-in admin interface
  - c) Automatic database migrations
  - d) All of the above
- 4) In Pandas, \_\_\_\_\_ function is used for aggregating data by a particular column.
 

|             |              |
|-------------|--------------|
| a) filter() | b) groupby() |
| c) merge()  | d) join()    |
- 5) \_\_\_\_\_ Python module is commonly used to connect to a MySQL database.
 

|              |                           |
|--------------|---------------------------|
| a) sqlite3   | b) psycopg2               |
| c) cx_Oracle | d) mysql-connector-python |
- 6) What is the result of using np.arange(5) in NumPy?
 

|                |                  |
|----------------|------------------|
| a) [0,1,2,3,4] | b) [1,2,3,4,5]   |
| c) [0,2,4,6,8] | d) None of these |

- 7) \_\_\_\_\_ SQL command is used to delete records from a table in MySQL.  
a) delete                                      b) insert  
c) select                                        d) drop
- 8) \_\_\_\_\_ method is used to fetch all rows from the result of an executed query.  
a) cursor.fetchall()                          b) cursor.fetchrows()  
c) cursor.fetch\_all()                         d) cursor.fetchallrows()
- 9) \_\_\_\_\_ is the primary purpose of the Tkinter Canvas.  
a) To handle text input  
b) To draw shapes and display images within a GUI  
c) To handle HTTP requests  
d) To perform Mathematical operations
- 10) \_\_\_\_\_ command is used to install matplotlib.  
a) pip matplotlib                              b) pip install numpy  
c) pip install matplotlib                    d) None of these

**B) Fill in the blanks.**

06

- 1) \_\_\_\_\_ command is used to create superuser in Django in python.
- 2) \_\_\_\_\_ functions in Pandas is used to get the first few rows of a DataFrame.
- 3) GUI stands for \_\_\_\_\_.
- 4) \_\_\_\_\_ arranges widgets in rows and columns.
- 5) A \_\_\_\_\_ is a one-dimensional labeled array.
- 6) The library used for data plotting is \_\_\_\_\_.

**Q.2 Solve any Eight of the following.**

16

- a) Write advantages of GUI.
- b) What is the model in Django?
- c) Define DataFrame.
- d) What is Matplotlib?
- e) Write list of parameters passed to connect method for database connectivity.
- f) What is the view in Django?
- g) Write a note on Button.
- h) What is Django form?
- i) Write a note on Entry.
- j) Write a note on scatter plots.

**Q.3 A) Attempt any Two of the following.**

10

- Write a program for displaying data from the book table.
- Write a short note on Checkbutton.
- What is plot matplotlib? explain it with examples.

**B)** Explain histogram with an example.

06

- Q.4 A) Attempt any Two of the following. 08**
- a) Explain the difference between a Pandas Series and a DataFrame.
  - b) Explain different commands used in Django.
  - c) write a program to demonstrate menu in Tkinter.

- B) Write a note on Layout Management in Tkinter. 08**

- Q.5 Attempt any Two of the following. 16**
- a) What are steps for database connectivity? Explain with example.
  - b) Explain line plots in detail with example.
  - c) Write a program to insert, update and delete record from student (rollno, name marks) table.



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Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:**  
**October/November - 2025**  
**COMPUTER SCIENCE (Special - XVI)**  
**Mobile Application Development using Kotlin (22221672-B)**

Day &amp; Date: Saturday, 01-11-2025

Max. Marks: 80

Time: 12:00 PM To 03:00 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.

**Q.1 A) Select the correct alternative. 10**

- 1) What is Android?
  - a) A type of robot
  - b) A mobile operating system
  - c) A web browser
  - d) A programming language
- 2) What is an APK in Android?
  - a) A type of permission
  - b) A configuration file
  - c) Android Package Kit
  - d) A debugging tool
- 3) What is the name of Android's virtual machine?
  - a) VirtualBox
  - b) Dalvik
  - c) JVM
  - d) ART
- 4) Which component in Android is responsible for screen navigation?
  - a) View
  - b) Activity
  - c) Service
  - d) BroadcastReceiver
- 5) What is a Service in Android?
  - a) An app component for long-running operations
  - b) A user interface component
  - c) A debugging tool
  - d) A layout manager
- 6) What is a Toast in Android?
  - a) A data storage option
  - b) A message displayed for a short period
  - c) A type of button
  - d) An image format
- 7) Which of these files specifies our screen's layout?
  - a) Manifest file
  - b) Layout file
  - c) R file
  - d) Strings XML

- 8) What is the main advantage of open-source mobile technology?
  - a) High licensing cost
  - b) Closed-source development
  - c) Free and customizable software
  - d) Limited community support software
- 9) Which method is called when an Activity is created?
  - a) onPause()
  - b) onStart()
  - c) onCreate()
  - d) onResume()
- 10) In SQLite Database, \_\_\_\_\_ method returns the total number of columns present in our table.
  - a) getColumnCount()
  - b) setColumnCount()
  - c) getCount()
  - d) getCountColumnn()

**B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. 06**

- 1) \_\_\_\_\_ method is used to perform click on event on button.
- 2) \_\_\_\_\_ Manager component of Android Studio is used to emulate different Android devices for testing.
- 3) \_\_\_\_\_ widget which displays some text on the screen based on the layout, size, color.
- 4) \_\_\_\_\_ is a software tool that simulates Android devices on your computer, allowing you to test and develop apps without needing a physical device.
- 5) \_\_\_\_\_ is the parent class of Activity.
- 6) \_\_\_\_\_ method called when the database needs to upgrade.

**Q.2 Solve any Eight of the following. 16**

- a) What is android emulator?
- b) What is activity in android?
- c) Define use of services in android.
- d) What is UI?
- e) What is android SDK?
- f) What is Android?
- g) What is a Toast? Write its syntax.
- h) What is context?
- i) What is the role of Dalvik in Android development?
- j) What is App Finalization?

**Q.3 A) Attempt any Two of the following. 10**

- a) Explain App optimization and performance.
- b) Explain steps of connected SQLite database in android.
- c) Write a program to Creating a simple "Hello World" app.

**B) Short note on Android layouts. 06**

- Q.4 A) Attempt any Two of the following. 08**
- a) What is the life cycle of Android activity?
  - b) Write a program to use of checkbox, radio and radio group components.
  - c) Explain content provider.
- B) What is a Fragment? Explain Fragment Lifecycle. 08**
- Q.5 Attempt any Two of the following. 16**
- a) What are Android services? Explain types of services.
  - b) Write a program to create a Simple Login Screen.
  - c) Explain android architecture in detail.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New) (CBCS) Examination:  
October/November - 2025**

**COMPUTER SCIENCE (Special Paper - XVI)  
Data Visualization using Power BI (22221672-C)**

Day &amp; Date: Saturday, 01-11-2025

Max. Marks: 80

Time: 12:00 PM To 03:00 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) The \_\_\_\_\_ is a primary user of Business Intelligence.
  - a) Database Administrator      b) Business Analyst
  - c) Software Developer          d) Hardware Engineer
  
- 2) Power BI's Data Model is used for \_\_\_\_\_.
  - a) Creating complex algorithms
  - b) Connecting to external sources
  - c) Structuring and organizing data for reporting
  - d) Storing raw data
  
- 3) A \_\_\_\_\_ is one of the components of Power BI.
  - a) Power Query                      b) PowerShell
  - c) Power Page                        d) Power Command
  
- 4) A \_\_\_\_\_ Power BI view allows creation of calculated columns directly on the table data.
  - a) Report View                        b) Data View
  - c) Query View                         d) Model View
  
- 5) In Power BI, \_\_\_\_\_ action cannot be performed from the Data View.
  - a) Rename a column                b) Change column data type
  - c) Change summarization        d) Create visuals
  
- 6) You want to return a blank if the result is zero \_\_\_\_\_ statement is used.
  - a) IF([value] = 0, BLANK(), [value])
  - b) SWITCH([value], 0, BLANK())
  - c) COALESCE([value], BLANK())
  - d) All of these

- 7) The \_\_\_\_\_ visual allows users to filter data by selecting values directly within the visual.
  - a) Table
  - b) Matrix
  - c) Slicer
  - d) Card
- 8) The "Auto Detect" feature of Power BI \_\_\_\_\_.
  - a) Detects themes
  - b) Highlights incorrect data
  - c) Suggests visuals
  - d) Creates relationships based on column names and data.
- 9) You want to create a new column with a 10% tax added to a 'Sales' column \_\_\_\_\_ type of DAX object should you use.
  - a) Calculated Column
  - b) Calculated Table
  - c) Calculated Measure
  - d) KPI
- 10) \_\_\_\_\_ option in Power BI allows you to convert all lowercase text values in a column to uppercase.
  - a) Format Column
  - b) Replace Values
  - c) Transform Column Contents
  - d) Extract Values

**B) Fill in the blanks.****06**

- 1) A \_\_\_\_\_ is Power BI component used to publish reports to the web.
- 2) When creating relationships, \_\_\_\_\_ type cardinality defines a unique value in both tables.
- 3) \_\_\_\_\_ join type in Power BI retains all rows from the left table and matching rows from the right table.
- 4) The \_\_\_\_\_ function is used to divide two numbers safely.
- 5) You need to display sales trends over time then \_\_\_\_\_ visual is most appropriate.
- 6) To apply the same formatting from one visual to another, \_\_\_\_\_ tool is used.

**Q.2 Solve any Eight of the following.****16**

- a) How would you calculate the rank of each salesperson based on total sales using DAX?
- b) What is "Fill Down" used for?
- c) What are the different connectivity modes?
- d) Differentiate between SUM and SUMX Function. Give example.
- e) What is the purpose of Power Query?
- f) What are the valid data type?
- g) What is Business Intelligence (BI)?
- h) Define Pivot and Unpivot the Columns
- i) What are the advantages of grouping data?
- j) Which Power BI visuals is used to highlight top 5 customers based on total purchase? Give example.

**Q.3 A) Attempt any Two of the following. 10**

- Explain with example how you would visualize sales by category and sub-category for a retail business.
- Differentiate between Measure and Calculated Column
- Explain reordering columns with property.

**B) Explain in detail the Building blocks of Power BI? 06**

**Q.4 A) Attempt any Two of the following. 08**

- Describe a real-life situation where a line chart would be more appropriate than an area chart.
- Why merging column important? List out the different Separator used in merge option.
- Explain with example how to display profit margins using conditional formatting in a table.

**B) Explain the business intelligence users. 08**

**Q.5 Attempt any Two of the following. 16**

- What is slicer? Explain with example.
- What are the type of relationship? Explain active and inactive relationship.
- Use following Financial Dataset to solve following questions and write DAX queries.

| Trans_ID | Account Name | Trans_Type | Trans_Amount | Trans_Date | Budget  |
|----------|--------------|------------|--------------|------------|---------|
| 1        | Sales        | Credit     | ₹50,000      | 2025-04-01 | ₹45,000 |
| 2        | Marketing    | Debit      | ₹15,000      | 2025-04-02 | ₹20,000 |
| 3        | Operations   | Credit     | ₹30,000      | 2025-04-03 | ₹25,000 |
| 4        | HR           | Debit      | ₹10,000      | 2025-04-04 | ₹12,000 |
| 5        | IT           | Debit      | ₹8,000       | 2025-04-05 | ₹10,000 |
| 6        | Sales        | Credit     | ₹60,000      | 2025-04-06 | ₹55,000 |
| 7        | Marketing    | Debit      | ₹20,000      | 2025-04-07 | ₹18,000 |
| 8        | Operations   | Credit     | ₹40,000      | 2025-04-08 | ₹35,000 |
| 9        | HR           | Debit      | ₹12,000      | 2025-04-09 | ₹14,000 |
| 10       | IT           | Debit      | ₹9,000       | 2025-04-10 | ₹11,000 |

- Calculates the total actual transaction amount.
- Calculates the total budgeted amount.
- Calculates the total actual amount per account.
- Calculates the cumulative budgeted amount up to the current date.
- Calculates the percentage of difference between actual and budgeted amounts.
- Calculates the difference between actual and budgeted amounts per account.
- Display count of total no. of transaction.
- Display total amount trans\_type wise.

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| 84  | 1 |
| 85  | 1 |
| 86  | 1 |
| 87  | 1 |
| 88  | 1 |
| 89  | 1 |
| 90  | 1 |
| 91  | 1 |
| 92  | 1 |
| 93  | 1 |
| 94  | 1 |
| 95  | 1 |
| 96  | 1 |
| 97  | 1 |
| 98  | 1 |
| 99  | 1 |
| 100 | 1 |

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
English (Compulsory)  
Literary Mindscapes - I (19201600)**

Day & Date: Tuesday, 28-10-2025  
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 Select the correct alternatives from the options.**

08

- 1) \_\_\_\_\_ are the names of children in ‘Growing Up’.

|                   |                   |
|-------------------|-------------------|
| a) Joss and Kady  | b) Jane and Karli |
| c) Jade and Katie | d) Jenny and Kate |
- 2) Who did Aksionov meet on his way to the fair?

|                      |                    |
|----------------------|--------------------|
| a) a fellow merchant | b) Makar Semyonich |
| c) convicts          | d) his wife        |
- 3) What kind of a room are the children sitting in?

|                    |                    |
|--------------------|--------------------|
| a) out in the open | b) a darkened room |
| c) classroom       | d) bedroom         |
- 4) \_\_\_\_\_ is the painter of the duchess’s portrait.

|                  |                |
|------------------|----------------|
| a) Aphra Pandolf | b) Fra Pangol  |
| c) Aphra Behn    | d) Fra Pandolf |
- 5) John Keats was a \_\_\_\_\_ poet.

|                |             |
|----------------|-------------|
| a) Victorian   | b) Romantic |
| c) Elizabethan | d) Modern   |
- 6) In the Poem ‘Life’ \_\_\_\_\_ springs again like elastic.

|            |           |
|------------|-----------|
| a) tragedy | b) family |
| c) hope    | d) death  |
- 7) Choose the correct adverb to fill in the blank.  
The Economy of India is based on \_\_\_\_\_ farming.

|            |                   |
|------------|-------------------|
| a) largely | b) large fully    |
| c) large   | d) on large scale |
- 8) She said “Monu is at home”. (Write into indirect speech)

|                                    |
|------------------------------------|
| a) She says Monu is at home.       |
| b) She asked that Monu is at home. |
| c) She said that Monu was at home. |
| d) She told that Monu is at home.  |

- Q.2 Write short answers of the following questions. (Any Four) 12**
- a) Discuss the difference in the behaviour of the girls in the story 'Growing up'.
  - b) What was the major change in the character of Aksionov in prison?
  - c) Describe the forest in Toru Dutta's poem "Sita".
  - d) What does emissary realize from the duke?
  - e) What is the theme of the poem, 'Ode to Beauty'?
  - f) How does the Poetess Charlotte Bronte see hope in the poem 'Life'?
- Q.3 Answer the following question. (Any One) 10**
- a) What is the importance of Media Literacy.
- OR**
- b) Write a note on the life skills, known as FLIPS.
- Q.4 What is the environmental consciousness? and mention habits for environment conservation. 10**



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Set **P**

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
PHYSICS (Paper - XIV)  
Electrodynamics (19201619)**

Day & Date: Wednesday, 29-10-2025  
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 trajectory of a particle entering an electric field in a direction perpendicular to  $\vec{E}$  is \_\_\_\_\_.  
 a) straight line parallel to  $\vec{E}$       b) parabola  
 c) circle      d) cycloid
- 2) Laplace's equation is applicable to \_\_\_\_\_.  
 a) charge free region  
 b) region with certain charge distribution  
 c) both (a) and (b)  
 d) None of these
- 3) In vacuum, polarization and magnetization are \_\_\_\_\_.  
 a) absent      b) present  
 c) of the same magnitude      d) of the different magnitude
- 4) If  $\varepsilon_1$  and  $\varepsilon_2$  are input and output e.m.f. of transformer with  $N_1$  and  $N_2$  turns in primary and secondary windings, then \_\_\_\_\_.  
 a)  $\frac{\varepsilon_2}{\varepsilon_1} = \frac{N_2}{N_1}$       b)  $\frac{\varepsilon_1}{\varepsilon_2} = \frac{N_2}{N_1}$   
 c)  $\varepsilon_1 \varepsilon_2 = N_1 N_2$       d)  $\frac{\varepsilon_2}{\varepsilon_1} = N_1 N_2$
- 5) The statement 'magnetic free poles do not exist' is justified by Maxwell's equation \_\_\_\_\_.  
 a)  $\nabla \cdot \vec{D} = \rho$       b)  $\nabla \cdot \vec{B} = 0$   
 c)  $\nabla \times \vec{H} = \vec{J} + \frac{\partial \vec{D}}{\partial t}$       d)  $\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$
- 6) The wave propagation vector is complex quantity in \_\_\_\_\_.  
 a) vacuum      b) dielectrics  
 c) conductors      d) air

- 7) According to Lenz's law, the induced e.m.f. \_\_\_\_\_ the rate of change of magnetic flux.  
 a) does not opposes                      b) opposes  
 c) increases                                d) decreases
- 8) The intensity of radiation along the axis of electric dipole is proportional to \_\_\_\_\_.  
 a) zero  
 b) infinity  
 c) finite value depending distance  
 d) finite value independent of distance
- 9) The relative amplitude of reflected wave incident normally on the interface of two dielectrics is given by \_\_\_\_\_.  
 a)  $\frac{2n_1}{n_1 + n_2}$                       b)  $\frac{n_1 - n_2}{n_1 + n_2}$   
 c)  $\frac{n_1 + n_2}{n_1 - n_2}$                       d)  $\frac{n_1 n_2}{n_1 - n_2}$
- 10) 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) none of these

**B) Fill in the blanks.****06**

- 1) The Motional e.m.f. forms the principle of \_\_\_\_\_.
- 2) Poisson's equation is \_\_\_\_\_.
- 3) Electric dipole moment per unit volume of polarized medium is called \_\_\_\_\_.
- 4) Self inductance and mutual inductance are measured in \_\_\_\_\_.
- 5) Mathematical formulations of empirical laws in electricity and magnetism are known as \_\_\_\_\_.
- 6) \_\_\_\_\_ charge cannot radiate.

**Q.2 Solve any Eight of the following.****16**

- a) State coulomb's law in electrostatics.
- b) Show that nature of Electromagnetic waves as a Transverse.
- c) Define coefficient of mutual inductance between two coils.
- d) What is electromagnetic induction?
- e) State Faraday's law.
- f) What is electric Displacement vector?
- g) Define the skin depth.
- h) Define transmission coefficient.
- i) Define the term Retarded time.
- j) 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.

- Q.3 A) Attempt any Two of the following. 10**
- Discuss the motion of a charged particle in constant and uniform electric field.
  - Obtain Integral and differential form of Faradays law.
  - The amplitude of electric field in a monochromatic plane wave in free space, incident normally on a plane surface of medium of refractive index 1.5 is 10 V/m. Find the amplitude of electric field inside the medium.
- B) Write a note on Biot and Savart's law. 06**
- Q.4 A) Attempt any Two of the following. 08**
- For electromagnetic waves through linear dielectrics, show that  $\vec{E}$ ,  $\vec{H}$  and  $\vec{K}$  are orthogonal.
  - Obtain an expression for total power radiated by an electric dipole.
  - Obtain the boundary conditions for electromagnetic field vectors  $(\vec{B}, \vec{H})$  at the interface of two media.
- B) State and prove Ampere's circuital law and obtain differential form of Ampere's circuital law. 08**
- Q.5 Attempt any Two of the following. 16**
- Deduce an expression for radiation reaction force for an electric dipole.
  - State Maxwell's equation in vacuum giving meaning of each term. Explain the physical significance of Maxwell's equations.
  - Establish the law of conservation of momentum for electromagnetic field.



- 8) Phenol water system is an example of liquids which are \_\_\_\_\_.  
 a) completely miscible                      b) partially miscible  
 c) completely immiscible                    d) None of these
- 9) Rotational spectrum is observed only in \_\_\_\_\_.  
 a) liquids                                          b) solids  
 c) gases                                            d) crystals
- 10) According to law of mass action, the rate at which a substance reacts is directly proportional to its \_\_\_\_\_.  
 a) active mass                                  b) active volume  
 c) temperature                                  d) None of these

**B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. 06**

- 1) A constant boiling mixture is called \_\_\_\_\_.  
 2)  $2\text{NO}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{NO}(\text{g})$  is an example of \_\_\_\_\_ order of reaction.  
 3)  $\Delta A = \Delta G$  when \_\_\_\_\_ is constant.  
 4) Number of cycles passing a given point per unit time is called \_\_\_\_\_.  
 5) In Van't Hoff's isochore, if  $K_2 < K_1$ , then sign of  $\Delta H$  is \_\_\_\_\_.  
 6) Triethyl amine-water system has \_\_\_\_\_ consolute temperature or CST.

**Q.2 Solve any Eight of the following. 16**

- a) State Hook's Law.  
 b) Define the term energy of activation.  
 c) What do you mean by mole fraction?  
 d) Characteristics of third order reaction for graphical method.  
 e) Define the term activity.  
 f) What are ideal and non-ideal solutions?  
 g)  $\text{CO}_2$  does not show rotational spectra but it shows vibrational spectra, explain.  
 h) Define the term wave number.  
 i) State law of mass action.  
 j) Define free energy.

**Q.3 A) Attempt any Two of the following. 10**

- a) Write a note on temperature coefficient.  
 b) Derive Gibb's-Helmholtz equation.  
 c) Explain nicotine water system.

**B) A solution of CO in the inert solvent of  $\text{CCl}_4$  absorbs the radiation at the frequency is  $5.40 \times 10^{13} \text{ sec}^{-1}$ . Calculate the force constant for the bond in CO. ( $\mu$  for CO =  $1.40 \times 10^{-23} \text{ gm}$ ) 06**

**Q.4 A) Attempt any Two of the following. 08**

- a) Distinguish ideal and non-ideal solutions.
- b) Explain the nicotine- water system. What is the effect of impurities on CST values?
- c) Write applications of vibrational spectra.

**B) Explain energy level diagrams of a diatomic molecule. 08**

**Q.5 Attempt any Two of the following. 16**

- a) Derive the equation of third order. If the rate of reaction gets doubled from 298K to 318K. Calculate  $E_a$  ( $R = 8.368$  joules).
- b) What is CST? Discuss the mutual solubility of partially miscible liquids having maximum CST.
- c) Write significance of Gibb's free energy as  $H$ ,  $T$  &  $S$  are state functions. If latent heat of vaporization of water is 2282 joules/gm; calculate the b.p. of water at an atmospheric pressure of 528 mm ( $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ )

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Set P

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
BOTANY (Special Paper - XIII)  
Plant Pathology (19201601)**

Day & Date: Wednesday, 29-10-2025  
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 and give equations wherever necessary.
- 4) Use of log table and non-programmable calculators is allowed.

**Q.1 A) Select the correct alternative. 10**

- Establishment of pathogen in the plant tissue after penetration is called \_\_\_\_\_.
  - Infection
  - Isolation
  - Incubation
  - Inoculation
- Plant disease which affects the absorption and accumulation of water and minerals is \_\_\_\_\_.
  - Root rot
  - Wilts
  - Soft rot
  - Damping off
- Which of the given disease is related to wheat?
  - Tikka
  - Leaf rust
  - Downy mildew
  - Late blight
- Sporisorium sorghi* causes \_\_\_\_\_ disease of jowar.
  - Head smut
  - Grain smut
  - Rust stem
  - Rot
- White rust of crucifer causes the infection \_\_\_\_\_.
  - Local type
  - Systemic type
  - Local and Systemic type
  - Seedling type
- Viruses enter the plant through \_\_\_\_\_.
  - Osmosis
  - Pinocytosis
  - Diffusion
  - Plasmolysis
- Citrus canker disease occur on \_\_\_\_\_.
  - grapes
  - ladies' finger
  - pomegranate
  - lemon

- 8) Aerobiology is directly associated with other scientific branches like \_\_\_\_\_.  
 a) Plant pathology                      b) Animal pathology  
 c) Palynology                              d) All of these
- 9) Plant diseases are classified on the basis of \_\_\_\_\_.  
 a) symptoms                              b) spread  
 c) severity of infection                  d) All of these
- 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 blank.****06**

- 1) The late blight of \_\_\_\_\_ is caused by *Phytophthora infestans*.
- 2) The physiological or morphological changes as a result of disease are known as \_\_\_\_\_.
- 3) Sulfur based fungicides are used for \_\_\_\_\_ types of disease.
- 4) The word \_\_\_\_\_ has been derived from Greek word Pathos means suffering.
- 5) Tikka disease is caused by \_\_\_\_\_.
- 6) The mode of nutrition in fungi is \_\_\_\_\_.

**Q.2 Solve any Eight of the following.****16**

- a) Write the control measures of little leaf of brinjal.
- b) Write symptoms of red rot of sugarcane.
- c) What is necrosis?
- d) Name any two seed borne diseases.
- e) Define host and pathogen.
- f) Name any two bacterial diseases.
- g) Define disease.
- h) Write symptoms of grain smut of jowar.
- i) What is host range?
- j) What is infection?

**Q.3 A) Attempt any Two of the following.****10**

- 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.

**B) Write note on - seed borne pathogens.****06**



**Q.4 A) 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.

**B) Explain the importance of plant diseases. 06**

**Q.5 Attempt any Two of the following. 16**

- a) Describe the causal organism, symptoms, disease cycle and control measures of Citrus canker.
- b) Explain the classification of plant diseases based on necrotic symptoms.
- c) Classify the plant diseases based on severity of infection and spread of disease.

Set P

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
ZOOLOGY (Special Paper - XIII)  
Animal Physiology: Life Sustaining Systems (19201627)**

Day & Date: Wednesday, 29-10-2025  
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) Multiple Choice Question.**

10

- The process of formation of ketone bodies is known as \_\_\_\_\_.
  - Ketogenesis
  - Kylogenesis
  - Ketolysis
  - Ketoneogenesis
- The partial pressure of O<sub>2</sub> in alveoli is \_\_\_\_\_ mmHg.
  - 141
  - 104
  - 105
  - 64
- Hamberger phenomenon is called \_\_\_\_\_ shift.
  - Phosphate
  - Nitrate
  - Chloride
  - Carbonate
- The breakdown of complex food material into simple form is called \_\_\_\_\_.
  - Digestion
  - Nutrition
  - Excretion
  - Emulsification
- Right auricle received \_\_\_\_\_ type of blood.
  - Oxygenated
  - Deoxygenated
  - Mixed
  - Dioxygenated
- \_\_\_\_\_ blood group is called as universal donor.
  - A
  - B
  - O
  - AB
- Major Stress hormone is \_\_\_\_\_.
  - Adrenaline
  - Glucagon
  - Epinephrine
  - Cortisol
- Sphygmomanometer instrument is used for measurement of \_\_\_\_\_.
  - Hb
  - BP
  - Pulse rate
  - Sugar

- 9) What is haematopoiesis?
- The process of bone formation
  - The process of blood cell production
  - The process of muscle tissue growth
  - The process of nerve cell development
- 10) Blood Pressure of healthy person is \_\_\_\_.
- 90/80
  - 120/80
  - 80/120
  - 90/60

**B) Fill in the blank/Definition/One sentence answer/One word answer/Give the name/predict the product etc. 06**

- Emulsification of fat
- Pacemaker
- A V Node
- Composition of blood
- Tidal volume
- Bowman's capsule

**Q.2 Solve Any Eight of the following. 16**

- Ultrastructure of kidney and its functional unit.
- Describe cardiac cycle.
- Describe ABO - Blood group system.
- S.A. Node
- Write the function of liver.
- Acidic chyme
- Role of ADH during urine formation
- Describe structure and functions of platelets.
- Name the hormones which regulate kidney function.
- Diagram of ECG

**Q.3 A) Attempt Any Two of the following. 10**

- Describe origin and conduction of heart beat.
- Describe the Bohrs effect.
- Describe Erythroblastosis fetalis.

**B) Write a short note on. 06**

Describe the ultrastructure of Nephron.

**Q.4 A) Attempt Any Two of the following. 08**

- Describe the phenomenon of blood clotting.
- Function of pancrease.
- Describe the physiology of urine formation.

**B) Write a short note on. 08**

Explain Yoga and Stress.

**Q.5 Attempt Any Two of the following.**

**16**

- a)** Describe the physiology of digestion in small intestine.
- b)** Describe nervous and chemical control of respiration.
- c)** Describe different cell types in leukocytes and their functions.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
MATHEMATICS (Special Paper - XIII)  
Metric Spaces (19201635)**

Day & Date: Wednesday, 29-10-2025  
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 metric space  $(R, d)$  or  $R_d$  is called \_\_\_\_\_ metric space.
  - a) Normal
  - b) Absolute
  - c) Usual
  - d) Discrete
- 2) Every convergent sequence in metric space is \_\_\_\_\_.
  - a) Convergent
  - b) Divergent
  - c) Cauchy sequence
  - d) Oscillatory sequence
- 3) In a metric space  $\langle M, \rho \rangle$  for all  $x, y, z \in M$  the triangle inequality is \_\_\_\_\_.
  - a)  $\rho(x, y) \leq \rho(x, z) + \rho(z, y)$
  - b)  $\rho(x, y) \geq \rho(x, z) + \rho(z, y)$
  - c)  $\rho(x, y) < \rho(x, z) + \rho(z, y)$
  - d)  $\rho(x, y) > \rho(x, z) + \rho(z, y)$
- 4) Every open ball in  $R'$  is \_\_\_\_\_.
  - a) an open interval
  - b) half-open interval
  - c) closed interval
  - d) half-closed interval
- 5) A function  $f$  is continuous at  $a$  iff for given  $\epsilon > 0$  &  $\delta > 0$  such that \_\_\_\_\_.
  - a)  $f^{-1}(B[f(a); \epsilon]) \subset B[a, \delta]$
  - b)  $f^{-1}(B[f(a); \epsilon]) \supset B[a, \delta]$
  - c)  $f^{-1}(B[f(a); \delta]) \supset B[a, \epsilon]$
  - d)  $f^{-1}(B[a; \delta]) \supset B[f(a), \epsilon]$
- 6) If  $f: M_1 \rightarrow M_2$  is continuous then  $f^{-1}(F)$  is closed subset of  $M_1$  whenever  $f$  is \_\_\_\_\_.
  - a) Closed subset of  $M_2$
  - b) Closed subset of  $M_1$
  - c) Open subset of  $M_1$
  - d) Open subset of  $M_2$
- 7) If any metric space  $M$  both  $M$  and  $\phi$  are \_\_\_\_\_.
  - a) Open
  - b) Closed
  - c) Both open and closed
  - d) Neither open nor closed

- 8) Every compact metric space is \_\_\_\_\_.  
 a) Complete and not bounded  
 b) Complete and bounded  
 c) Complete and totally bounded  
 d) Totally bounded and not complete
- 9) A closed subset of complete metric space is \_\_\_\_\_.  
 a) Compact  
 b) Closed  
 c) Bounded  
 d) Complete
- 10) The arbitrary union of open set is \_\_\_\_\_.  
 a) open  
 b) not open  
 c) closed  
 d) Both open and closed

**B) Fill in the blank.****06**

- 1) If  $M = Rd$  is the discrete metric space &  $a \in Rd$  then  $B[a; 1] = \underline{\hspace{2cm}}$ .
- 2) For a class  $\ell^2$  Let  $S = \{S_n\} \in \ell^2$  then the norm of  $S$  is defined as  $\|S\| = \underline{\hspace{2cm}}$ .
- 3) Let  $M = [0,1]$  be a metric space and  $A = \{1, 1/2, 1/3, \dots\}$   $A \subset M$  then  $\text{diam } A = \underline{\hspace{2cm}}$ .
- 4) If  $G_1$  and  $G_2$  are open sets of a metric space  $M$  then  $G_1 \cap G_2$  is \_\_\_\_\_.  
 5) If  $f(x) = x^2$  ( $-1 \leq x \leq 1$ ) then  $f$  attains maximum value at \_\_\_\_\_.  
 6) In the metric space  $M$  has the Heine-Borel property then  $M$  is \_\_\_\_\_.

**Q.2 Solve any Eight of the following.****16**

- a) If  $|x - 2| < 1$  show that  $|x^2 - 4| < 5$ .
- b) Let  $(M, d)$  be a metric space and let  $x, y, z$  be any three points of  $M$  then  $d(x, y) \geq |d(x, z) - d(z, y)|$
- c) Define the class  $\ell^2$  space with suitable example.
- d) If  $\lim_{x \rightarrow a} f(x) = L$  &  $\lim_{x \rightarrow a} g(x) = M$  then show that  $\lim_{x \rightarrow a} (f(x) - g(x)) = L - M$ .
- e) If  $f$  is continuous at  $a$  and if  $C \in R'$  prove that  $CF$  is continuous at  $a$ .
- f) Define open ball  $B[a, r]$  in metric space.
- g) Consider the usual metric  $\rho(x, y) = |x - y|$  for  $[0,1]$  then describe  $B(0, 1/8)$
- h) If  $T(x) = x^2$  ( $0 \leq x \leq 1/3$ ) prove that  $T$  is a contraction on  $[0, 1/3]$ .
- i) Define the term totally bounded set.
- j) Define  $\epsilon$ -dense in  $A$ .

**Q.3 A) Attempt any Two of the following.****10**

- a) Show that  $d: R^2 \rightarrow R^2$  such that  $d(x, y) = \max\{|x_1 - y_1|, |x_2 - y_2|\}$  where  $x = (x_1, x_2)$  &  $y = (y_1, y_2)$  are in  $R^2$  is metric on  $R^2$
- b) If  $G_1$  and  $G_2$  are open subsets of the metric space  $M$  then  $G_1 \cap G_2$  is also open.
- c) If  $A$  is totally bounded of  $(x, d)$  then  $\bar{A}$  is totally bounded.

**B)** State and prove Schwarz inequality. **06**

**Q.4 A)** Attempt any Two of the following. **08**

- a) If  $F_1$  and  $F_2$  are closed subsets of a metric space  $M$  then  $F_1 \cup F_2$  is also closed.
- b) If  $A$  is closed subset of the compact metric space  $(M, \rho)$  then the metric space  $(A, \rho)$  is also compact.
- c) Let  $(M, \rho)$  be a metric space and let  $a \in M$  and real valued function whose domain  $a \subset e$  subsets of  $M$ .  
If  $\lim_{x \rightarrow a} f(x) = L$  &  $\lim_{x \rightarrow a} g(x) = N$  then  $\lim_{x \rightarrow a} (f(x).g(x)) = L.N$ .

**B)** Let  $\langle M, \rho \rangle$  be a complete metric space. If  $T$  is a contraction on  $M$  then there is only one point  $x$  in  $M$  such that  $T_x = x$ . **08**

**Q.5** Attempt any Two of the following. **16**

- a) Let  $\ell^\infty$  be the set of all bounded sequence of real number if  $x = \{x_n\}_{n=1}^\infty$  and  $y = \{y_n\}_{n=1}^\infty$  are  $\ell^\infty$  and  

$$d(x, y) = l.u.b. |x_n - y_n|$$

$$1 \leq n \leq \infty$$
then prove that  $(\ell^\infty, d)$  is a metric space.
- b) Let  $(M, \rho)$  be complete metric space for each  $n \in I$ . Let  $F_n$  be closed subset of  $M$  such that
  - 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.
- c) Let  $\langle M_1, \rho_1 \rangle$  and  $\langle M_2, \rho_2 \rangle$  be metric space and let  $F: M_1 \rightarrow M_2$ . Then  $F$  is continuous on  $M_1$  iff  $F^{-1}(F)$  is also closed subset of  $M_1$ , whenever  $F$  is closed subset of  $M_2$ .

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
STATISTICS (Special Paper - XIII)  
Statistical Inference - II (19201643)**

Day & Date: Wednesday, 29-10-2025  
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) 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
- 2) Area of critical region depends on \_\_\_\_\_.  
a) size of type I error  
b) size of type II error  
c) value of the statistic  
d) number of observations
- 3) Neyman - Pearson lemma provides \_\_\_\_\_.  
a) Unbiased C. R.  
b) Most powerful C. R.  
c) Admissible C. R.  
d) Minimal C. R.
- 4) In Sequential Probability Ratio Test (SPRT) the sample size is \_\_\_\_\_.  
a) fixed  
b) a random variable  
c) fixed but small  
d) fixed but large
- 5) Which of the following is applicable to paired data?  
a) The Sign test  
b) The Median test  
c) Wilcoxon's signed rank test  
d) Both a) & c)
- 6) 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)



- 7) 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
- 8) Test of  $H_0: \mu = 70$  against  $H_1: \mu \neq 70$  leads to \_\_\_\_\_.
  - a) left tailed test
  - b) right tailed test
  - c) two tailed test
  - d) None of these
- 9) 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
- 10) Most frequently used method of breaking the ties is \_\_\_\_\_.
  - a) midrank method
  - b) average statistics approach
  - c) to omit tied values
  - d) most favorable statistic approach

**B) Define the following.****06**

- 1) Type II error
- 2) Type I error
- 3) Power of test
- 4) Pivotal quantity
- 5) Run
- 6) Simple and composite hypothesis

**Q.2 Explain any Eight of the following terms.****16**

- a) Most powerful test
- b) Level of significance
- c) U.M.P. test
- d) Null and alternative hypothesis
- e) Size of test
- f) Confidence interval
- g) State confidence interval for  $\mu$  when  $\sigma^2$  is unknown in case of  $N(\mu, \sigma^2)$  distribution.
- h) Define the SPRT.
- i) Critical region
- j) Define LRT.

- Q.3 A) Attempt any Two of the following. 10**
- A coin is for which the probability of occurrence of head is  $P$ , thrown 7 times and null hypothesis is  $H_0: P = 1/2$  is tested against  $H_1: P = 1/4$  is accepted more than one head appears, then compute
    - size of test
    - power of test
  - Obtain  $100(1 - \alpha)\%$  confidence interval for the parameter  $\mu$  in case of  $N(\mu, \sigma^2)$  distribution, when  $\sigma^2$  is unknown.
  - Describe the procedure of Sign test.
- B) Explain the procedure of run test for one sample. 06**
- Q.4 A) Attempt any Two of the following. 08**
- Let  $X$  be a Bernoulli variate with p.m.f  

$$P(x, \theta) = \theta^x(1 - \theta)^{1-x}; x = 0, 1, \quad 0 \leq x \leq 1$$
 Construct SPRT test for testing  $H_0: \theta = \theta_0$  against  $H_1: \theta = \theta_1$
  - Obtain  $100(1 - \alpha)\%$  confidence interval for ratio of two population variances in case of normal distribution.
  - Describe the procedure of median test.
- 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 Attempt any Two of the following. 16**
- State and prove Neyman- Pearson lemma.
  - Obtain SPRT for testing  $H_0: \lambda = \lambda_0$  against  $H_1: \lambda = \lambda_1$  where  $\lambda$  is the parameter of Poisson distribution, find appropriate expressions for OC function and ASN function.
  - State the procedure of Kolmogorov - Smirnov test for two independent samples.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
GEOLOGY (Special Paper - XIII)  
Photo Geology and Remote Sensing (19201652)**

Day & Date: Wednesday, 29-10-2025  
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 study of the characters of the geological features on earth surface using the aerial photographs is \_\_\_\_\_.  
a) Photointerpretation                      b) Photogrammetry  
c) Photo resolution                          d) Photo reading
- 2) Which one of the following band composites is called as true colour composite?  
a) Bands 1, 2 & 3                              b) Bands 2, 3 & 4  
c) Bands 3, 4 & 5                              d) Bands 4, 5 & 6
- 3) Which of the following information is NOT printed on the aerial photographs?  
a) Serial No                                      b) Clock  
c) Wind speed                                  d) Date
- 4) Ultraviolet light is greatly absorbed by \_\_\_\_\_ in the atmosphere.  
a) Oxygen                                        b) Ozone  
c) Water vapour                                d) Nitrogen
- 5) Band number 5 of LANDSAT is \_\_\_\_\_.  
a) NIR - near-infrared                      b) SWIR - short wave infrared  
c) TIR - Thermal infrared                  d) Blue
- 6) \_\_\_\_\_ sensor produce its own energy source.  
a) Active                                          b) Passive  
c) Proximity                                      d) Ultrasonic
- 7) Raster data is a type of \_\_\_\_\_ data.  
a) Numerical                                      b) Non-spatial  
c) Spatial                                              d) Vector

- 8) A linear feature in the aerial photograph which has different tone and stands out from surrounding plain surface is identified as \_\_\_\_\_.
  - a) Lineament
  - b) Fault plane
  - c) Dyke
  - d) Syncline fold
- 9) Which among the following is having more wavelengths?
  - a) X-rays
  - b) Cosmic waves
  - c) Radio waves
  - d) Gamma rays
- 10) 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

**B) Answer the following questions in one sentence. 06**

- 1) What is vertical aerial photographs?
- 2) Name different types of resolution.
- 3) Radar is passive sensor system? True or false
- 4) Write full form of LIDAR.
- 5) Define reflection.
- 6) What is microwave?

**Q.2 Solve any Eight of the following. 16**

- a) Define aerial photographs?
- b) What is platform in remote sensing?
- c) What is sensor in remote sensing?
- d) What is low angle oblique photograph?
- e) What is IRS?
- f) Define geographic information system.
- g) Which point on aerial photograph represent nadir on the ground?
- h) What are the two data formats used in GIS?
- i) Name the errors occur in flying.
- j) What is strike and dip?

**Q.3 A) Attempt any Two of the following. 10**

- Describe tone and texture of aerial photographs with examples.
- Describe NDVI.
- What is resolution? Explain their types.

**B)** Write short note on vector data structure. **06**

**Q.4 A) Attempt any Two of the following. 08**

- What are data input methods in GIS?
- How faults can be interpreted on aerial photograph?
- What is attribute data in GIS? Write note on attribute data entry.

**B) Describe thermal sensors. 08**

**Q.5 Attempt any Two of the following.**

**16**

- a)** Describe pocket stereoscope.
- b)** Describe various information printed on the aerial photographs.
- c)** Describe supervised classification of image.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
MICROBIOLOGY (Special Paper - XIII)  
Microbial Genetics (19201660)**

Day & Date: Wednesday, 29-10-2025  
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) Insulin produced by rDNA technology is used for treating \_\_\_\_\_.  
 a) Blood pressure                      b) AIDS  
 c) Cancer                                  d) Diabetes
- 2) Nucleic acid in gel is usually visualized by staining with \_\_\_\_\_  
 intercalating dye.  
 a) Ethidium bromide                      b) Coomassie blue  
 c) Methylene blue                      d) Venus green
- 3) Genetic complementation test discovered by \_\_\_\_\_.  
 a) S. Benzer                                  b) S. Altman  
 c) Edward Lewis                      d) Watson
- 4) \_\_\_\_\_ provide the binding site for RNA polymerase in Operon system.  
 a) Promoter                                  b) Operator  
 c) Repressor                                  d) Inducer
- 5) A base pair substitution mutation that changes a codon specifying  
 an amino acid into a stop codon is called as \_\_\_\_\_ mutation.  
 a) Missense                                  b) Non sense  
 c) Frame shift                                  d) Deletion
- 6) Vectors designed to replicate in two different species is called as  
 \_\_\_\_\_ vector.  
 a) Phasmid                                  b) Phagemid  
 c) Transfer                                  d) Shuttle
- 7) \_\_\_\_\_ type of restriction enzyme most commonly used in r-DNA  
 technology.  
 a) Type I                                      b) Type II  
 c) Type III                                      d) Type IV

- 8) In DNA replication RNA primer Synthesis carried out by \_\_\_\_\_.
  - a) DNA polymerase
  - b) DNA gyrase
  - c) DNA primase
  - d) Helicase
- 9) The information retrieval tool of NCBI GenBank is \_\_\_\_\_.
  - a) Entrez
  - b) STAG
  - c) Sequin
  - d) BankIt
- 10) GenBank, the nucleic acid sequence database is maintained by \_\_\_\_\_.
  - a) Brookhaven laboratory
  - b) National center for biotechnology information
  - c) DNA database of Japan
  - d) European molecular biology laboratory

**B) Fill in the blank.****06**

- 1) \_\_\_\_\_ are essential during DNA replication because they separate double-stranded DNA into single strands allowing each strand to be copied.
- 2) In genetics, the \_\_\_\_\_ is the set of observable characteristics or traits of an organism.
- 3) A \_\_\_\_\_ mutation is a point mutation in which a single nucleotide change results in a codon that codes for a different amino acid.
- 4) A \_\_\_\_\_ is a DNA molecule that is used as a vehicle to carry a particular DNA segment into a host cell as part of a cloning or recombinant DNA technique.
- 5) \_\_\_\_\_ is a laboratory technique used to separate DNA, RNA or protein molecules based on their size and electrical charge.
- 6) \_\_\_\_\_ program compares nucleotide or protein sequences to sequence databases and calculates the statistical significance.

**Q.2 Solve any Eight of the following.****16**

- a) What is *ori* site?
- b) What is inducer in operon?
- c) What is the meaning of semiconservative replication?
- d) What is complementation?
- e) What is plasmid vector?
- f) What is BT cotton?
- g) What is linker?
- h) Enlist applications of genetic engineering.
- i) What is cDNA?
- j) What is genome?

**Q.3 A) Attempt any Two of the following.****10**

- a) Explain the DNA replication.
- b) Describe the bacterial mutation.
- c) Write in detail the DNA electrophoresis.

**B) Write short note on applications of genetic engineering.****06**

**Q.4 A) Attempt any Two of the following. 08**  
a) Write in short about the NCBI.  
b) Explain in short the tools used in Genetic engineering.  
c) Describe the DNA finger printing.

**B) Explain in detail the Lac operon. 08**

**Q.5 Attempt any Two of the following. 16**  
a) Describe in detail the transcription.  
b) Explain in detail the PDB and GenBank.  
c) Write an essay on structural organization of *E. coli* chromosome and folded fiber model.



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Set **P**

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
ELECTRONICS (Special Paper - XIII)  
Power Electronics (19201676)**

Day & Date: Wednesday, 29-10-2025  
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) Buried gate is observed in \_\_\_\_\_.  
 a) Power MOSFET                      b) IGBT  
 c) SCR                                      d) SIT
- 2) Typically, the value of the holding current of the SCR is \_\_\_\_\_.  
 a) 100 to 150 mA                      b) 0 to 1 mA  
 c) 8 to 10 mA                              d) 100 to 150 A
- 3) In a controlled rectifier \_\_\_\_\_ commutation is employed.  
 a) forced                                      b) line  
 c) load                                        d) All of these
- 4) In step down choppers, if  $t_{on}$  is the on-period and  $f$  is the chopping frequency, &  $V_{dc}$  is input voltage, the output voltage will be \_\_\_\_\_.  
 a)  $f \times V_{dc} \times t_{on}$                       b)  $V_{dc} \times \frac{f}{t_{on}}$   
 c)  $\frac{V_{dc}}{f \times t_{on}}$                               d)  $V_{dc} \times \frac{t_{on}}{f}$
- 5) The full form of UPS is \_\_\_\_\_.  
 a) Uninterrupted Power SCR  
 b) Unijunction Power Supply  
 c) Uninterrupted Power Supply  
 d) Under Performance SCR
- 6) Another name for a COMFET is \_\_\_\_\_.  
 a) GTO                                        b) IGBT  
 c) LASCR                                      d) Power MOSFET

- 7) In the controlled rectifier the firing angle increases, the average power delivered to the load is \_\_\_\_\_.
  - a) increases
  - b) not depend on firing angle
  - c) remain same
  - d) decrease
- 8) It is possible to protect the SCR from heat conditions by utilizing \_\_\_\_\_.
  - a) heat sink
  - b) snubber circuit
  - c) equalizing circuits
  - d) fuse
- 9) When an SCR is in reverse blocking state, then \_\_\_\_\_.
  - a) junctions J1 & J3 are in forward bias while junction J2 is in reverse bias
  - b) junctions J1 & J2 are in forward bias while junction J3 is in reverse bias
  - c) junctions J1 & J2 are in reverse bias while junction J3 is in forward bias
  - d) junctions J1 & J3 are in reverse bias while junction J2 is in forward bias
- 10) The input and output voltage waveforms in choppers are \_\_\_\_\_.
  - a) continuous and discontinuous respectively
  - b) both discontinuous
  - c) both continuous
  - d) discontinuous and continuous respectively

**B) Answer in one sentence.**

06

- 1) Define Gate threshold voltage.
- 2) If the firing angle is 45 degrees, obtain its conduction angle.
- 3) Write the typical forward voltage drop of the conducting SCR.
- 4) Write the types of gate triggering.
- 5) State primary function of UPS.
- 6) What is commutation?

**Q.2 Solve any Eight of the following.**

16

- a) State function of the drift layer.
- b) List the various SCR triggering mechanism.
- c) State the drawback of SCR.
- d) Give the classification of inverter based on O/P waveform and configuration.
- e) Draw the block diagram of SMPS.
- f) Classify power diodes according to reverse recovery time.
- g) Define latching and holding current of SCR.
- h) Draw the constructional diagram of power MOSFET.
- i) Give the principle of phase control.
- j) Draw the circuit diagram for speed control of the motor.

- Q.3 A) Attempt any Two of the following. 10**
- a) Describe the workings of SIT using a suitable constructional diagram.
  - b) Describe the turn on and off mechanism of GTO.
  - c) Describe the working of basic transistorized inverter.
- B) Describe the working of parallel inverter using SCR. 06**
- Q.4 A) Attempt any Two of the following. 08**
- a) Explain working of RC triggering circuit.
  - b) Describe the working of a step-down chopper.
  - c) Explain in brief the action of battery charger circuit by using SCR.
- B) Explain working of SCR with the help of V-I characteristics. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Using a constructional diagram, describe how the IGBT works.
  - b) Explain the workings of complementary voltage commutation.
  - c) Explain the working of a single-phase full wave-controlled rectifier with inductive load and effect of freewheeling diode.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
COMPUTER SCIENCE (Paper - XIV)  
Web Technology (19201668)**

Day & Date: Wednesday, 29-10-2025  
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 extension of the ASP.NET page?
  - a) .asp
  - b) .aspx
  - c) .asx
  - d) .apx
- 2) Which of the following attribute must be set on a validator control for the validation?
  - a) ControlToValidate
  - b) ValidateControl
  - c) ValidateToBind
  - d) ValidateBind
- 3) Which file contains the Application\_Start event?
  - a) Global.asax
  - b) Web.config
  - c) Local.asax
  - d) None
- 4) Which is not a page event in ASP.Net?
  - a) PreLoad
  - b) Load
  - c) LoadComplete
  - d) UpLoad
- 5) How many navigation controls are in ASP.NET?
  - a) 2
  - b) 3
  - c) 4
  - d) 5
- 6) \_\_\_\_\_ is used to redirect the user's browser to another page or site.
  - a) Response.Redirect
  - b) Server.Redirect
  - c) Client.Transfer
  - d) Server.Transfer
- 7) The CSS stands for \_\_\_\_\_.
  - a) Client Style Sheet
  - b) Cascading Style Sheet
  - c) Common Style Sheet
  - d) Cascading Simple Sheet
- 8) Which of the following types of authentications ASP.NET supports?
  - a) Windows Authentication
  - b) NET Passport Authentication
  - c) Forms Authentication
  - d) All of the above

- 9) Which control is required for every page that have AJAX Extensions for ASP.NET?
  - a) UpdatePanel
  - b) ScriptManager
  - c) ContentPanel
  - d) None of the above
- 10) Which of the following programming language can be used with ASP.NET?
  - a) C#.NET
  - b) VB.NET
  - c) Both
  - d) None

**B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. 06**

- 1) The \_\_\_\_\_ folder is used for keeping assemblies inside it.
- 2) XML Full Form \_\_\_\_\_.
- 3) The \_\_\_\_\_ Validator control is used to compare the value of one input control to the value of another input control.
- 4) Ajax stands for \_\_\_\_\_.
- 5) Using Property \_\_\_\_\_ can we set the size for a Textbox control.
- 6) IIS stands for \_\_\_\_\_.

**Q.2 Solve any Eight of the following.** **16**

- a) What are page life cycle events?
- b) What is metadata in ASP.Net?
- c) What is Autopostback?
- d) List Different list control in ASP.Net.
- e) What is Authentication?
- f) What is ADO.Net?
- g) How to create session?
- h) List different page directive.
- i) What is AJAX?
- j) What is Garbage Collector?

**Q.3 A) Attempt any Two of the following. 10**

- What is session? How to store and retrieve value from session.
- What are the advantages of AJAX?
- Design a web page which use TreeView Control.

**B) Explain ASP.Net page life cycle.** **06**

**Q.4 A) Attempt any Two of the following. 08**

- Explain App\_Code application folder.
- Explain table control.
- Design a xml file for student.

**B) Explain master page with example. 08**

**Q.5 Attempt any Two of the following.**

**16**

- a) Design a web page which insert, update, delete employee record using ADO.Net.
- b) Explain .Net architecture in detail.
- c) Explain all ASP.Net validation server controls.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
PHYSICS (Paper - XV)  
Materials Science (19201620)**

Day & Date: Thursday, 30-10-2025  
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 and give equations 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) Cermets 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) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc.**

06

- 1) The dielectric strength of material is a function of length. (True/False)
- 2) Saturated monomer undergoes addition polymerization. (True/False)
- 3) Oxide ceramic is generally good conductor in their normal oxidation states. (True/False)
- 4) Fiber reinforced polymer is a composite material. (True/False)
- 5) Selection of materials mainly depends upon cost of a material. (True/False)
- 6) Sol gel is the chemical method for synthesis of nanomaterial. (True/False)

**Q.2 Solve any Eight of the following.**

16

- a) What is ductility?
- b) Write in short thermal conductivity of material.
- c) What are polymers?
- d) Write any two applications of ceramic materials.
- e) Draw Cesium Chloride structure.
- f) What is composite?
- g) What are biomechanics?
- h) Define the term biocompatibility.
- i) Write names of any two chemical method for synthesis of nanomaterials.
- j) What is Top-Down approach for synthesis of nanomaterials?

**Q.3 A) Attempt any Two of the following.**

10

- Explain the difference between elasticity and plasticity.
- Write a note on fiber reinforced composites.
- What is copolymer. Explain classification of copolymer.

**B) What are the properties of biomaterials?**

06

**Q.4 Attempt any Two of the following.**

16

- Explain with difference between elasticity and plasticity.
- Write a note on fiber reinforced composites.
- What is co-polymer? Explain classification of co-polymer.



**Q.5 Attempt any Two of the following.**

**16**

- a)** Discuss classification of materials.
- b)** Write any four applications of polymer.
- c)** Explain any two physical methods for the synthesis of nanomaterials.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
CHEMISTRY (Special Paper - XIV)  
Inorganic Chemistry (19201611)**

Day & Date: Thursday, 30-10-2025  
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**

- Terminal carbonyl groups linked with metal through \_\_\_\_\_ bond in metal carbonyl compounds.
  - Sigma and pi
  - Covalent
  - Hydrogen
  - Ionic
- Modern method for separation of Lanthanides is \_\_\_\_\_ method.
  - Complex formation
  - Fractional precipitation
  - Ion exchange
  - Fractional thermal decomposition
- Free electron theory for bonding in metals fails to explain \_\_\_\_\_.
  - cohesive energy
  - specific heat
  - specific conductance
  - all of these
- $\text{XeO}_4$  has \_\_\_\_\_ sigma bonds and \_\_\_\_\_ pi bonds respectively.
  - three, three
  - four, four
  - four, three
  - three, four
- Passivity producing reagents are \_\_\_\_\_.
  - oxidising agents
  - reducing agents
  - Buffers
  - neutral solutions
- Among lanthanons, \_\_\_\_\_ element does not occur in nature.
  - Samarium
  - Promethium
  - Praseodymium
  - Cerium
- In Alkyl aluminium compound both Al and C undergoes are \_\_\_\_\_ hybridization.
  - $\text{dsp}^2$
  - $\text{sp}$
  - $\text{sp}^2$
  - $\text{sp}^3$
- The bond angle in sulphur dioxide molecule is \_\_\_\_\_ degree.
  - 90
  - 109.5
  - 119.5
  - 120



**B)** Write a note on superconductor. Give their applications. **08**

**Q.5 Attempt any two of the following.** **16**

- a)** What are Actinides? Write atomic number, name of elements, symbol and electronic configuration of Actinides.
- b)** Discuss the structure of borazine.
- c)** What are extrinsic semiconductors? Give their types and explain any one of it in detail. Give the applications of semiconductors.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
BOTANY (Special Paper - XIV)  
Plant Biotechnology (19201602)**

Day & Date: Thursday, 30-10-2025  
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) Plasmids are found in \_\_\_\_\_ cell.
  - a) Viral
  - b) Bacterial
  - c) Mycoplasma
  - d) None of the above
- 2) Which enzyme is useful in Recombinant DNA Technology?
  - a) Isomerase
  - b) Amylase
  - c) Lipase
  - d) Restriction endonuclease
- 3) *Agrobacterium tumefaciens* is used in \_\_\_\_\_ method of gene transfer.
  - a) Chemical
  - b) Biological
  - c) Physical
  - d) Natural
- 4) The Golden Rice variety is rich in \_\_\_\_\_.
  - a) Vitamin C
  - b) B-carotene and ferritin
  - c) Biotin
  - d) Lysine
- 5) The first transgenic plant to be produced is \_\_\_\_\_.
  - a) Tobacco
  - b) Rice
  - c) Brinjal
  - d) Cotton
- 6) Which is a genetically modified crop?
  - a) Bt-cotton
  - b) Bt-brinjal
  - c) Golden rice
  - d) All of the above
- 7) In micropropagation \_\_\_\_\_ part of plant is used to raised virus resistant plants.
  - a) Meristem
  - b) Node
  - c) Bark
  - d) Vascular tissue

- 8) Cellular totipotency is the property of \_\_\_\_\_.
  - a) Animals
  - b) Plants
  - c) Microbes
  - d) All of these
- 9) The polymerase chain reaction is \_\_\_\_\_.
  - a) It is a DNA sequencing technique
  - b) It is a DNA degradation technique
  - c) It is a DNA amplification technique
  - d) All of these
- 10) Haploid plants can be obtained from \_\_\_\_\_.
  - a) Root culture
  - b) Leaf culture
  - c) Bud culture
  - d) Anther culture

**B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc.**

06

- 1) Which technique is used in DNA finger printing?
- 2) In Plant tissue culture, the callus tissues are generated into a complete plantlet by alternating the concentration of \_\_\_\_\_.
- 3) The PCR technique was developed by \_\_\_\_\_.
- 4) \_\_\_\_\_ medium is used as an ideal medium in tissue culture technique.
- 5) Gene gun was invented by \_\_\_\_\_.
- 6) The DNA fragments have sticky ends due to \_\_\_\_\_.

**Q.2 Solve any Eight of the following.**

16

- a) Enlist the steps in Southern blotting.
- b) What is bacterial transformation?
- c) Enlist the chemicals used in surface sterilization.
- d) Define vector and give any one example.
- e) What are transgenic plants? Give any one example.
- f) What is callus?
- g) Define the term 'Clone'
- h) Enlist the enzymes involved in recombinant DNA technology (any two).
- i) Define the term 'somatic hybridization'.
- j) Enlist the plant hormones used in tissue culture.

**Q.3 A) Attempt any Two of the following.**

10

- Describe the method of micro-propagation
- Describe the process of microinjection in gene delivery.
- Explain in detail DNA finger printing

**B) Describe in detail DNA libraries.**

06

**Q.4 A) Attempt any Two of the following.**

08

- Explain in brief Northern blotting technique
- What is somatic hybridization? Describe it.
- Write the role of biotechnology in Industry.

**B)** Describe the method of bacterial transformation. **08**

**Q.5 Attempt any Two of the following.** **16**

- a)** What is protoplast? Describe in detail method of protoplast isolation and culture.
- b)** What is tissue culture? Describe the technique of tissue culture.
- c)** With neat, labeled diagram, explain the Polymerase Chain Reaction (PCR).

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November – 2025  
ZOOLOGY (Special Paper - XIV)  
Evolutionary Biology (19201628)**

Day & Date: Thursday, 30-10-2025  
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 of the following factors lead to the development of a new species from an existing one?
  - a) genic drift
  - b) geographic isolation
  - c) natural selection
  - d) all the above
- 2) Who put forward the theory of natural selection \_\_\_\_\_.
  - a) E. Darvin
  - b) C. Darwin
  - c) Lamark
  - d) Osborn
- 3) In the Hardy-Weinberg equation, ( $p^2 + 2pq + q^2$ ), what does q represent?
  - a) homozygous recessive individuals
  - b) heterozygous individuals
  - c) homozygous dominant individuals
  - d) frequency of the recessive allele
- 4) The origin of species book was written by \_\_\_\_\_.
  - a) Charles Darwin
  - b) Lamarck
  - c) Wallace
  - d) Carolus Linnaeus
- 5) Palaentological evidences for evolution refer to the \_\_\_\_\_.
  - a) Development of embryo
  - b) Homologous organs
  - c) Fossils
  - d) Analogous organs
- 6) "Genetic drift" refers to \_\_\_\_\_.
  - a) Gene flow due to migration
  - b) Changes in gene frequencies due to chance
  - c) Common ancestry
  - d) Random mutations
- 7) Darwin's finches are a good example of \_\_\_\_\_.
  - a) Industrial melanism
  - b) Connecting link
  - c) Adaptive radiation
  - d) living fossil



- 8) The theory of inheritance of acquired characters was proposed by \_\_\_\_\_.  
 a) Charles Darwin                      b) Mendel  
 c) Morgan                                d) Lamarck
- 9) The most accepted line of descent in human evolution is: \_\_\_\_\_.  
 a) Australopithecus → Ramapithecus → Homo sapiens → homo habilis  
 b) Homo erectus → Homo habilis → Homo sapiens  
 c) Ramapithecus → Homo habilis → Homo erectus → Homo sapiens  
 d) Australopithecus → Ramapithecus → Homo erectus → Homo habilis → Homo sapiens
- 10) *Biston betularia* is a good example of \_\_\_\_\_.  
 a) Industrial melanism                      b) Connecting link  
 c) Adaptive radiation                      d) macroevolution

**B) Fill in the blanks.****06**

- 1) \_\_\_\_\_ is Hardy Weinberg equation.
- 2) Alternate form of gene is \_\_\_\_\_.
- 3) Primate \_\_\_\_\_ is closet to Human being.
- 4) The modern man is \_\_\_\_\_.
- 5) Synthetic theory of evolution by natural selection was proposed by \_\_\_\_\_.
- 6) It is known that the total sum of all the frequencies of the allele is \_\_\_\_\_.

**Q.2 Solve any eight of the following.****16**

- a) Define variation.
- b) What is RNA world?
- c) Define Chemogeny.
- d) Define migration.
- e) Define evolution.
- f) Define Isolation.
- g) What is a fossil?
- h) What does K-T extinction stand for?
- i) What is speciation?
- j) Define gene pool.

**Q.3 A) Attempt any two of the following.****10**

- a) What are the prepositions of Lamarckism? Discuss with the help of examples.
- b) Discuss the adaptive radiation in Darwin's finches
- c) What is the role of mutation and migration in operating the gene pool of a population?

**B) Short note / Solve** **06**

What do you mean by mass extinction? Explain with the help of examples.

**Q.4 A) Attempt any two of the following.** **08**

- a) What are the key unique hominin characters that are different from that of primate characters?
- b) Discuss the role of variation in evolution.
- c) Explain with the help of molecule are evolution -universality of genetic code.

**B) Describe / Explain / Solve** **08**

Discuss the evolution of horse over geological time scale.

**Q.5 Attempt any two of the following.** **16**

- a) Discuss the principles of Darwinism.
- b) What is speciation? What are the different types of speciation?
- c) What does Hardy-Weinberg Law of equilibrium state? Discuss its salient feature.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November – 2025  
MATHEMATICS (Special Paper - XIV)  
Numerical Analysis (19201636)**

Day & Date: Thursday, 30-10-2025  
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 for each of the following** **10**

- 1) Simpson's  $(1/3)^{rd}$  rule is obtained by putting  $n = \dots$  in general quadrature formula.
 

|      |      |
|------|------|
| a) 1 | b) 2 |
| c) 3 | d) 0 |
- 2) In Trapezoidal rule, the function  $y = f(x)$  is taken to be .....
 

|                  |            |
|------------------|------------|
| a) straight line | b) ellipse |
| c) parabola      | d) circle  |
- 3)  $(E^{1/2} + E^{-1/2})(1 + \Delta)^{1/2} = \dots$ 

|                 |                 |
|-----------------|-----------------|
| a) $\Delta + 1$ | b) $2 + \Delta$ |
| c) $\Delta - 2$ | d) $2 - \Delta$ |
- 4)  $\Delta \tan^{-1} x = \dots$ 

|                                                      |                                                      |
|------------------------------------------------------|------------------------------------------------------|
| a) $\tan^{-1} \left[ \frac{h}{x^2 + hx + 1} \right]$ | b) $\tan^{-1} \left[ \frac{h}{x^2 - hx + 1} \right]$ |
| c) $\tan^{-1} \left[ \frac{1}{x^2 - hx - 1} \right]$ | d) None of these                                     |
- 5) A linear difference equation is an equation in which  $y_{n+2}, y_{n+1}, y_n$  occur in ..... degree.
 

|      |       |
|------|-------|
| a) 1 | b) 2  |
| c) 0 | d) -2 |
- 6) The order of the equation  $y_{n+2} + y_{n+1} + 2y_n = 0$  is .....
 

|      |                  |
|------|------------------|
| a) 1 | b) 3             |
| c) 2 | d) none of these |
- 7) The solution of the equation  $4y_n = y_{n+2}$  such that  $y_0 = 0$  and  $y_1 = 2$  is .....
 

|                                   |                                 |
|-----------------------------------|---------------------------------|
| a) $y_n = (2)^{n-1} + (-2)^{n-1}$ | b) $y_n = 2^{n+1} + (-2)^{n+1}$ |
| c) $y_n = (2)^n + (-2)^{-n}$      | d) $y_n = 2^n + (-2)^n$         |

- 8) Interpolation is the technique of estimate the value of a function for any.....
- Intermediate value of a constant
  - Intermediate value of a variable
  - Both a) and b)
  - none of these
- 9) The number of strips required in Simpson's  $(3/8)^{th}$  rule is multiple of .....
- 1
  - 2
  - 3
  - 4
- 10)  $\delta = \dots\dots\dots$
- $E^{1/2} + E^{-1/2}$
  - $E^{1/2} - E^{-1/2}$
  - $E\nabla$
  - $E(\Delta - 1)$

**B) Fill in the blanks for the following.****06**

- The Gauss backward interpolation formula is used to interpolate the value of  $y$  for \_\_\_\_\_.
- If  $f(x) = x^3 - 5x^2 + 10$  then  $\Delta^3 f(x) = \underline{\hspace{2cm}}$ .
- If  $\lambda_1, \lambda_2, \lambda_3$  are real and equal roots of difference equal then C.F. = \_\_\_\_\_.
- The Lagrange's interpolation formula for unequal intervals for  $n$  points is a polynomial of degree \_\_\_\_\_.
- Gauss forward interpolation formula is used to interpolate the value of  $y$  for \_\_\_\_\_.
- The relation between  $E$  and  $\Delta$  is \_\_\_\_\_.

**Q.2 Solve any eight of the following.****16**

- State Simpson's  $(1/3)^{rd}$  rule.
- With usual notation's prove that  $\nabla = 1 - E^{-1}$
- Solve the difference equation  $U_{n+3} - 5U_{n+1} + 6U_n = 0$
- State the Lagrange's interpolation formula.
- Evaluate  $\Delta^2 \cos 2x$ .
- Solve:  $y_{n+2} - 5y_{n+1} + 6y_n = 4^n$
- State Newton's - cotes quadrature formula.
- Evaluate  $\Delta^2(ab^x)$
- Find  $\cos(1.74)$  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 |

- Prove that  $\Delta({}^nC_{r+1}) = {}^nC_r$

**Q.3 A) Attempt any Two from the following.****10**

a) Evaluate.

i)  $\Delta^2 \left( \frac{5x+2}{x^2+5x+6} \right)$

ii) Prove that,  $\Delta^3 y_2 = \nabla^3 y_5$

b) Solve  $y_{x+1}^n - 3y_{x+1} \cdot y_x + 2y_x^2 = 0$

c) Given that :

|     |         |        |        |         |
|-----|---------|--------|--------|---------|
| $x$ | 0.1     | 0.2    | 0.3    | 0.4     |
| $y$ | 1.10517 | 1.2240 | 1.3498 | 1.49182 |

Find  $\frac{dy}{dx}$  at  $x = 0.4$ **B) State and prove Lagrange's interpolation formula.****06****Q.4 A) Attempt any Two of the following.****08**a) Evaluate  $\int_0^1 \frac{dx}{1+x^2}$  using

i) Trapezoidal rule taking  $h = 1/4$

ii) Simpson's  $(1/3)^{rd}$  rule taking  $h = 1/4$

iii) Simpson's  $(3/8)^{th}$  rule taking  $h = 1/4$

b) Prove that  $\mu = \frac{2+\Delta}{2\sqrt{1+\Delta}} = \sqrt{1+y_4\delta^2}$

c) Solve:  $y_{x+1}^2 - 3y_{x+1} y_x + 2y_x^2 = 0$

**B) Using Newton's backward difference formula, construct interpolation formula (polynomial) of degree three for the data****08**

$f(-0.75) = -0.718125, \quad f(-0.5) = -0.2475$

$f(-0.25) = 0.3349375, \quad f(0) = 1.10100$

hence find  $f(-y_3)$ **Q.5 Attempt any Two of the following.****16**

a) Solve:

i)  $y_{n+2} - 2 \cos \alpha \cdot y_{n+1} + y_n = \cos \alpha \cdot n$

ii)  $u_{n+3} - 2u_{n+2} - 5u_{n+1} + 6u_n = 0$

b) State and prove Newton's forward interpolation formula.

c) Find the polynomial  $f(x)$  by using Lagrange's formula and hence find  $f(4)$ .

|        |   |   |    |     |
|--------|---|---|----|-----|
| $x$    | 0 | 1 | 2  | 5   |
| $f(x)$ | 2 | 3 | 12 | 147 |

Set P

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
STATISTICS (Special Paper - XIV)  
Probability Theory (19201644)**

Max. Marks: 80

**Instructions:** 1) All questions are compulsory.  
2) Figure to right indicate full marks.  
3) Use of calculators is allowed.

10

- 1) If  $Y_5$  is the fifth order statistic of a random sample  $X_1, X_2 \dots X_{10}$ ;  $0 < X_i < 5$  then range of  $Y_5$  is \_\_\_\_\_.  
a)  $0 < y_5 < 1$   
b)  $0 < y_5 < 10$   
c)  $-10 < y_5 < 10$   
d)  $0 < y_5 < 5$
- 2)  $P(\text{at least one of } x_1, x_2, x_3, \dots, x_n \leq x) = \underline{\hspace{2cm}}$ .  
a) c.d.f. of  $n^{\text{th}}$  order statistics  
b) p.d.f. of  $n^{\text{th}}$  order statistics  
c) c.d.f. of  $1^{\text{st}}$  order statistics  
d) p.d.f. of  $1^{\text{st}}$  order statistics
- 3) W.L.L.N does not hold good for the sequence  $\{X_n\}$  of i.i.d r.v.  
a) Cauchy  
b) Chi-Square  
c) Normal  
d) Exponential
- 4) 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
- 5) The most famous example of convergence in distribution to standard normal distribution is \_\_\_\_\_.  
a) WLLN  
b) CLT  
c) convergence in probability  
d) None of these
- 6) If state 3 is absorbing state, then  $P_{32} = \underline{\hspace{2cm}}$ .  
a) 1  
b) 0  
c) less than 1  
d) 0.5

- 7) Which of the following is not a Stochastic matrix?
- a)  $P = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$
- b)  $P = \begin{bmatrix} 1/2 & 1/2 & 0 \\ 1/3 & 1/3 & 1/3 \\ 1/3 & 0 & 2/3 \end{bmatrix}$
- c)  $P = \begin{bmatrix} 1/2 & 2/3 & 0 \\ 1/2 & 1/2 & 0 \\ 0 & 1/3 & 2/3 \end{bmatrix}$
- d)  $P = \begin{bmatrix} 1/6 & 1/3 & 1/2 \\ 1/4 & 1/5 & 1/2 \\ 1/6 & 1/2 & 1/3 \end{bmatrix}$
- 8) In  $M/M/1:\infty$  /FIFO model the distribution of arrivals is \_\_\_\_.
- a) Poisson
- b) Geometric
- c) Uniform
- d) Exponential
- 9) Consider the following statements regarding Transition Probability Matrix (TPM).
- i) For TPM row sum must be 1
- ii) For TPM column sum must be 1
- a) only i) is true
- b) only ii) is true
- c) Both i) and ii) are true
- d) Neither i) nor ii) are true
- 10) In  $M/M/1:\infty$  /FIFO model the probability that the server is busy is \_\_\_\_.
- a)  $\rho$
- b)  $1 - \rho$
- c)  $\frac{1}{\rho}$
- d)  $1 - \frac{1}{\rho}$

**B) Fill in the blank.**

06

- 1) The probability density function of the largest order statistic  $X(n)$  is \_\_\_\_\_.
- 2) While deriving the p.d.f. of  $k^{\text{th}}$  order statistics we use concept of \_\_\_\_\_ distribution.
- 3) If  $X_n \xrightarrow{P} x$ , then  $(X_n - X) \xrightarrow{P}$  \_\_\_\_\_.
- 4) Transient state is also called as \_\_\_\_\_.
- 5) In usual notations, if  $\lambda = 5$  per hour and  $\mu = 4$  per hour then in  $M/M/1 : \infty / \text{FIFO}$  model, traffic intensity will be \_\_\_\_\_.
- 6) If the customer leaves the queue when he finds that the queue is too long then it is called \_\_\_\_\_.

**Q.2 Solve the following. (Any Eight)**

16

- In usual notations state the p.d.f of  $r^{\text{th}}$  order statistic.
- Find the c.d.f of  $n^{\text{th}}$  order statistic.
- Define convergence in quadratic mean.
- State the necessary and sufficient condition for existence of W.L.L.N.
- Write the density function of sample median (when  $n$  is odd).

- f) Define
  - i) Transient state
  - ii) Persistent state
- g) Define Irreducible Markov chain.
- h) Define first return probability of Markov chain.
- i) Define
  - i) Balking
  - ii) Reneging in queuing theory
- j) Write on service mechanism in queuing theory.

**Q.3 A) Attempt the following. (Any Two) 10**

- a) State and prove the WLLN for i.i.d. random variables.
- b) Workers come to a tool store room to inquire about the special tools for a particular job. Customers arrive at the store have Poisson distribution with average rate of 30 customers per hour. The average service time is minute and a half per customer. Find
  - i) Average queue length
  - ii) Expected number of customers in the system
  - iii) Average waiting time of worker in the queue
- c) A particle performs a random walk on the states  $\{0,1,2,3,4\}$ . Whenever it is at any position  $k(0 < k < 4)$ , it either moves to  $k + 1$  with probability  $p$ , or it moves to  $(k - 1)$  with probability  $q$ , or it remains at  $k$  with probability  $r(p + q + r = 1)$  in the next step. But as soon as it reaches to 0 (zero) it remains there with probability  $a$  and is reflected to state 1 with probability  $1 - a$ . similarly, when the particle reaches state 4, it remains there with probability  $b$  and it reflected to 3 with probability  $1 - b$ . Let  $X_n$  be the position of the particle after  $n$  steps. Construct TPM.

**B) If  $X_1, X_2, X_3, X_4$ , be the i.i.d random variable having common distribution function 06**

$$F(x) = 1 - e^{-3x}, x \geq 0$$

Find the expected value of first order statistic.

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

- a) For a random sample of size  $n$  from a distribution with pdf  $f(x)$  and and CDF  $F(x)$  obtain the cdf and pdf of first order statistics.
- b) Let  $\{X_n\}$  be a sequence of random variables defined by
 
$$P(X_n = 0) = 1 - \frac{1}{n}, P(X_n = 1) = \frac{1}{n}$$
 show that  $X_n \xrightarrow{P} \frac{1}{n}$
- c) For queuing model  $M/M/1 : (\infty / FCFS)$  with usual notation find the probability that queue size being greater than or equal to  $k$ .



**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 the following. (Any Two)** **16**

**a)** For a random sample of size  $n$  from a distribution with pdf  $f(x)$  and CDF  $F(x)$  obtain the distribution of  $r^{\text{th}}$  order statistics.

**b)** If  $X$  is  $B(100, 0.5)$  then find the approximate value of  $P(Y = 50)$  using CLT, where

$$Y = \frac{1}{n} \sum X_i \quad (P(Z \leq 1) = 0.8413 \quad P(Z \leq -1) = 0.1587 \quad Z \sim N(0, 1))$$

**c)** In  $M/M/1: \infty / FCFS$  model if the  $P_n$  = steady state probability that there are  $n$  customers in the system at a time  $t$  and is given by

$$P_n = \rho^n (1 - \rho), n = 0, 1, 2, \dots \text{ then find the expression for}$$

- i) expected length of the queue
- ii) expected length of the system

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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
GEOLOGY (Special Paper - XIV)  
Geomorphology and Geotectonic (19201653)**

Day & Date: Thursday, 30-10-2025  
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) According to sea-floor spreading, the age of the sea-floor should become younger towards a: \_\_\_\_\_  
 a) Constructive boundary      b) Conservation boundary  
 c) Destructive boundary      d) All of the above
- 2) "The present is the key to the past" is the principle of \_\_\_\_\_  
 a) Uniformalism  
 b) Unconformities  
 c) Uniformitarianism  
 d) Unified theories of geomorphology
- 3) Which of the following are not associated with convergent plate margins?  
 a) deep-focus earthquakes      b) rift valleys  
 c) island arcs      d) deep-sea trenches
- 4) Which among the following is called "Mushroom rocks"?  
 a) Pedestal rocks      b) Yardangs  
 c) Ventifacts      d) Desert pavements
- 5) The formation of Red sea between African and Arabian continental plate is the example of \_\_\_\_\_.  
 a) Oceanic divergence  
 b) Oceanic - continental convergence  
 c) Continental divergence  
 d) Oceanic - oceanic convergence
- 6) \_\_\_\_\_ 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

- 7) The composition of the mantle is equivalent to which of the following rock type \_\_\_\_\_.
  - a) Granite
  - b) Basalt
  - c) Peridotite
  - d) None of the above
- 8) Which one of the following is endogenic process?
  - a) Weathering
  - b) Erosion
  - c) Deposition
  - d) None of these
- 9) What is the name of the Mesozoic supercontinent that consisted of all of the present continents?
  - a) Eurasia
  - b) Laurasia
  - c) Pangaea
  - d) Gondwanaland
- 10) Ox-bow lakes, levees and flood plains are characteristics of \_\_\_\_\_ stage.
  - a) Youth
  - b) Mature
  - c) Old
  - d) None of these

**B) Fill in the blanks.**

06

- 1) Karst topography is related with \_\_\_\_\_ terrain.
- 2) \_\_\_\_\_ is the study of the record of the Earth's magnetic field in rocks or sediments.
- 3) Deep gorges are characteristically present in \_\_\_\_\_ stage
- 4) Compressive stresses, reverse faulting, granitic magmas, and intermediate depth earthquakes are associated with \_\_\_\_\_.
- 5) The variously shaped depressions of different dimensions that are developed in the riverbed are called \_\_\_\_\_.
- 6) The plates that make up the crust and the upper part of the mantle is \_\_\_\_\_.

**Q.2 Solve any eight of the following.**

16

- a) Name the types of plate boundaries.
- b) What is a Transform boundary?
- c) List the geological features related to convergent plate boundary.
- d) Name the any two types of drainage pattern.
- e) Braided streams are characteristics of which stage of river.
- f) What type of drainage pattern would you expect to find where rapid weathering along joints in bedrock controls the course of streams?
- g) Give two examples of exogenous processes.
- h) Define Hot spot.
- i) Name erosional features of wind.
- j) What is degradation?

**Q.3 A) Attempt any two of the following.**

10

- Describe the different gradation process with suitable examples.
- Explain the brief the karst topography and its features.
- Discuss the evidences to support continental drift theory.

- Q.3 B)** Write short note on mid oceanic ridge with neat labelled diagram. **06**
- Q.4 A) Attempt any two of the following. 08**
- a) Explain the causes of formation of Volcanic arc.
  - b) Write short note on evidences of sea floor spreading.
  - c) Describe transportation process by wind.
- B) Describe in detail epigenic and exogenic processes. 08**
- Q.5 Attempt any two of the following. 16**
- a) Explain in detail the three stages of river with its suitable features.
  - b) What are causes of rejuvenation? Explain with suitable examples.
  - c) Discuss the geological features related to convergent plate boundaries.

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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November – 2025  
MICROBIAL (Special Paper - XIV)  
Microbial Biochemistry (19201661)**

Day & Date: Thursday, 30-10-2025  
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 general mechanism is that an enzyme acts by: \_\_\_\_\_.
  - a) Reducing the activation energy
  - b) Increasing activation energy
  - c) Decreasing pH value
  - d) Increasing the pH value
- 2) Enzymes are made up of: \_\_\_\_\_.
 

|                  |             |
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| a) Fats          | b) Proteins |
| c) Nucleic acids | d) Vitamins |
- 3) Koshland proposed which model: \_\_\_\_\_.
 

|                       |                           |
|-----------------------|---------------------------|
| a) Fluid mosaic model | b) Induced fit model      |
| c) Lock and key model | d) Reflective index model |
- 4) Which of the following is not a step involved in purification?
  - a) Precipitation
  - b) Dialysis or ultrafiltration
  - c) Chromatographic techniques
  - d) Freezing technique
- 5) What is the name of the enzyme that catalyzes the initial carbon fixation step in the Calvin cycle?
 

|            |            |
|------------|------------|
| a) RuBisCO | b) PEPcase |
| c) ATPase  | d) Rubisco |
- 6) The process of converting inorganic sulfur compounds into organic sulfur-containing molecules is known as: \_\_\_\_\_.
 

|                        |                     |
|------------------------|---------------------|
| a) Sulfurization       | b) Sulfur cycling   |
| c) Sulfur assimilation | d) Sulfur reduction |

- 7) What is the role of the enzyme "sulfite reductase" in sulfur assimilation?
  - a) Converts sulfate to sulphite
  - b) Converts sulfite to sulfate
  - c) Converts sulfite to sulphide
  - d) Converts sulfide to sulfate
- 8) The Glyoxylate cycle does not operate in which of the following organisms?
 

|           |             |
|-----------|-------------|
| a) Plants | b) Bacteria |
| c) Fungi  | d) Humans   |
- 9) What is the main function of the pentose phosphate pathway?
  - a) Supply NADP<sup>+</sup>
  - b) Supply NADH
  - c) Supply energy
  - d) Supply pentoses and NADPH
- 10) Conversion of nitrogen to ammonia or nitrogenous compounds is termed as \_\_\_\_\_.
 

|                      |                          |
|----------------------|--------------------------|
| a) Nitrogen fixation | b) Nitrification         |
| c) Denitrification   | d) Nitrogen assimilation |

**B) One word answer question.****06**

- 1) Ammonia or ammonium is oxidized to nitrite followed by the oxidation of nitrite to nitrate is called \_\_\_\_\_
- 2) The process by which organisms incorporate substances from their environment into their own tissues is called as \_\_\_\_\_
- 3) RNA molecules which behave as Enzyme are called as \_\_\_\_\_
- 4) What is the end product of phosphoketolase pathway?
- 5) How biological affinity could be employed in enzyme purification
- 6) Peptidoglycan is a component of \_\_\_\_\_

**Q.2 Solve any eight of the following.****16**

- a) Define Enzyme.
- b) Long form of GOGAT
- c) What are Isozymes?
- d) Enlist the methods of purification of Enzymes on the basis of Molecular Size.
- e) Define Enzyme Unit.
- f) What is Bioluminescence?
- g) Enlist various intermediates of Glyoxylate bypass.
- h) What are the steps involved in carbon assimilation?
- i) Give names of purines and pyrimidines.
- j) What are the steps involved in the synthesis of proteins?

- Q.3 A) Attempt any two of the following. 10**
- a) Factors affecting the catalytic efficiency of Enzymes
  - b) Methods of Cell disruption for enzyme extraction
  - c) Allosteric Enzymes
- Q.3 B) Write a note on ED pathway. 06**
- Q.4 A) Attempt any two of the following. 10**
- a) Write a note on Biosynthesis of Peptidolycon
  - b) Describe the Induced fit model of enzyme action
  - c) Write a note on Sulphur Assimilation
- B) Discuss in detail Pyruvate as a key metabolite in carbohydrate metabolism. 06**
- Q.5 Attempt any two of the following. 16**
- a) Write a detailed account of Enzyme Immobilization.
  - b) Explain in detail the Derivation of the Michaelis - Menten equation.
  - c) Write a note on Carbon Assimilation.

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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
ELECTRONICS (Special Paper - XIV)  
Embedded System Design (19201677)**

Day & Date: Thursday, 30-10-2025  
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 for each of the following** **10**

- 1) In C programming, the 'format specifier' of float variable is \_\_\_\_\_  
a) %lf                                      b) %f  
c) %F                                        d) %Lf
- 2) State the invalid keyword in an embedded C programming.  
a) equal                                      b) int  
c) for                                         d) char
- 3) For developing the firmware for 8051 based embedded system \_\_\_\_\_ IDE is needed  
a) Pony Prog                                  b) Flash Magic  
c) Keil microVision                        d) Micro C.
- 4) For serial communication in 8051 normally the baud rate used is \_\_\_\_\_  
a) 9600                                        b) 4900  
c) 18000                                       d) All of these
- 5) The programming language used to program embedded system is \_\_\_\_\_  
a) Assembly                                  b) C  
c) Java                                         d) both assembly and C
- 6) In embedded C programming, the Superloop is constructed using \_\_\_\_\_ statement.  
a) for( ; ;)                                    b) while(1)  
c) Either a) or b)                            d) Both a) and b
- 7) The 8 bit microcontrollers are used in \_\_\_\_\_ embedded Systems  
a) Small Scale                                b) Medium Scale  
c) Sophisticated                              d) All of these
- 8) Which of the following statement is correct?  
a) A = {1, 2, 3, 4}                            b) A [2] = {1, 2, 3}  
c) A [4] = {1, 2, 3, 4}                       d) A [4] = {1, 2, 3}



- 9) 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; |
- 10) 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 |

**B) Answer the following.****06**

- 1) After execution of the statement  $X = Y * Z$ , where  $Y = 1.5$  and  $Z = 3$ , what is the value returned to X, if X variable is integer type?
- 2) Define of embedded system.
- 3) In 8051 Timer programming using C, who reflect the completion or overflow of counting?
- 4) Give the name of header file must be needed while developing C program for 8051 based system.
- 5) Give the sample of Input statement in C programming.
- 6) How many numbers of keywords are utilized for 8051 using C programming.

**Q.2 Solve any eight of the following.****16**

- a) Give the characteristics of an embedded system.
- b) Define constants and state its type in C programming.
- c) State the logical operations used in C language.
- d) Sketch structure of embedded system.
- e) Is data types available in C language? If yes, write.
- f) State the eight keyword of C programming.
- g) Sketch the DC motor interfacing to 8051.
- h) Write the syntax of 'if...else' statement in C programming.
- i) State any four applications of embedded system.
- j) Give the features of C programming.

**Q.3 A) Attempt any two of the following.****10**

- a) What is software delay? Write embedded C program for generation of square of at port P1 using software delay.
- b) With suitable diagram explain minimum hardware requirement for embedded system.
- c) With suitable diagram describe an interfacing of DAC to microcontroller 8051.

**Q.3 B) Discuss the operators with suitable C program.****06****Q.4 A) Attempt any two of the following.****08**

- a) Describe Superloop or Endlessloop in detail.
- b) Discuss local & global variable declaration in C language.
- c) Sketch the interfacing of 16 x 2 LCD to microcontroller.

**B)** Describe 'if' control statement with suitable example. **08**

**Q.5 Attempt any two of the following.** **16**

- a)** Describe 'loop' control statement with suitable example.
- b)** Describe designing of an embedded system for humidity measurement.
- c)** With suitable diagram & C programming, describe interfacing of ADC to 8051.

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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
COMPUTER SCIENCE (Paper - XV)  
Advanced Java (19201669)**

Day & Date: Thursday, 30-10-2025  
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) Choose correct alternative for each of the following** **10**

- 1) Which of the following methods can be used to get a RequestDispatcher object in a servlet?
  - a) getRequestDispatcher()
  - b) getServletRequest()
  - c) getDispatcher()
  - d) createDispatcher()
- 2) Which of the following methods is used to get the session ID from an HttpSession object?
  - a) getSessionId()
  - b) getId()
  - c) getSessionID()
  - d) getSession().getId()
- 3) Which of the following methods is used to insert data into a database using JDBC?
  - a) executeUpdate()
  - b) executeInsert()
  - c) execute()
  - d) executeData()
- 4) Which of the following is NOT an implicit object in JSP?
  - a) request
  - b) response
  - c) session
  - d) dbConnection
- 5) What is the lifecycle sequence of a servlet?
  - a) service() → init() → destroy()
  - b) init() → service() → destroy()
  - c) destroy() → service() → init()
  - d) service() → destroy() → init()
- 6) Which interface must a class implement to handle HTTP requests in a servlet?
  - a) Servlet
  - b) HttpServlet
  - c) HttpServletRequest
  - d) ServletRequest

- 7) Which of the following is true about JSP?
  - a) JSP is a server-side technology used to create dynamic web pages
  - b) JSP is used for client-side scripting
  - c) JSP is a programming language
  - d) JSP cannot interact with databases
- 8) Which JSP tag is used to display the value of an expression directly in the output?
  - a) `<%= %>`
  - b) `<jsp:out/>`
  - c) `<jsp:print />`
  - d) `<%= print() %>`
- 9) Which of the following JSP tags is used to set properties of a JavaBean?
  - a) `<jsp:setProperty>`
  - b) `<jsp:getProperty>`
  - c) `<jsp:useBean>`
  - d) `<jsp:setValue>`
- 10) Which JDBC driver is also called the "JDBC-ODBC bridge driver"?
  - a) Type 1 Driver
  - b) Type 2 Driver
  - c) Type 3 Driver
  - d) Type 4 Driver

**B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. 06**

- 1) \_\_\_\_\_ files is required to configure the ActionServlet in a Struts application.
- 2) \_\_\_\_\_ methods in PreparedStatement is used to set an integer parameter.
- 3) In Hibernate, \_\_\_\_\_ file is used for configuration.
- 4) \_\_\_\_\_ is the default value of the hibernate.hbm2ddl.auto configuration property in Hibernate.
- 5) \_\_\_\_\_ is used to include the content of another file in a JSP page.
- 6) Write the correct syntax to create a Statement object in JDBC.

**Q.2 Solve any eight of the following. 16**

- a) What is Hibernate?
- b) What is a JavaBean in JSP?
- c) What CGI?
- d) Write the use of struts.
- e) Write the steps to create application of HB.
- f) What are the advantages & disadvantages of JavaBean in JSP?
- g) Explain networking tag in JSP.
- h) What are the use of Hidden form filed?
- i) Define Servlet API.
- j) Which is an advantage of using Hibernate over JDBC?

- Q.3 A) Write short notes on any two of the following. 10**
- a) What is Session? Explain Session tracking mechanism in servlet.
  - b) Explain steps to create application of HB with example.
  - c) Write a program to create a simple Login and Registration page using JSP and a Servlet.
- B) What is Generator class and explain different types of Generator classes in Hibernate. 06**
- Q.4 A) Answer any two of the following. 08**
- a) Explain implicit object in JSP.
  - b) Explain servlet Life cycle.
  - c) Explain Architecture of struts.
- B) Short notes on Hibernate annotation. 08**
- Q.5 Solve the following. 16**
- a) What is JSTL and explain different types of JST tags in JSP.
  - b) Explain JavaBean in JSP with example.
  - c) Write a Java program using JDBC to perform the following tasks:
    - i) Establish a Connection to a Database
    - ii) Create a Table
    - iii) Insert Data into the Table
    - iv) Update Data
    - v) Retrieve and Display Data

Set P

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
PHYSICS (Paper - XVI)  
Atomic, Molecular Physics and Quantum Mechanics (19201621)**

Day & Date: Friday, 31-10-2025  
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 tables and calculators is allowed.

**Q.1 A) Multiple Choice Questions.**

10

- 1) The selection rule for pure vibrational spectra is \_\_\_\_\_.  
a)  $\Delta V = 0$   
b)  $\Delta V = \pm 1$   
c)  $\Delta V = \pm 2$   
d) Both a and b
- 2) The intensity of Rayleigh's line is \_\_\_\_\_ as compared to Raman lines.  
a) very high  
b) very low  
c) almost equal  
d) zero
- 3) Schrodinger's time dependent wave equation is based on the conservation of \_\_\_\_\_.  
a) mass  
b) energy  
c) momentum  
d) probability
- 4) The energy of particle which is moving in one dimensional rigid box is proportional to \_\_\_\_\_.  
a) square of length of the box  
b) reciprocal of square of length of the box  
c) length of box  
d) reciprocal of length of box
- 5) The minimum energy of a particle confined to one dimensional rigid box is obtained by substituting  $n =$  \_\_\_\_\_.  
a) 1  
b) 0  
c)  $\frac{1}{2}$   
d) 2
- 6) The momentum operator is given by \_\_\_\_\_.  
a)  $\frac{\hbar}{i} \frac{\partial^2}{\partial x^2}$   
b)  $i\hbar \frac{\partial}{\partial x}$   
c)  $\frac{\hbar}{i} \frac{\partial}{\partial x}$   
d)  $-\frac{\hbar}{i} \frac{\partial^2}{\partial x^2}$

- 7) Eigen value of  $L_z$  is \_\_\_\_\_.  
a)  $m^2\hbar$   
b)  $m\hbar^2$   
c)  $m\hbar$   
d)  $m\hbar$
- 8) The ratio of magnetic moment to the mechanical moment of orbital motion of electron is \_\_\_\_\_.  
a)  $e/2m$   
b)  $2e/m$   
c)  $e/m$   
d) None of these
- 9) Elements with electronic configuration  $ns^1$  for last orbit are called \_\_\_\_\_.  
a) alkaline earth metals  
b) inert gases  
c) halogens  
d) alkali metals
- 10) The ground state of single electron systems always give rise to \_\_\_\_\_.  
a) doublet  
b) triplet  
c) singlet  
d) quartet

**B) Fill in the blank.**

06

- 1) The zero-point energy of molecules is \_\_\_\_\_.
- 2) The separation between two successive energy levels of Harmonic oscillator is \_\_\_\_\_.
- 3) For a free particle the potential energy is \_\_\_\_\_.
- 4) Pure rotational spectra occur in \_\_\_\_\_.
- 5) The total Probability of wave function is always \_\_\_\_\_.
- 6) The magnitude of spin quantum number is \_\_\_\_\_.

**Q.2 Solve the following. (Any Eight)**

16

- What is Stokes and anti-stokes lines?
- Estimate rotational energy levels for  $J = 0, 1, 2, 3$ .
- What is Paschen-back effect?
- What is eigen value and eigen function?
- Give electronic configuration of Li, Na and K.
- Calculate the ground state energy of electron confined to move freely between two ends separated by  $2\text{\AA}$   
(Given:  $h = 6.626 \times 10^{-34} \text{ J.s}$ ,  $m = 9.1 \times 10^{-31} \text{ kg}$ )
- What is tunnel effect?
- Write any four observations of alkali spectra.
- Show that  $[x^2, P_x] = 2x i\hbar$
- What is an operator?

**Q.3 A) Answer the following. (Any Two)**

10

- Write a note on Frank-Condon principle.
- Explain zero-point energy in detail.
- Show that momentum operator commutes with Hamiltonian operator.

**Q.3 B) Answer the following:**

06

Explain spectrum of Sodium in brief.

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

- a) The force constant of CO is  $1840 \text{ Nm}^{-1}$ . Calculate its oscillation frequency.  
(Given:  $^{16}\text{O} = 15.9994 \text{ amu}$ ,  $^{12}\text{C} = 12 \text{ amu}$ ,  $1 \text{ amu} = 1.66 \times 10^{-27} \text{ kg}$ )
- b) Derive Schrodinger's time dependent wave equation in one dimension.
- c) State Anomalous Zeeman effect. Draw Zeeman effect on Sodium D lines.

**B) Answer the following. 08**

What is weak field Stark effect in hydrogen atom? Explain in detail and give selection rules.

**Q.5 Answer the following. (Any Two) 16**

- a) By separation of variables in spherical polar coordinates  $\Psi(r, \theta, \Phi) = R(r)\Theta(\theta)$  derive radial and angular parts from Schrodinger's equation for hydrogen atom.
- b) Apply Schrodinger's wave equation to a particle in 1D rigid box to calculate energy eigen values, give energy levels.
- c) Obtain an expression for rotational energy of a diatomic molecule with rotational energy levels.



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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November – 2025  
CHEMISTRY (Special Paper - XV)  
Organic Chemistry (19201612)**

Day & Date: Friday, 31-10-2025  
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) Choose the most correct alternatives for each of the following. 10**

- The active ingredient of pyrethrum is \_\_\_\_\_.  
a) alcohol                                      b) acid  
c) ester                                          d) cyano
- Pyrrole undergo electrophilic substitution reactions preferentially at position \_\_\_\_\_.  
a) 1                                                  b) 2  
c) 3                                                  d) 4
- \_\_\_\_\_ is provitamin of vitamin A.  
a) Ergosterol                                      b)  $\beta$ -carotene  
c) p-nitrobenzene                                  d) isoprene
- Natural dye is \_\_\_\_\_.  
a) picric acid                                      b) indigo  
c) thioindigo                                      d) None of these
- Skraup's synthesis is used to prepare \_\_\_\_\_.  
a) Indole                                              b) Pyrrole  
c) Quinoline                                          d) Pyridine
- The colour of compound is due to the presence of \_\_\_\_\_ group.  
a) chromophore                                      b) auxochrome  
c) bathochrome                                      d) hypsochrome
- Mutarotation is catalyzed by \_\_\_\_\_.  
a) acid                                                  b) base  
c) acid and base                                      d) metal
- Paludrine is used as \_\_\_\_\_ agents.  
a) antimalarial                                      b) antitubercular  
c) antidiabetics                                      d) antimicrobial

- 9) Starch is a \_\_\_\_\_.  
a) trisaccharide                      b) amylose  
c) amylopectin                        d) amylose and amylopectin
- 10) Among the following \_\_\_\_\_ is an antidiabetic agent.  
a) Paludrine                            b) Ethambutol  
c) Tolbutamide                        d) Isoniazid

**B) Fill in the blank.**

06

- 1) Alizarin belong to the class of \_\_\_\_\_ dye.
- 2) Ibuprofen is an \_\_\_\_\_ agent.
- 3) In Skraup's synthesis, \_\_\_\_\_ is used as an oxidizing agent.
- 4) Adrenaline contains \_\_\_\_\_ hydroxyl groups.
- 5) Polysaccharides are also known as \_\_\_\_\_.
- 6) Baygonis chemically known as \_\_\_\_\_.

**Q.2 Answer the following: (Any Eight)**

16

- a) How will you synthesize pyrrole from,
  - i) Acetylene
  - ii) Furan
- b) What are carbohydrates? Draw the open chain structure of D-glucose.
- c) Explain in brief the structure of Adrenaline.
- d) What is the action of p-nitrobenzoic acid and manganese dioxide on Vitamin A?
- e) Define the terms:
  - i) Anesthetics
  - ii) Antineoplastic agents
- f) What are disaccharides? Write the structure of Sucrose.
- g) Write the synthesis of isoniazid drug.
- h) How will you prepare 2-pyridone 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 the following. (Any Two)**

10

- What are hormones? Write about the Hems synthesis for thyroxine hormone.
- Write the classification of dyes based on the chemical composition.
- What are pyrethroids? Discuss the method of isolation, structure and uses of pyrethroids.

**B) Write a short note on**

06

- Basic character of pyrrole
- Baygon

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

- a) What are heterocyclic compounds? Give the methods of synthesis of pyridine.
- b) Discuss the analytical evidence put forth in support of structure of Vitamin A.
- c) Explain Witt's theory for chromophore and auxochrome.

**B) Answer the following questions.** **08**

- a) What happens when glucose is treated with,
  - i) Red P/HI
  - ii) Acetic anhydride
  - iii) Conc.  $\text{HNO}_3$
  - iv)  $\text{NH}_2\text{OH}$
- b) Give the synthesis and uses of Phenobarbitone.

**Q.5 Answer the following. (Any Two)** **16**

- a) What are antibiotics? Explain Penicillin-G with respect to,
  - i) Structure
  - ii) Types
  - iii) Acidic hydrolysis
  - iv) 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?
  - i) Conc.  $\text{HNO}_3$  + Conc.  $\text{H}_2\text{SO}_4$
  - ii)  $\text{SO}_3 - \text{H}_2\text{SO}_4/220^\circ\text{C}$
  - iii)  $\text{NaNH}_2/\Delta$
  - iv)  $\text{C}_4\text{H}_9\text{Li}$
  - v)  $\text{C}_6\text{H}_5\text{Li}$
  - vi) Na in liquid  $\text{NH}_3$
  - vii)  $\text{H}_2/\text{Ni}, 150^\circ\text{C}, 160 \text{ atm}$
  - viii)  $\text{H}_2 - \text{Pt}/\text{CH}_3\text{COOH}$

Set P

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
BOTANY (Special Paper - XV)  
Cell Biology (19201603)**

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.
- 4) Use of log tables and calculators is allowed.

10

- 1) The form of cell division which results in the creation of gametes or sex cells is \_\_\_\_\_.
  - a) Mitosis
  - b) Meiosis
  - c) Miosis
  - d) None of the above
- 2) Nuclear DNA replicates in the \_\_\_\_\_ phase.
  - a) G1
  - b) G2
  - c) S
  - d) G1&G2
- 3) The condensation of chromosomes is observed in \_\_\_\_\_.
  - a) Prophase I
  - b) Metaphase I
  - c) Anaphase I
  - d) Telophase I
- 4) The cell organelle that traps the sunlight is \_\_\_\_\_.
  - a) Chloroplast
  - b) Ribosomes
  - c) Mitochondria
  - d) Golgi complex
- 5) The non-sex chromosomes are known as \_\_\_\_\_.
  - a) Autosomes
  - b) Allosomes
  - c) lysosomes
  - d) Oxsomes
- 6) The spindle apparatus is formed during the \_\_\_\_\_ of mitosis.
  - a) Telophase
  - b) Metaphase
  - c) Prophase
  - d) Anaphase
- 7) Synapsis is defined as the pairing of \_\_\_\_\_.
  - a) Acentric chromosomes
  - b) Non-homologous chromosomes
  - c) Any chromosomes
  - d) Homologous chromosomes

- 8) Cyclin is associated with \_\_\_\_\_.
  - a) Mitosis
  - b) Cytolysis
  - c) Glycolysis
  - d) Leptospirosis
- 9) Mitosis represents the \_\_\_\_\_ traits.
  - a) Somatic
  - b) Gametic
  - c) Asexual
  - d) None of the above
- 10) The chromosome number present in the human being is \_\_\_\_\_.
  - a) 42
  - b) 43
  - c) 44
  - d) 46

**B) Fill in the blank/Definition/One sentence answer/ One word answer.** **06**

- 1) The cell cycle is regulated by \_\_\_\_\_.
- 2) In \_\_\_\_\_ stage of meiosis, synapsis takes place.
- 3) Balbiani rings are present in \_\_\_\_\_ chromosomes.
- 4) The \_\_\_\_\_ microscope is used to study the ultra-structure of cell organelles.
- 5) The G<sub>1</sub>, S and G<sub>2</sub> are the stages of \_\_\_\_\_.
- 6) \_\_\_\_\_ is the powerhouse of cell.

**Q.2 Solve the following. (Any Eight) 16**

- a) What is Microscopy?
- b) Define cell.
- c) Define chromosome.
- d) Give any two functions of Cell wall.
- e) Sketch and label the Endoplasmic reticulum.
- f) Give any two functions of Nucleus.
- g) Define Karyotype.
- h) What is mean by cell cycle?
- i) Enlist the components of Eukaryotic cell.
- j) Define Cytokinesis.

**Q.3 A) Write short notes on the following: (Any Two) 10**

- a) Sample preparation for light microscopy
- b) Components of Eukaryotic cell
- c) Anaphase of mitosis

**B)** Explain types of chromosomes on the basis of position of centromere. **06**

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

- Describe the principle and uses of scanning transmission electron microscopy.
- Define mitochondria and explain its ultrastructure with suitable diagram.
- Explain types of Endoplasmic reticulum.

**B)** Describe Eukaryotic cell with suitable diagram. **08**

**Q.5 Attempt the following. (Any Two)** **16**

- a)** Describe the stages of meiosis -I with labelled diagram.
- b)** Explain the ultrastructure and functions of chloroplast.
- c)** Explain the principle of phase contrast microscopy.

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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
ZOOLOGY (Special Paper-XV)  
Animal Behavior and Chronobiology (19201629)**

Day & Date: Friday, 31-10-2025  
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) Multiple choice question.**

**10**

- 1) Ivan Pavlov worked with \_\_\_\_ for classical conditioning experiment.
  - a) Cat
  - b) Dog
  - c) Horse
  - d) Donkey
- 2) An endogenously generated rhythms with a period close to 24 hrs is \_\_\_\_\_.
  - a) Circannual rhythm
  - b) Circadian rhythm
  - c) Diurnal rhythm
  - d) Ultradian rhythm
- 3) On the ground ants leave a trail of pheromone for others to follow, this is an example of use of \_\_\_\_\_ senses for communication.
  - a) Auditory
  - b) Tactile
  - c) Visual
  - d) Olfactory
- 4) Symptoms of \_\_\_\_\_ disease increases progressively during nighttime.
  - a) Cardiovascular
  - b) Allergy
  - c) Asthma
  - d) Diabetes
- 5) Gradual decrease in response to repeated exposure to same stimulus if found to be harmless is called as \_\_\_\_\_.
  - a) Imprinting
  - b) Habituation
  - c) Selection
  - d) Fixation
- 6) Melatonin is produced by \_\_\_\_\_ gland.
  - a) Adrenal
  - b) Pancreas
  - c) Pineal
  - d) Thyroid
- 7) Pronounced differences between male and female is called as \_\_\_\_\_.
  - a) Polymorphism
  - b) Dimorphism
  - c) Metamorphism
  - d) Sexual dimorphism

- 8) Self-destructive behaviour performed for the wellbeing of others is known as \_\_\_\_\_.  
a) Polyandry                      b) Altruism  
c) Polygyny                        d) Mutualism
- 9) In honeybee society fertile is \_\_\_\_\_.  
a) Female                          b) Male  
c) Queen                          d) Fertile worker
- 10) Karl Van Frisch received Nobel prize in the year \_\_\_\_\_.  
a) 1963                              b) 1973  
c) 1965                              d) 1975

**B) One sentence answer.**

06

- 1) Chronomedicine
- 2) Chronobiology
- 3) Altruism
- 4) Biological clock
- 5) Sexual dimorphism
- 6) Phototaxis.

**Q.2 Solve the following. (Any Eight)**

16

- a) Give examples of verbal-vs-non-verbal communication.
- b) Give any two types of biological rhythms.
- c) List two important contributions of Charles Darwin in behavioral science.
- d) Reciprocal altruism with one example.
- e) Define meaning of ultimate cause of behaviour.
- f) Worker honeybee
- g) Mention the contribution of Thorndike and Skinner in ethology.
- h) Give two examples of acquired/learned behaviors.
- i) Differentiate the meanings of 'nature-vs-nurture' in behavior.
- j) Enlist contributions of E.O. Wilson in ethology.

**Q.3 A) Attempt the following. (Any Two)**

10

- Explain origin and history of Ethology.
- Explain Instinct and learned behaviour.
- Describe foraging and dance behaviour of honeybees.

**B) Short note/Solve.**

06

Explain role of melatonin in biological rhythm.

**Q.4 A) Attempt the following. (Any Two)**

08

- Give adaptive significance of biological clocks.
- Describe Inter-sexual selection.
- Explain types of communication.

**B) Describe/Explain/Solve.**

08

Give a short account on Ivan Pavlov expt on dog with suitable illustration.



**Q.5 Attempt the following. (Any Two)**

**20**

- a)** Explain types and characteristics of biological rhythm.
- b)** Describe dance language in honeybee and its advantages.
- c)** Write a brief profile of Karl Von Frish contributions in behavioral biology & add a of his work.

Set P

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
MATHEMATICS (Special Paper - XV)  
Graph Theory (19201637)**

Day & Date: Friday, 31-10-2025  
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

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

**Q.1 A) Select the most correct alternative.**

10

- The number of elements in the adjacency matrix of a graph having 4 vertices is \_\_\_\_\_.  
a) 10                      b) 16  
c) 20                      d) 25
- A graph with one vertex and no edges is \_\_\_\_\_.  
a) Multigraph            b) Diagraph  
c) Isolated graph       d) Trivial graph
- Conversion of decimal number  $(29)_{10}$  to hexadecimal number is \_\_\_\_\_.  
a) 1F                      b) 1E  
c) 1B                      d) 1D
- A given graph  $G$  is a Euler graph if and only if all vertices of  $G$  are of \_\_\_\_\_.  
a) Same degree          b) Even degree  
c) Odd degree           d) Different degree
- The maximum number of edges in a simple graph with  $n$  vertices is \_\_\_\_\_.  
a)  $\frac{n(n-1)}{2}$                       b)  $n(n-1)$   
c)  $n(n+1)$                       d)  $\frac{n(n+1)}{2}$
- If  $G = (V, E)$  be an undirected graph with  $e$  edges. Then  $\sum_{v \in V} deg_G(v) =$  \_\_\_\_\_.  
a)  $e$                       b)  $2e$   
c)  $\frac{e}{2}$                       d)  $e + 1$

- 7) A simple graph with at least two vertices has at least \_\_\_\_\_ vertices of same degree.  
a) one                                      b) two  
c) three                                     d) not exists
- 8) A complete bipartite graph  $K_{m,n}$  is not a regular graph if \_\_\_\_\_.  
a)  $m > n$                                 b)  $m < n$   
c)  $m = n$                                   d)  $m \neq n$
- 9) Let  $G$  be a Null graph, then \_\_\_\_\_.  
a)  $V(G) = \phi$                               b)  $E(G) = \phi$   
c)  $|E(G)| = \text{Even}$                         d)  $|E(G)| = \text{Odd}$
- 10) Conversion of decimal number  $(22)_{10}$  to binary number is \_\_\_\_\_.  
a)  $(11011)_2$                                 b)  $(10111)_2$   
c)  $(10110)_2$                                 d)  $(11100)_2$

**B) Fill in the Blank.**

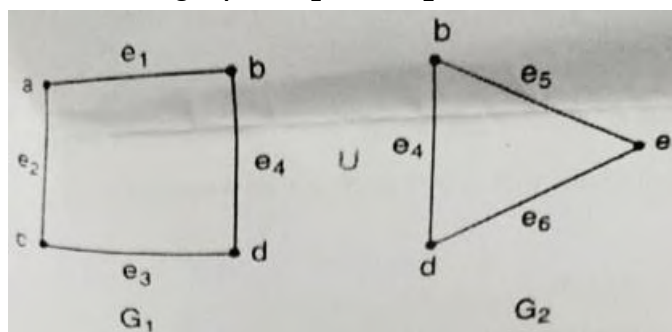
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- 1) The order of the incidence matrix corresponding the graph with  $n$  vertices and  $m$  edges is \_\_\_\_\_.
- 2) The number of vertices in a binary tree is always \_\_\_\_\_.
- 3) If  $G$  is a connected graph with  $n$  vertices and  $m$  edges, spanning tree of  $G$  must have \_\_\_\_\_ edges.
- 4) A graph in which loops and multiple edges are allowed, is called a \_\_\_\_\_.
- 5) A tree  $T$  with  $n$  vertices has \_\_\_\_\_ edges.
- 6) A complete graph  $G$  with  $n$  vertices has \_\_\_\_\_ edges.

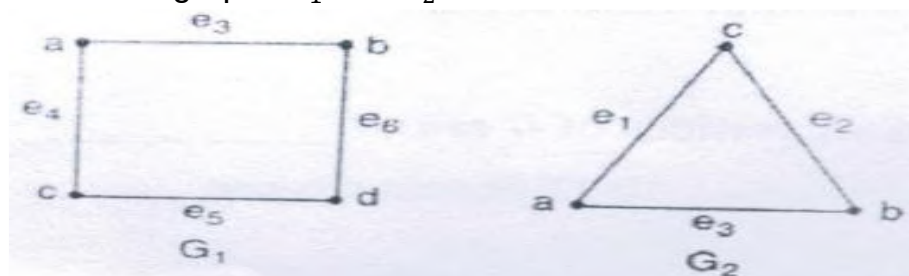
**Q.2 Attempt the following (Any Eight)**

16

- a)** Given two graphs  $G_1$  and  $G_2$ . Then find their union

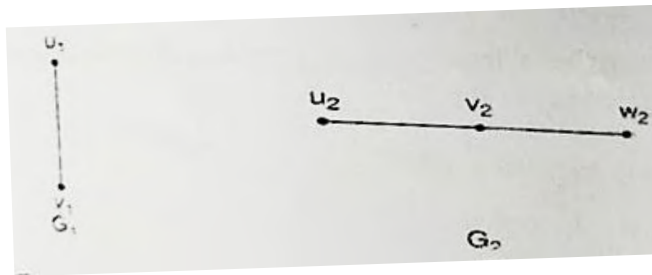


- b)** Given two graphs  $G_1$  and  $G_2$ . Then find their intersection



- c) Draw the graph of the chemical molecules of methane ( $\text{CH}_4$ ).

- d) Given two graphs  $G_1$  and  $G_2$ . Then find their product.



- e) Represent the expression in a binary tree  $[(A + B)/C] + D$   
 f) What is the value of prefix expression?  $- * 2/842$   
 g) What is the value of postfix expression?  $678 + -$   
 h) What is the difference between path and circuit?  
 i) How many vertices and how many edges does a  $K_{m,n}$  graph has?  
 j) Draw the graph having four vertices of degree 1, 1, 3, and 3.

**Q.3 A) Attempt the following (Any Two)**

**10**

- a) For any positive integer  $n$ , if  $G$  is a connected graph with  $n$  vertices and  $n - 1$  edges then prove that  $G$  is tree.  
 b) Convert the binary number  $(1110101110)_2$  to octal number.

- c) Draw the graph of the incidence matrix
- $$\begin{bmatrix} 1 & 1 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 \end{bmatrix}$$

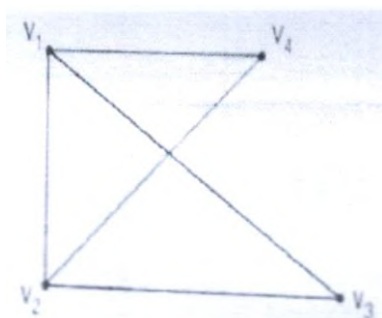
- B) Solve: Convert the octal number  $(1773)_8$  to hexa decimal number.**

**06**

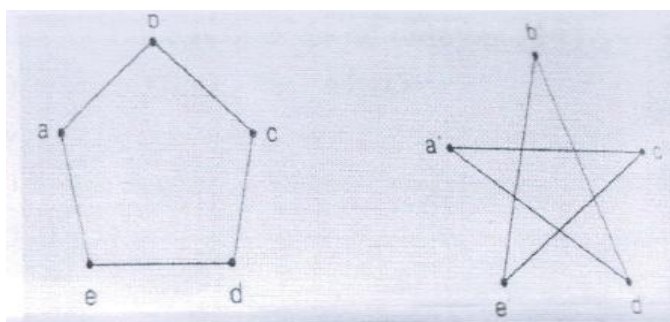
**Q.4 A) Answer the following. (Any Two)**

**08**

- a) Find all spanning trees of the graph  $G$  shown in figure.



- b) Show that the following graphs are isomorphic.



- c) Convert the hexadecimal number  $(AB2.23C)_{16}$  to binary equivalent.

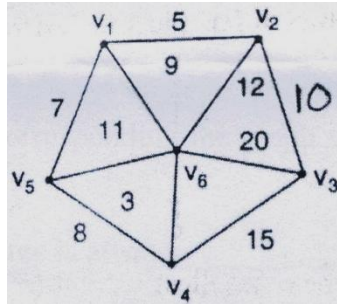
**B)** Draw the directed graph represented by the given adjacency matrix. **08**

$$\begin{bmatrix} 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

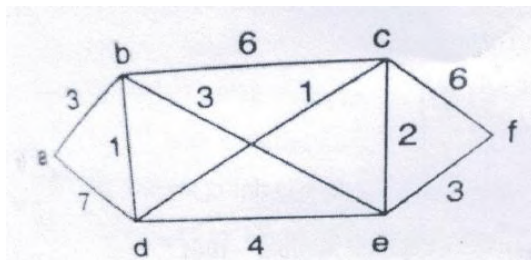
**Q.5 Attempt the following. (Any Two)**

**16**

- a)** Using Kruskal's algorithm finds a minimal spanning tree of the following graph.



- b)** Apply Dijkstra's algorithm to the graph given below and find the shortest path from *a* to *f*.



- c)** Convert the octal number  $(65.175)_8$  into binary equivalent.

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Set **P**

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November – 2025  
STATISTICS (Special Paper - XV)  
Designs of Experiments (19201645)**

Day & Date: Friday, 31-10-2025  
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 statistical table and calculators is allowed.

**Q.1 A) Choose correct alternative from the following: 10**

- 1) In LSD having  $m$  rows, the degrees of freedom for treatment is \_\_\_\_\_.  
 a)  $(m - 1)(m - 2)$                       b)  $m - 1$   
 c)  $m^2 - 1$                                   d)  $N - m$
- 2) In LSD, if mean sum of squares due to columns = 36 and mean sum of square due to error = 12 then F ratio will be: \_\_\_\_\_.  
 a) 1                                              b) 2  
 c) 3                                              d) 4
- 3) LSD controls: \_\_\_\_\_.  
 a) two-way variation                      b) three-way variation  
 c) multi-way variation                    d) None of these
- 4) In LSD with 6 treatments with two missing observations, the error degrees of freedom will be: \_\_\_\_\_.  
 a) 20                                            b) 19  
 c) 18                                            d) 17
- 5) In RBD, the following principles of design of experiment are applied: \_\_\_\_\_.  
 a) Randomization and local control  
 b) Replication and local control  
 c) Randomization and replication  
 d) Randomization, replication and local control
- 6) If the same factorial effect is confounded in all the replicates, it is known as \_\_\_\_\_.  
 a) Partial confounding                    b) Complete confounding  
 c) Conservative confounding            d) All of these

- 7) A RBD has: \_\_\_\_\_.  
 a) two-way classification                      b) one-way classification  
 c) three-way classification                    d) no classification
- 8) A Latin square design is a: \_\_\_\_\_.  
 a) one restrictional design                      b) two restrictional design  
 c) three restrictional design                    d) non- restrictional design
- 9) In RBD, we always have: \_\_\_\_\_.  
 a) no. of blocks = no. of treatments  
 b) no. of blocks > no. of treatments  
 c) no. of blocks < no. of treatments  
 d) None of these
- 10) The formula for estimating one missing value in a RBD having 'b' blocks and 'k' treatments with usual notations is: \_\_\_\_\_.  
 a)  $\frac{bT' + kB' - G'}{(b-1)(k-1)}$                       b)  $\frac{bB' + bT' - G'}{(b-1)(k-1)}$   
 c)  $\frac{bT' + kB' - kG'}{(b-1)(k-2)}$                       d)  $\frac{bB' + kT' - G'}{(b-1)(k-1)}$

**B) Attempt the following:****06**

- 1) Compute M.S.S., if S.S. = 12 and d.f. = 3.
- 2) Write full form of ANOVA.
- 3) State mathematical model used in CRD.
- 4) State the parameters in RBD.
- 5) State any one principle of DEO.
- 6) State types of confounding.

**Q.2 Attempt the following. (Any Eight)****16**

- a) Define yield in design of experiments.
- b) State mathematical model used in RBD.
- c) Define efficiency of design of experiment.
- d) Explain the term Treatment.
- e) Define experimental unit.
- f) State the formula to find a missing observation in LSD.
- g) State the formula to find M.S.S.
- h) State the headings of columns in ANOVA table.
- i) Define block.
- j) Define replication.

**Q.3 A) Attempt the following. (Any Two)****10**

- a) Explain total confounding.
- b) Give layout of CRD.
- c) Estimate the parameters in CRD.

**Q.3 B) What is RBD? Give its layout.****06**

- Q.4 A) Attempt the following. (Any Two) 08**
- a) Derive the expressions for main and interaction effects in  $2^2$  factorial experiments.
  - b) Derive the formula for one missing observation in RBD.
  - c) Explain partial confounding.
- B) State mathematical model, assumptions and analysis of variance table in case of LSD. 08**
- Q.5 Attempt the following. (Any Two) 16**
- a) Explain Yate's procedure to obtain factorial effect totals in  $2^2$  factorial experiments.
  - b) Derive the formula for one missing observation in CRD.
  - c) Estimate the parameters in LSD.



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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
GEOLOGY (Special Paper - XV)  
Environmental Geology (19201654)**

Day & Date: Friday, 31-10-2025  
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) Rewrite the sentence by filling the blanks with the correct answer from the given options. 10**

- 1) The illegal underground mining of coal in Bihar causes \_\_\_\_\_.  
 a) Flood  
 b) Subsidence  
 c) Rapid solution of limestone near the surface  
 d) All of these reasons given in a, b & c.
- 2) The Gabion structure reduces hazard of \_\_\_\_\_.  
 a) Flood  
 b) Tsunami  
 c) Landslide  
 d) Volcano
- 3) What is the climate like at 10-degree Latitude?  
 a) Very cold  
 b) Cold & less precipitation  
 c) Tropical  
 d) Hot & stormy
- 4) Solution of reducing the slope angle is used to prevent \_\_\_\_\_.  
 a) Flood  
 b) Tsunami  
 c) Subsidence  
 d) Landslide
- 5) What is the main symptom that is associated with the upcoming volcanic hazard?  
 a) Rise in groundwater temperature  
 b) Water breaking the limits of banks  
 c) Volent sea waves  
 d) Heavy rain
- 6) Which type of slope causes most destructive landslides generally?  
 a) Gentle slopes  
 b) Intermediate slopes  
 c) Steep slopes  
 d) leveled ground
- 7) Which is the common hazard associated with almost all Volcanoes?  
 a) Earthquake  
 b) Cyclone  
 c) Tsunami  
 d) Sea level fall

- 8) Which structure is built along the bank of a river to control floods?  
 a) Retention walls                      b) Mesh  
 c) Bolt and plates                      d) Artificial Levee
- 9) In which geological hazard situation, the gas masks are used?  
 a) Cyclone                                  b) Tsunami  
 c) Landslide                                d) Volcano
- 10) What is the Climatic set-up of Tibet?  
 a) Rain shadow & cold                  b) Very cold  
 c) Rainy & cold                          d) Humid & cold

**B) Answer the following:****06**

- 1) Define Liquefaction.
- 2) Define solar energy.
- 3) Define the fall type of mass movement.
- 4) Define meshing solution for the landslide.
- 5) Define landslide.
- 6) Define creep type of mass movement.

**Q.2 Answer the following. (Any Eight)****16**

- a) What is the atmosphere?
- b) What is lithosphere?
- c) What is the role of vegetation in a landslide?
- d) What is a retention wall?
- e) What is the relation of time and rain in a landslide?
- f) What is the role of urban sewage disposal in landslides?
- g) Write down the two symptoms of the earthquake?
- h) What is the role of water bodies in energy balance?
- i) What are two causes of an avalanche?
- j) What is the greenhouse effect?

**Q.3 A) Attempt the following. (Any Two)****10**

- a) Explain in detail about the field methods to predict the upcoming volcanic activities.
- b) Explain any five effects of volcanic hazards.
- c) Explain five preparedness measures of flood hazard.

**B) Explain Coriolis effect & its relation to earth's climate.****06****Q.4 A) Attempt the following. (Any Two)****08**

- a) Explain the volcanic hazard preparedness
- b) Explain the causes of climate change.
- c) Explain the effects of climate change.

**B) Explain the energy budget of the earth.****08**

**Q.5 Attempt the following. (Any Two)**

**16**

- a)** Explain the elements of disaster management.
- b)** Explain the causes & effects of drought.
- c)** Explain the energy crisis and add note on alternative energy resources.

Set P

**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
MICROBIOLOGY (Special Paper-XV)  
Clinical Microbiology (19201662)**

Day & Date: Friday, 31-10-2025  
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) AIDS is caused by \_\_\_\_\_.
  - a) Retroprison
  - b) Prion
  - c) Rhabdovirus
  - d) Retrovirus
- 2) Which of the following is a bacterial disease?
  - a) Leprosy
  - b) Rabies
  - c) Malaria
  - d) Cryptococcosis
- 3) Treatment given or action taken to prevent disease is called \_\_\_\_\_.
  - a) Treatment
  - b) Prophylaxis
  - c) Anaphylaxis
  - d) Ingestion
- 4) In Bacteria Penicillin acts as \_\_\_\_\_.
  - a) Broad spectrum antibiotic
  - b) Narrow spectrum antibiotic
  - c) Bad antibiotic
  - d) Aminoglycoside type of antibiotic
- 5) Mechanism of Action of Mechanism of Action of Quinolones is \_\_\_\_\_.
  - a) It Inhibits Bacterial Protein Synthesis
  - b) It inhibits Bacterial Cell Wall Synthesis
  - c) It inhibits intake of folic acid
  - d) It inhibits DNA gyrase
- 6) Which of the following parasite is a common cause of diarrhea in humans and some animals?
  - a) *Leishmania donovani*
  - b) *Toxoplasma gondii*
  - c) *Giardia lamblia*
  - d) *Pneumocystis carinii*
- 7) The Color code of plastic bag for disposing of Microbial Laboratory culture waste?
  - a) Black
  - b) Red
  - c) Blue
  - d) White

- 8) Naglers reaction is shown by \_\_\_\_\_  
 a) *Clostridium tetani*                      b) *Mycobacterium leprae*  
 c) *Helicobacter pylori*                      d) *Clostridium perfringens*
- 9) Which of the following resistance mechanisms is the most nonspecific to a particular class of antimicrobials?  
 a) Drug modification                      b) Target mimicry  
 c) Efflux pump                                d) Target modification
- 10) Which of the following areas has the lowest chance of producing a biomedical waste?  
 a) Hospitals                                      b) Clinics  
 c) Agriculture Land                            d) Laboratories

**B) Fill in the blank/Definition/One sentence answer/ One word answer/ Give the name/Predict the product etc. 06**

- 1) Draw a neat, labeled diagram of structure of HIV.
- 2) What are Fomites?
- 3) What are Acid fast Bacteria?
- 4) What is the selective media used for *Vibrio cholera*?
- 5) What are toxoids?
- 6) Define 'Pathogenicity'.

**Q.2 Solve the following. (Any Eight) 16**

- a) What is diagnosis?
- b) What is microbial invasion?
- c) Give examples of any two fungal diseases.
- d) What is Epidemiology?
- e) How is Ebola disease transmitted?
- f) Which pigments are formed by *Pseudomonas aeruginosa*?
- g) Give the significance of Lepromin test.
- h) Enlist the chemotherapeutic agents that inhibit Protein synthesis
- i) Enlist ideal characteristics of biological weapons.
- j) How does Swine flu spreads?

**Q.3 A) Attempt the following. (Any Two) 10**

- a) Lepromatous leprosy.
- b) Virulence factors of *Vibrio cholera*.
- c) Rabies disease.

**B) Write a short note on the mechanism of antibiotic resistance 06**

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

- a) Explain the mechanism of drugs Acting on folic acid synthesis.
- b) Use of microbes in Bioterrorism.
- c) Disposal of sharp devices and culture media.

**B) Write a brief essay on vaccines. 08**

**Q.5 Attempt the following. (Any Two)**

**16**

- a)** What is beta-lactam antibiotics? Give a detailed account of the mode of action of penicillin.
- b)** Write an essay on Malaria.
- c)** Write a note on Types & mechanism of action of Bacterial toxins.

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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November – 2025  
ELECTRONICS (Special Paper - XV)  
Electronics Instrumentation (19201678)**

Day & Date: Friday, 31-10-2025  
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 tables and calculators is allowed.

**Q.1 A) Multiple choice questions.****10**

- 1) In multichannel data acquisition system \_\_\_\_\_ unit is used to scan the conditioned outputs from different channels.
  - a) Buffer
  - b) Controller
  - c) A/D converter
  - d) Multiplexer
- 2) In case of CRO, the delay line circuit is introduced in \_\_\_\_ channel.
  - a) Horizontal
  - b) Vertical
  - c) Dual
  - d) None of these
- 3) The AD594/595 is precalibrated precision amplifier to produce output voltage \_\_\_\_\_ from thermocouple signal.
  - a) 1 mV/ $^{\circ}\text{C}$
  - b) 10  $\mu\text{V}/^{\circ}\text{C}$
  - c) 10 mV/ $^{\circ}\text{C}$
  - d) 1  $\mu\text{V}/^{\circ}\text{C}$
- 4) The \_\_\_\_\_ method is employed in magnetic tape recording.
  - a) direct recording
  - b) frequency modulation
  - c) pulse code modulation
  - d) All of these
- 5) The frequency generator utilizes \_\_\_\_\_ to produce the frequency.
  - a) integrator
  - b) differentiator
  - c) both a and b
  - d) amplifier
- 6) The programmable instrumentation amplifier has \_\_\_\_\_.
  - a) low offset voltage
  - b) low offset voltage drift
  - c) low noise
  - d) All of these
- 7) In X-Y recorders, the self-balancing potentiometers plot emf as a function of \_\_\_\_\_.
  - a) Another emf
  - b) Frequency
  - c) Time
  - d) Pressure

- 8) The Basic pH scale Ranges from \_\_\_\_\_.
  - a) 7 to 10
  - b) 0 to 10
  - c) 0 to 14
  - d) 7 to 14
- 9) The \_\_\_\_\_ techniques are used to eliminate noise or interference in the signal.
  - a) grounding
  - b) electrostatic shielding
  - c) electromagnetic shielding
  - d) All of these
- 10) The signal conditioning systems are required to perform \_\_\_\_\_ process in all the measurement devices.
  - a) linear
  - b) non-linear
  - c) both a) and b)
  - d) None of these

**B) One sentence answer.**

06

- 1) List the names of display units.
- 2) Give salient features of Programmable Instrumentation amplifier.
- 3) What is recorder?
- 4) Give advantages of Digital storage oscilloscope.
- 5) List out the basic components of a Magnetic recorder.
- 6) What is chopper amplifier?

**Q.2 Solve the following. (Any Eight)**

16

- a) Give the features of the data loggers.
- b) What is the role of preamplifier in signal conditioning?
- c) Draw the block diagram of chopper amplifier.
- d) What is Instrumentation Amplifier?
- e) What is need of DAS?
- f) Give the salient features of AD 594/595.
- g) Give the need of Programmable Instrumentation Amplifiers.
- h) What is 4-20mA current transmission?
- i) Distinguish between LED and LCD.
- j) Compare DC and AC signal conditioning System.

**Q.3 A) Attempt the following. (Any Two)**

**10**

- Explain Ratiometric and logarithmic conversion.
- Explain Magnetic recorder.
- What is signal conditioning? Explain the basic elements of the signal conditioning system.

**B) Explain X-Y recorder.**

06

**Q.4 A) Attempt the following. (Any Two)**

08

- Explain conductivity meter.
- Explain offset compensation.
- Explain Instrumentation Amplifier.

**B) Explain Analog CRO with block diagram.**

08



**Q.5 Attempt the following. (Any Two)****16**

- a)** Describe general DAS with block diagram. And explain the multichannel DAS.
- b)** Explain the data logger system in detail.
- c)** Explain LCR-Q meter with diagram.

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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025**

**COMPUTER SCIENCE (Special Paper-XVI)  
Data Communication and Networking–II (19201670)**

Day & Date: Friday, 31-10-2025  
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 the correct alternative and rewrite the sentences again. 10**

- 1) The physical layer is concerned with\_\_\_\_\_
  - a) Bit-by-bit delivery
  - b) Process to process delivery
  - c) Application to application delivery
  - d) Port to port delivery
- 2) A single channel is shared by multiple signals by\_\_\_\_\_
  - a) Analog modulation
  - b) Digital modulation
  - c) Multiplexing
  - d) Phase modulation
- 3) Wireless transmission of signals can be done via\_\_\_\_\_
  - a) Radio waves
  - b) Microwaves
  - c) Infrared
  - d) All of the mentioned
- 4) The data link layer takes the packets from \_\_\_\_\_ and encapsulates them into frames for transmission.
  - a) Network layer
  - b) Physical layer
  - c) Transport layer
  - d) Application layer
- 5) CRC stands for\_\_\_\_\_
  - a) Cyclic redundancy check
  - b) Code repeat check
  - b) Code redundancy check
  - d) Cyclic repeat check
- 6) Which of the following is the multiple access protocol for channel access control?
  - a) CSMA/CD
  - b) CSMA/CA
  - c) Both CSMA/CD & CSMA/CA
  - d) HDLC
- 7) Which one of the following is not a function of network layer?
  - a) Routing
  - b) Inter-networking
  - c) Congestion control
  - d) Error control

- 8) In virtual circuit network each packet contains \_\_\_\_\_  
a) Full source and destination address  
b) A short VC number  
c) Only source address  
d) Only destination address
- 9) Which of the following are transport layer protocols used in networking?  
a) TCP and FTP                      b) UDP and HTTP  
b) TCP and UDP                      c) HTTP and FTP
- 10) The sharing of a medium and its link by two or more devices is called \_\_\_\_\_  
a) Fully duplexing                      b) Multiplexing  
c) Microplexing                      d) Duplexing

**B) Fill in the blanks.****06**

- 1) WAN stands for \_\_\_\_\_
- 2) \_\_\_\_\_ is a protocol that allows to send / upload email message from local computer to an email server.
- 3) A network of networks is known as \_\_\_\_\_
- 4) The \_\_\_\_\_ is the protocol used to make hypertext document readable on WWW
- 5) Every computer on the internet has a unique \_\_\_\_\_
- 6) CSMA/CA stands for \_\_\_\_\_

**Q.2 Solve any Eight of the following.****16**

- a) Define Flow Control.
- b) Define HUB and Repeater.
- c) Define Bandwidth and Amplitude
- d) What is Framing?
- e) Define ALOHA.
- f) Long form of RTP, FTP.
- g) Define Compression.
- h) Long form of SMTP and SNMP.
- i) Define Protocols & Standards.
- j) What are the Data Communication Components?

**Q.3 A) Attempt any Two of the following.****10**

- a) Explain Manchester & Differential Manchester Coding.
- b) Explain Stop and Wait ARQ.
- c) Explain Congestion prevention policies.

**B) Differentiate between Bridges and Routers.****06****Q.4 A) Attempt any Two of the following.****08**

- a) Explain FTP detail.
- b) Explain Circuit Switching in detail.
- c) Explain Infrared in detail.

**B)** Explain TCP/IP reference model with suitable diagram. **08**

**Q.5 Attempt any Two of the following.** **16**

- a)** Explain Fiber Optic Cable in detail.
- b)** Explain ISO-OSI reference model in detail.
- c)** Explain Shortest Path Routing with example.

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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
PHYSICS (Paper-XVII)  
Electronics (19201622)**

Day & Date: Saturday, 01-11-2025  
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) Multiple choice questions. 10**

- 1) An inverting amplifier has  $R_2 = 5\text{ M}\Omega$  and  $R_1 = 5\text{ K}\Omega$ , its gain is \_\_\_\_\_.  
a) 1000                                  b) -1000  
c)  $10^{-3}$                                 d)  $-10^{-3}$
- 2) The OP-AMP comparator circuit uses \_\_\_\_\_.  
a) positive feedback                  b) negative feedback  
c) regenerative feedback              d) no feedback
- 3) Trigger input is connected to pin number \_\_\_\_\_, when IC 555 is operated as an oscillator.  
a) 1                                          b) 3  
c) 6                                          d) 5
- 4) The IC 555 is built in \_\_\_\_\_ circuit.  
a) Differential amplifier                b) Timer  
c) Schmitt's trigger                      d) Adder
- 5) An SCR is sometimes called \_\_\_\_\_.  
a) triac                                     b) diac  
c) UJT                                        d) thyristor
- 6) An SCR combines the features of \_\_\_\_\_.  
a) a rectifier and resistance            b) a rectifier and transistor  
c) a rectifier and capacitor              d) a rectifier and inductor
- 7) A DIAC has \_\_\_\_\_ semiconductor layers.  
a) one                                        b) two  
c) three                                       d) five
- 8) In gas discharge plasma displays, cold cathode numerical indicators are called \_\_\_\_\_.  
a) cathode                                  b) anode  
c) nixies                                      d) gate



**Q.5 Attempt the following. (Any Two)****16**

- a)** Draw and explain functional block diagram of operational amplifier.
- b)** Explain circuit operation of D-MOSFET.
- c)** Explain LCD. State different types of liquid crystals used for LCD display. Give important features of LCD.

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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
CHEMISTRY (Special Paper - XVI)  
Analytical and Industrial Organic Chemistry (19201617)**

Day & Date: Saturday, 01-11-2025  
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 the gas chromatography \_\_\_\_\_ is used as mobile phase.
 

|             |             |
|-------------|-------------|
| a) Methanol | b) Nitrogen |
| c) Hexane   | d) Water    |
- 2) 1,3-Butadiene and styrene on polymerization gives \_\_\_\_\_.
 

|                  |                   |
|------------------|-------------------|
| a) Polyurethane  | b) Bakelite resin |
| c) Buna-N Rubber | d) Buna-S Rubber  |
- 3) The soap molecule having positively charged hydrophilic tail is known as \_\_\_\_\_.
 

|                     |                  |
|---------------------|------------------|
| a) Invert Soap      | b) Anionic Soap  |
| c) Amphoteric Soaps | d) Neutral Soaps |
- 4) Green Chemistry is set to achieve \_\_\_\_\_ principles.
 

|       |       |
|-------|-------|
| a) 10 | b) 12 |
| c) 6  | d) 8  |
- 5) The polymers which on stretching undergo elongation and regain its original shape when force is removed are known as \_\_\_\_\_.
 

|                  |                  |
|------------------|------------------|
| a) Elastomers    | b) Thermoplastic |
| c) Thermosetting | d) None of these |
- 6) \_\_\_\_\_ is used in Dental Caries and in Cosmetics.
 

|             |                  |
|-------------|------------------|
| a) Teepol   | b) Igepon-I      |
| c) Deriphat | d) Turkeyred oil |
- 7) In phase transfer catalysis generally \_\_\_\_\_ salt is used.
 

|                                 |
|---------------------------------|
| a) Quaternary ammonium salt     |
| b) NaCN                         |
| c) $(\text{NH}_4)_2\text{SO}_4$ |
| d) NaCl                         |



- 8) Vulcanization is carried by heating raw rubber with \_\_\_\_\_.
  - a) Phosphorous
  - b) Sulphur
  - c) Carbon
  - d) Nitrogen
- 9) In production of ethanol on industrial scale fermentation is brought about by \_\_\_\_\_.
  - a) Bacillus bacteria
  - b) Yeast
  - c)  $\text{NaHCO}_3$
  - d) Soda ash
- 10) The Silica gel is used in column chromatography as \_\_\_\_\_.
  - a) Eluent
  - b) Adsorbent
  - c) Column support
  - d) Mobile phase

**B) Fill in the blank/Definition/One sentence answer/ One word answer.**

06

- 1) \_\_\_\_\_ is the monomer of natural rubber.
- 2) \_\_\_\_\_ is the general formula of toilet soap.
- 3) Sodium hyposulphite is used as \_\_\_\_\_ in soap.
- 4) \_\_\_\_\_ have emerged as non-volatile, polar, stable ionic solvents in recent time.
- 5) In column chromatography, \_\_\_\_\_ is used as a mobile phase.
- 6)  $\text{SeO}_2$  is \_\_\_\_\_ type of reagent.

**Q.2 Solve any Eight of the following.**

16

- a) What are ionic liquids? Give two examples.
- b) Define the terms.
  - i) Rectified spirit
  - ii) Absolute alcohol
- c) What is meant by  $R_f$  Value? Mention Factors affecting  $R_f$  value of solute.
- d) What is addition polymerization? Give its types.
- e) Write synthesis and uses of polyvinyl chloride
- f) What are soaps? Give different types of soap.
- g) Write the product of given by the reaction of  $\text{LiAlH}_4$  on crotonaldehyde and 2-nitro propane.
- h) Write any two synthetic applications of selenium dioxide.
- i) What is molasses approximately how much sugar is present in it?
- j) Explain any four principles of green chemistry.

**Q.3 A) Attempt any Two of the following.**

10

- Define polymers; explain in detail classification of polymers based on  
i) Origin ii) composition
- Write a note on phase transfer catalysis.
- Distinguish (Compare) Soaps & Detergents.

**B)** What is chromatography? Give its principle for the separation and discuss experimental technique of Thin Layer Chromatography.

06

- Q.4 A) Attempt any Two of the following. 08**
- a) Give Synthesis and uses of BuNA-n rubber.
  - b) Write a note on raw materials used in soap industry.
  - c) What is fermentation? What are major and by products of alcohol and sugar industry?
- B) What are different type of polymerization? Explain different steps involved in radical addition polymerization. Give synthesis and uses of polystyrene. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Discuss various steps involved in refining of sugar.
  - b) What is gas chromatography? Give its principle, working and instrumentation. Mention its applications.
  - c) What is saponification? Write general reaction for saponification. Explain in detail manufacture of soap by hot or boiled process.

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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November – 2025  
BOTANY (Special Paper - XVI)  
Nursery, Gardening and Horticulture (19201608)**

Day & Date: Saturday, 01-11-2025  
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 a neat labelled diagram wherever necessary.

**Q.1 A) Rewrite the following sentence by choosing the correct alternative.** **10**

- 1) Leading flower producing state is \_\_\_\_\_  
a) Tamil Nadu                      b) Kerala  
c) Andhra Pradesh                d) Karnataka
- 2) \_\_\_\_\_ among the given cities is known as Garden city.  
a) Bangaluru                      b) Delhi  
c) Pune                          d) Chennai
- 3) Gibberellins can facilitate seed germination due to their influence on\_\_\_\_\_  
a) Synthesis of abscisic acid  
b) Rate of cell division  
c) Production of hydrolysing enzymes  
d) Absorption of water
- 4) The proteinaceous part of maize endosperm is  
a) Peripheral layer                b) Scutellum  
c) Apophysis                      d) Aleurone layer
- 5) \_\_\_\_\_ of these compounds can induce seed dormancy.  
a) Potassium nitrate              b) ABA  
c) Gibberellins                  d) Ethylene
- 6) Horticulture is the study that includes\_\_\_\_\_  
a) Fruits, vegetables and flowers  
b) All food crops  
c) Vegetable of gardens and lawns  
d) Some bush crops and apples
- 7) Cryopreservation is a technique used for \_\_\_\_\_  
a) Crystallization of food        b) Food packing  
c) Seed saving                    d) Preservation of vegetables

- 8) The pH in soils can be raised by adding: \_\_\_\_\_
- a) Sand                                      b) Lime  
c) Sulphur                                  d) Nitrogen
- 9) Onion and garlic are examples of \_\_\_\_\_
- a) Rhizome                                  b) corm  
b) stem tuber                                c) bulb
- 10) Example of plant in which vegetative propagation is occurred by leaves is \_\_\_\_\_
- a) *Cannabis*                                  b) *Chrysanthemum*  
c) *Bryophyllum*                              d) *Brassica*

**B) Answer the following: one sentence only.**

06

- 1) What is nursery?
- 2) Enlist any three monocot seeds.
- 3) Enlist any three dicot seeds.
- 4) Write down the names of any two cut flowers.
- 5) Enlist any three plant species suitable for bonsai.
- 6) Enlist types of gardening.

**Q.2 Solve the following. (Any Eight)**

16

- a) Define seed.
- b) What is gardening?
- c) What is mean by landscaping?
- d) Define budding.
- e) Define grafting.
- f) Enlist types of simple fruits.
- g) Define weed.
- h) What is biopesticide?
- i) What is bonsai?
- j) Define cut flowers.

**Q.3 A) Write a short note on the following. (Any Two)**

10

- 1) Scope of gardening.
- 2) Seed certification.
- 3) Biopesticides.

**B)** Explain in brief importance of flower shows and exhibitions.

06

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

08

- 1) Explain in brief essential genetic erosion of seeds.
- 2) Explain in brief biopesticides & its applications.
- 3) Explain in brief significance of vegetative reproduction.

**B) Answer the following.**

08

- 1) Comment upon seed banks.
- 2) Comment upon roles of PGRs.

**Q.5 Answer the following. (Any Two)**

**16**

- a)** Explain in detail vegetative method of propagation- Budding & its types.
- b)** Explain in detail computer applications in land scaping.
- c)** Explain in detail seed dormancy with respect to causes and methods of breaking dormancy.

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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November – 2025  
BOTANY (Special Paper - XVI)  
Biostatistics (19201609)**

Day & Date: Saturday, 01-11-2025  
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.  
4) Use of log table and calculators is allowed.

**Q.1 A) Multiple Choice Questions.**

**10**

- 1) \_\_\_\_\_ is better utilized more often in biological studies.
  - a) Mean
  - b) Median
  - c) Mode
  - d) Range
- 2) \_\_\_\_\_ is the number obtained by dividing the total value of different items by their number.
  - a) Mode
  - b) median
  - c) Arithmetic mean
  - d) all of these
- 3) In a throw of coin what is the probability of getting tail.
  - a) 1
  - b) 2
  - c) 1/2
  - d) 0
- 4) t-test was worked out by \_\_\_\_\_.
  - a) W. S. Gosset
  - b) Milton Friedman
  - c) Harvey Goldstein
  - d) Herman Hollerith
- 5) The calculated t-value is greater than the table value at an \_\_\_\_\_ level of 0.05.
  - a) Alpha
  - b) Beta
  - b) Gama
  - d) All of these
- 6) Seeds were treated with \_\_\_\_\_ growth regulator is compared with control set.
  - a) 0.4ppm
  - b) 0.3ppm
  - c) 0.2ppm
  - d) 0.1ppm
- 7) The null hypothesis for the independent sample t-test is \_\_\_\_\_.
  - a)  $\mu_1 = \mu_3$
  - b)  $\mu_1 = \mu_2$
  - c)  $\mu_1 = \mu_1$
  - d)  $\mu_1 = \mu_4$

- 8) The null hypothesis is that the pair wise difference between the \_\_\_\_\_ test is equal.
- |         |          |
|---------|----------|
| a) Four | b) Three |
| c) Two  | d) One   |
- 9) A paired \_\_\_\_\_ is used to compare the two sample.
- |           |           |
|-----------|-----------|
| a) y-test | b) s-test |
| b) t-test | c) z-test |
- 10) \_\_\_\_\_ is used to compare two samples means to determine if they are different from each other.
- |           |           |
|-----------|-----------|
| a) t-test | b) y-test |
| c) z-test | d) s-test |

**B) Fill in the blanks.****06**

- 1) A \_\_\_\_\_ t-test is used to compare a single sample.
- 2) \_\_\_\_\_ numeric variable are ones that can take only a certain set of value.
- 3) The examples of continuous distributed numeric variable are \_\_\_\_\_
- 4) A \_\_\_\_\_ is most commonly applied when the test statistic would follow a normal distribution.
- 5) In null hypothesis there is no difference between 110:90 and Mendel's monohybrid ratio \_\_\_\_\_
- 6) A statistical method is treated as a branch of science which deals with \_\_\_\_\_

**Q.2 Solve the following. (Any Eight)****16**

- a) define variable.
- b) what is tabulation?
- c) Give the definition of mode.
- d) Define event.
- e) What is degree of freedom?
- f) What is biostatistics?
- g) Define primary data.
- h) What is hypothesis?
- i) Define probability.
- j) What is statistical inference?

**Q.3 A) Attempt the following. (Any Two)****10**

- 1) Give the sources of secondary data.
- 2) Merits of arithmetic mean.
- 3) Uses of statistics.

**B) Short note:****06**

merits and demerits of primary data.

- Q.4 A) Attempt the following. (Any Two)** **08**
- 1) Write on the statistical methods of biostatistics.
  - 2) Explain the sampling methods.
  - 3) Describe the kinds of probabilities.
- B) Describe the following.** **08**
- Write on basic concepts of probability.
- Q.5 Attempt the following. (Any Two)** **16**
- a) Discuss the methods of primary data collection.
  - b) Explain the function and limitation of biostatistics.
  - c) Write the characteristic of Chi Square test.



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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November – 2025  
ZOOLOGY (Special Paper - XVI)  
Applied Zoology (19201630)**

Day & Date: Saturday, 01-11-2025  
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 Question.**

**10**

- 1) Management and rearing of fishes only is called as \_\_\_\_\_.  
a) Aquaculture                      b) Pisciculture  
c) Apiculture                      d) Fishery
- 2) \_\_\_\_\_ of the following product of fishes is used for clearing wines?  
a) Shagreen                      b) Isinglass  
c) Fish flour                      d) Fish oil
- 3) \_\_\_\_\_ causes cotton wool disease in fish.  
a) Ichthyobodo                      b) Aspergillus  
c) Saprolegnia                      d) Aphanomyces
- 4) Ulcerative diseases in fish are caused by \_\_\_\_\_.  
a) Aeromonas                      b) Pseudomonas  
c) Vibrio                      d) Myxobacterium
- 5) The net consisting of two layers of larger meshes and a middle layer of smaller mesh is termed as \_\_\_\_\_.  
a) Gill net                      b) Bag net  
c) fyke net                      d) Trammel Net
- 6) Apiculture involves \_\_\_\_\_.  
a) Rearing of bees                      b) Rearing of animals  
c) Rearing of birds                      d) Rearing of insects
- 7) \_\_\_\_\_ of the following hormone is secreted by Queen of honey bees.  
a) Bombykol                      b) Trail pheromone  
c) Antiqueen pheromone                      d) Copulin

- 8) \_\_\_\_\_ is the primary source of food for the settled nymphs of the lac insect.
- Hard twigs
  - Phloem sap of specific host plants
  - Resinous substance
  - Encrustations of females
- 9) \_\_\_\_\_ of the following varieties of silk is not produced in India.
- Muga silk
  - Tassar Sil
  - Mulberry Silk
  - American Silk
- 10) The study of the causes of a fish disease is called as \_\_\_\_\_
- Etiology
  - Biotechnology
  - Biology
  - Ecology

**B) Fill in the blanks/ definition/one sentence answer/ one word answer. 06**

- Define fish culture.
- Define fish preservation.
- Define Moulting
- Enlist any two poultry diseases.
- Write any four names of Freshwater fishes
- Enlist any two Indigenous cow breeds.

**Q.2 Solve the following. (Any Eight) 16**

- What is Hatching Pond?
- Define Induced breeding.
- Write Medicinal value of Honey.
- Write any four milk products.
- Explain salting and canning methods of fish preservation.
- Define Variance, Mean and Mode.
- Enlist the types of silk in India.
- Define Breeding Pond.
- Write lac Products.
- Types of honeybees.

**Q.3 A) Attempt the following. (Any Two) 10**

- Write common Fish Diseases.
- Explain Life History of Apis
- What is the significance of transgenic animals?

**B) Write the role of egg and meat in diet 06**

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

- Describe different fish by products.
- Describe techniques of dairy managements and write common dairy animals.
- 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)** Explain methods of Bee keeping and write Bee products and their uses.
- b)** Explain cultivation of lac insects, and write uses of lac.
- c)** Describe in detail life history of silkworm and write natural enemies of silkworm and their control.

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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
MATHEMATICS (Special Paper - XVI)  
Integral Calculus (19201638-A)**

Day & Date: Saturday, 01-11-2025  
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

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

**Q.1 A) Select the correct alternative for each of the following? 10**

1) The integral  $\int_0^1 \frac{e^x}{x^2} dx$  is \_\_\_\_\_.

- a) divergent                                      b) convergent  
c) proper                                          d) absolutely convergent

2) The integrand of the integral  $\int_0^2 \frac{1}{x-1} dx$  has the point of discontinuity at  $x =$  \_\_\_\_\_.

- a)  $\infty$                                               b)  $-\infty$   
c)  $-1$                                               d)  $1$

3) Which of the following integral is/are divergent?

I)  $\int_2^{\infty} \frac{x}{(1+x^2)^2} dx$

II)  $\int_1^{\infty} \frac{1}{\sqrt{x}} dx$

III)  $\int_2^{\infty} \sin 2x dx$

- a) only I                                              b) I and II  
c) II only                                              d) III only



**B) Attempt the following.****06**

- 1) Evaluate  $\iint_D x^2 e^{xy} dx dy$  where  $D = \{(x, y) / 0 \leq x \leq 2, \frac{x}{2} \leq y \leq 1\}$
- 2) Write the double integrals that represent the area enclosed by the curve  $y = x - x^2$  and the line  $y = x/4$
- 3) Write the formula for volume of the solids.
- 4) Define Beta function.
- 5) Compute  $\int_0^1 -\frac{1}{2} dx$
- 6) Evaluate  $\int_{-\infty}^0 e^x dx$

**Q.2 Solve any Eight of the following.****16**

- a) Define the term conditional convergent integral.
- b) Test the convergence of  $\int_0^1 \frac{dx}{x^2}$
- c) Evaluate  $\int_1^{\infty} \frac{dx}{\sqrt{x}}$
- d) Find  $\int_0^{\pi} \int_0^{\sin \theta} r dr d\theta$
- e) Draw the sketch to evaluate the integral  $\int_R \int x(x^2 + y^2) dR$  where  $R$  is the region bounded by  $y = 0$ ,  $x = 2$  and  $y = x^2$ .
- f) Evaluate  $\int_1^{\log 8} \int_0^{\log y} e^{x+y} dx dy$ .
- g) Find  $\int_0^1 dx$
- h) Prove that  $\int_0^{\infty} x^4 e^{-x} dx = 24$
- i) Evaluate  $\int_0^1 x^2(1-x)^3 dx$
- j) Examine the convergence of  $\int_0^{\infty} \frac{x dx}{(1+x)^3}$

**Q.3 A) Attempt any Two of the following.** **10**

a) State and prove Cauchy's test for convergence.

b) Show that  $B(m, n) = 2 \int_0^{\pi/2} \sin^{2m-1} \theta \cos^{2n-1} \theta d\theta$

c) Find by using the double integration the area of the circle  
 $x^2 + y^2 = a^2$

**B)** Prove that  $B(m, n) = \frac{\Gamma(m) \Gamma(n)}{\Gamma(m+n)}$  **06**

**Q.4 A) Attempt any two of the following.** **08**

a) Show that  $\int_0^{\infty} \frac{\sin mx}{a^2 + x^2} dx$  converges absolutely.

b) Evaluate  $\int_0^{\infty} \frac{x^a}{a^x} dx$

c) Change to polar co-ordinates and evaluate.

$$\int_0^{\infty} \int_0^{\infty} e^{-(x^2+y^2)} dy dx$$

**B)** State and prove the duplication formula. **08**

**Q.5 Attempt any Two of the following.** **16**

a) State and prove Abel's test.

b) Evaluate  $\int_0^a x^3 (2ax - x^2)^{3/2} dx$

c) Evaluate  $\int_0^{2a} \int_0^{\sqrt{2ax-x^2}} xy dx dy$  by changing the order of integration.

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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November – 2025  
STATISTICS (Special Paper - XVI)  
Quality Management and Reliability (19201650)**

Day & Date: Saturday, 01-11-2025  
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

- EWMA Control charts first introduced by \_\_\_\_\_.
  - a) Lucas
  - b) Saccucci
  - c) Shewarts
  - d) Roberts
- What is the full form of E in the EWMA chart?
  - a) Exponentially
  - b) Experimentally
  - c) Exactly
  - d) Estimated
- Which charts are particularly more effective for sample size One?
  - a) P-charts
  - b) C-charts
  - c)  $\bar{X}$  & S chart
  - d) CUSUM Chart
- DMAIC is often associated with \_\_\_\_\_.
  - a) Acceptance sampling
  - b) Kaizen board
  - c) Six- Sigma
  - d) Five -Sigma
- The structure function of a binary system S takes any one of \_\_\_\_\_ possible values.
  - a) 4
  - b) 2
  - c) 3
  - d) None of these
- The purpose of Acceptance sampling is to \_\_\_\_\_.
  - a) Sentence lots
  - b) Estimate lot quality
  - c) Estimate lot defectives
  - d) Estimate lot conformity
- Exponential distribution is \_\_\_\_\_.
  - a) IFR
  - b) DFR
  - c) Both a and b
  - d) None of these
- Average Sample number for single sampling plan  
  - a) n
  - b) N
  - c)  $N - n$
  - d) None of these





**Q.5 Attempt the following. (Any Two)**

**16**

- a)** Explain Eight dimensions of quality.
- b)** Explain Double Sampling plan
- c)** Explain the Tabular CUSUM for monitoring the process mean.

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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November – 2025  
STATISTICS (Special Paper - XVI)  
Time Series Analysis (19201651)**

Day & Date: Saturday, 01-11-2025  
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) 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
- 2) Prosperity, Recession, Depression and Recovery in a business is an example of \_\_\_\_\_.  
a) Irregular variations          b) Secular trend  
c) Cyclical variations         d) Seasonal variations
- 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) Prosperity, Recession, Depression and Recovery in a business is an example of \_\_\_\_\_.  
a) Irregular trend                b) Secular trend  
c) Cyclical trend                d) Seasonal trend
- 6) A fire in a factory delaying production for some weeks is \_\_\_\_\_.  
a) Irregular trend                b) Secular trend  
c) Cyclical trend                d) Seasonal trend
- 7) Cyclical variations are \_\_\_\_\_.  
a) short term variation          b) long term variation  
c) sudden variation              d) none of the above

- 8) In time series values are arranged in \_\_\_\_\_ order
  - a) Increasing
  - b) Chronological
  - c) Decreasing
  - d) both a) and c)
- 9) In time series analysis, method of ratio to MA 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  $Y = \underline{\hspace{2cm}}$ .
- 3) In time series multiplicative model gives  $Y = \underline{\hspace{2cm}}$
- 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

- a) Trend.
- b) Write note on irregular variations.
- c) What do you mean by stationarity?
- d) Define autocorrelation function.
- e) Explain the term 'season'.
- f) Describe the term 'Business cycle'.
- g) State the four components of time series.
- h) Write the difference between seasonal variations and cyclical variations.
- i) Write first order moving average MA (1) model.
- j) Write first order autoregressive model AR (1) model.

**Q.3 A) Attempt 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 method of simple average.

**B)** Describe the procedure of ratio to trend method.

06

**Q.4 A) Attempt the following. (Any Two)**

08

- Describe the procedure of single exponential smoothing.
- Explain how to fit MA (1) model.
- Explain moving average method.

**B)** Describe the procedure of method of simple average.

08

**Q.5 Attempt the following. (Any Two)****16**

- a) Describe the procedure of link relative method.
- b) Describe the procedure of curve fitting least square method.
- c) Obtain the seasonal indices for the quarters by ratio to moving average method.

| Year        | Quarters No. |    |     |    |
|-------------|--------------|----|-----|----|
|             | I            | II | III | IV |
| <b>2017</b> | 37           | 41 | 33  | 35 |
| <b>2018</b> | 37           | 39 | 36  | 36 |
| <b>2019</b> | 40           | 41 | 33  | 31 |
| <b>2020</b> | 33           | 44 | 40  | 40 |

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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November – 2025  
GEOLOGY (Special Paper - XVI)  
Geochemistry (19201655)**

Day & Date: Saturday, 01-11-2025  
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) Multiple choice questions.****10**

- 1) Geochemical processes operate only because of:
  - a) Presence of various chemical on the earth's crust.
  - b) Water circulation system.
  - c) A flow of energy from a higher to a lower potential or intensify.
  - d) High pressure in the crust
- 2) According to the cosmic abundance which of the following element is abundant
 

|            |             |
|------------|-------------|
| a) Iron    | b) Carbon   |
| c) Silicon | d) Hydrogen |
- 3) 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 |
- 4) Siderites consist essentially of \_\_\_\_\_
 

|                        |                                    |
|------------------------|------------------------------------|
| a) Nickle - iron alloy | b) Nickel-iron alloy and silicates |
| c) Silicates only      | d) Silicates and graphite          |
- 5) Uranium-238 decays to which of the following daughter isotopes?
 

|                  |                  |
|------------------|------------------|
| a) Rubidium – 87 | b) Uranium – 234 |
| c) Lead – 206    | d) Nitrogen - 14 |
- 6) 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.

- 7) Which of the following is not a suitable pair.  
 a) K-Rb                                      b) Al-Ga  
 c) Ca-Sr                                      d) Si-Pb
- 8) \_\_\_\_\_ bonding is the force of attraction between valence electrons and the metal atoms.  
 a) Ionic                                      b) Covalent  
 c) Metallic                                      d) Hydrogen
- 9) 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
- 10) \_\_\_\_\_ elements most commonly used for the interpretation of the petrogenesis of igneous rocks.  
 a) Major                                      b) Minor  
 c) Trace                                      d) None of these

**B) Fill in the blanks.****06**

- 1) Which method is used for dating relatively recent geological events? \_\_\_\_\_
- 2) In meteorite, the metal phase is discontinuous and the silicates are mainly plagioclase feldspar and pyroxene sometimes with accessory olivine is \_\_\_\_\_.
- 3) \_\_\_\_\_ isotopes have proven to be a particular useful tracer to indicate whether magma that formed an igneous rock originated in the crust or the mantle.
- 4) Elements which readily-form ions with an outermost 8-electron shell are: \_\_\_\_\_
- 5) The approximate relative distances of most of the planets (excluding Mercury and Neptune but including the asteroid Ceres) from the sun are given by \_\_\_\_\_.
- 6) Different element with same neutron number but with different values of atomic weight and protons are known as \_\_\_\_\_.

**Q.2 Solve the following. (Any Eight)****16**

- a) Name the groups of geochemical elements classified by Goldsmith.
- b) List the kinds of solid solution substitution.
- c) Give the any two examples of polymorphs.
- d) Define the term Adsorption
- e) Write the applications of colloids
- f) Name the types of Aerolites.
- g) Define Isomorphism.
- h) Name the three isotopes of Hydrogen.
- i) List the dating method of radiogenic isotopes.
- j) Name the elements of LILE.

- Q.3 A) Attempt the following. (Any Two) 10**
- a) Explain in brief the geochemical periodic table.
  - b) Write short note on Polymorphism with suitable example.
  - c) Discuss the applications of radiogenic isotopes.
- B) Write short note on geochemical cycle with suitable diagram. 06**
- Q.4 A) Attempt the following. (Any Two) 08**
- a) Explain Isomorphism and polymorphism with suitable examples.
  - b) Discuss the difference between ionic bonding and covalent bonding.
  - c) Explain the carbon dating method in detail.
- B) Describe in brief the Goldsmith's classification of geochemical elements 08**
- Q.5 Attempt the following. (Any Two) 16**
- a) Define trace elements. Explain the types of trace elements with its significance.
  - b) Discuss any four radiogenic methods used for dating geologic events.
  - c) Explain in details the composition of Meteorites.



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## Max. Marks: 80

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- 9) Biodegradable organic matter in sewage is measured by \_\_\_\_\_ test.
- |        |          |
|--------|----------|
| a) COD | b) MPN   |
| c) BOD | c) IMViC |
- 10) \_\_\_\_\_ is the peculiar characteristic of marine bacteria.
- Attachment tendency
  - Fast growth
  - Growth at high temperature
  - Growth at low salt

**B) Fill in the blanks/ Definition/One sentence answer/One word answer/ Give the name. 06**

- Name the ores of copper.
- The strong oxidising agent used for C.O.D. is \_\_\_\_\_
- Examples of thermophiles.
- State the temperature and time of incubation for BOD test.
- Long form of RDAC \_\_\_\_\_
- \_\_\_\_\_ elements act as key elements in eutrophication.

**Q.2 Solve the following. (Any Eight) 16**

- Define primary oil recovery.
- Define extremophile.
- Explain bioaerosols and its significance.
- What is significance of microorganisms in air?
- Define B.O.D.
- Define barophiles and give examples of barophiles.
- What is TS and TSS?
- Oligotrophic lakes.
- Bioremediation of mercury.
- Define One Carbon Credit.

**Q.3 A) Attempt the following. (Any Two) 10**

- General characteristics of osmophiles.
- Give an account of characteristics and treatment of dairy industry waste.
- Write a note on regulatory framework of biosafety in India.

**B) Short note / Solve. 06**

Describe various methods of sampling of air.

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

- Define bioleaching. Explain in detail uranium leaching.
- Define and describe carbon sequestration.
- Describe characteristics of marine bacteria.

**B) Describe / Explain / Solve 08**

Describe various methods of biological treatment of wastewater.

**Q.5 Attempt the following. (Any Two)****16**

- a)** Write an essay on biological safety.
- b)** What is eutrophication? Describe sources, effects and control of eutrophication.
- c)** Write in detail on various methods of oil recovery.

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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
ELECTRONICS (Special Paper - XVI)  
Modern Communication Systems (19201684)**

Day & Date: Saturday, 01-11-2025  
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 scientific calculators is allowed.

**Q.1 A) Multiple choice questions.**

**10**

- 1) \_\_\_\_\_ signals are used for satellite communication.
  - a) RF
  - b) Light
  - c) IF
  - d) Microwave
- 2) The stretching of the light pulse is called as \_\_\_\_\_.
  - a) Modal dispersion
  - b) Scattering
  - c) Reflection
  - d) Refraction
- 3) The period of geostationary satellite is \_\_\_\_\_ hours.
  - a) 12
  - b) 24
  - c) 36
  - d) 48
- 4) In optical receiver \_\_\_\_\_ is the best optical detector.
  - a) Photo diode
  - b) Light dependent resistor
  - c) p-i-n diode
  - d) Gunn diode
- 5) In mobile communication the transmitter and receiver frequency are decided by \_\_\_\_\_.
  - a) Calling subscriber
  - b) Called subscriber
  - b) Cell phone manufacturer
  - d) MTSO
- 6) In mobile communication the term handoff means \_\_\_\_\_.
  - a) Switching a call from one cell to another while moving
  - b) Transferring mobile data to a SIM card
  - c) Changing from 3G to 4G
  - d) Installing a new base station
- 7) Radar operates in \_\_\_\_\_ frequency range.
  - a) Radio
  - b) Infrared
  - c) Microwave
  - d) Visible

- 8) The most common radar display is \_\_\_\_\_  
a) LED                                      b) PPI  
c) LCD                                      d) Television
- 9) Modem is nothing but a \_\_\_\_\_ unit.  
a) Multiplexer demultiplexer  
b) Modulation demodulation  
c) Receiving  
d) Transmitting
- 10) Full form of WAN is \_\_\_\_\_  
a) Width Areas Network                  b) Wave Area Network  
c) Wide Area Network                  d) Wavelength Area Network

**B) Fill in the blanks.**

06

- 1) The full form of Gbps \_\_\_\_\_.
- 2) In \_\_\_\_\_ topology, all computers are to a single cable.
- 3) \_\_\_\_\_ is the main part of satellite.
- 4) \_\_\_\_\_ the Transferred Electron Device.
- 5) MTSO stands for \_\_\_\_\_.
- 6) The term Wi-Fi is the abbreviation for \_\_\_\_\_.

**Q.2 Solve any Eight of the following.**

16

- a) Give the advantages of microwave communication.
- b) State the name of two optical sources used in optical transmitter.
- c) State the roll of Frequency synthesizer in cell phone?
- d) State the roll of duplexer in satellite earth station?
- e) Define uplink and downlink frequency in satellite communication.
- f) Compare step index with graded index optical fiber.
- g) What is RADAR? What are its types?
- h) Compare LAN and WAN.
- i) What is Hub? What is its type.
- j) Channel No. 1 in cellular phone transmits 825 MHz frequency then what is the frequency for channel 2 and 3?

**Q.3 A) Attempt any Two of the following.**

10

- Explain the function of MTSO in cellular system.
- Explain Gunn diode with suitable diagram.
- With suitable diagram explain Bus topology.

**B)** What is optical fiber? What are its types? Give the construction of fiber optics.

06

**Q.4 A) Attempt any Two of the following.**

08

- Explain earth station in satellite communication.
- With block diagram explain mobile transmitter.
- Explain micro-strip transmission line.

**B) Explain working of Klystron tube.**

08

**Q.5 Attempt any Two of the following.**

**16**

- a)** Give construction and working of Laser diode.
- b)** Explain working of Rader System with block diagram.
- c)** What is internet? State its application. Discuss any two of them.

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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November – 2025  
COMPUTER SCIENCE (Paper - XVII)  
Advanced Python (19201671)**

Day & Date: Saturday, 01-11-2025  
Time: 12:00 PM To 03:00 PM

Max. Marks: 80

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

**Q.1 A) Choose correct alternatives: 10**

- 1) Which of the following is a GUI library in Python.
  - a) Numpy
  - b) Tkinter
  - c) Pandas
  - d) Django
- 2) \_\_\_\_\_ SQL command is used to delete records from a table in MySQL.
  - a) delete
  - b) Insert
  - c) select
  - d) Drop
- 3) \_\_\_\_\_ Python module is commonly used to connect to a MySQL database.
  - a) sqlite
  - b) Psycopg2
  - c) cx\_Oracle
  - d) None of these
- 4) \_\_\_\_\_ layout manager places widgets in a table-like structure.
  - a) pack()
  - b) border()
  - b) place()
  - d) grid()
- 5) \_\_\_\_\_ 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()
- 6) \_\_\_\_\_ file maps URLs to views in Django.
  - a) view.py
  - b) models.py
  - c) urls.py
  - d) none of the above
- 7) Django uses \_\_\_\_\_ architecture.
  - a) MVT
  - b) client-server only
  - c) MVC only
  - d) None pf these
- 8) \_\_\_\_\_ API is event-driven in XML parsing.
  - a) DOM
  - b) SAX
  - b) JSON
  - d) XMLtree

- 9) \_\_\_\_\_ port is used to HTTP communication.
- |       |                  |
|-------|------------------|
| a) 80 | b) 5221          |
| c) 90 | d) None of these |
- 10) Which protocol is mostly used in socket programming?
- |         |                  |
|---------|------------------|
| a) FTP  | b) TCP/IP        |
| c) SMTP | d) None of these |

**B) Fill in the blanks.****06**

- 1) MVT stands for \_\_\_\_\_.
- 2) XML stands for \_\_\_\_\_.
- 3) \_\_\_\_\_ widget is used to display text.
- 4) \_\_\_\_\_ command retrieves data from a MySQL table.
- 5) \_\_\_\_\_ command runs the development server in Django.
- 6) \_\_\_\_\_ is an endpoint for communication between two machines over a network.

**Q.2 Solve the following. (Any Eight)****16**

- a) Write Django commands for create project and app.
- b) Write advantages of GUI programming.
- c) Write a note on place layout.
- d) What does the fetchone() method do?
- e) Write a note on Template in Django.
- f) What is a cursor?
- g) What is socket?
- h) Write a note on Canvas.
- i) What us Models in Django?
- j) What is IP Address?

**Q.3 A) Attempt the following. (Any Two)****10**

- a) Write a note on Button and Entry.
- b) Write a GUI program for the addition of two numbers.
- c) Explain template and view in Django.

**B) Explain steps of connectivity in Python and MySQL****06****Q.4 A) Attempt the following. (Any Two)****08**

- a) What is URL? Explain
- b) Explain Frame and Canvas.
- c) Create Django application for display "Hello" message.

**B) Explain Layout Management in Tkinter with example****08****Q.5 Attempt the following. (Any Two)****16**

- a) What is XML? Explain XML parser.
- b) Explain Server Socket Methods, Client Socket Methods in details.
- c) Create a Django application for login page. (Write urls.py, views.py and template )



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**B.Sc. (Plain) (Semester - VI) (New/Old) (CBCS) Examination:  
October/November - 2025  
COMPUTER SCIENCE (Paper - XVII)  
Software Testing (19201671-01)**

Day & Date: Saturday, 01-11-2025  
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 the correct alternatives. 10**

- 1) Which of the following is not part of the Test document?
  - a) Test Case
  - b) Requirements Traceability Matrix [RTM]
  - c) Test strategy
  - d) Project Initiation Note [PIN]
- 2) Which of the following term describes testing?
  - a) Finding broken code
  - b) Evaluating deliverable to find errors
  - c) A stage of all projects
  - d) None of the mentioned
- 3) White Box techniques are also classified as \_\_\_\_
  - a) Design based testing
  - b) Structural testing
  - c) Error guessing technique
  - d) None of the Mentioned
- 4) What are the various Testing Levels?
 

|                        |                         |
|------------------------|-------------------------|
| a) Unit Testing        | b) System Testing       |
| c) Integration Testing | d) All of the mentioned |
- 5) Alpha testing is done at \_\_\_\_
  - a) Developer's end
  - b) User's end
  - c) Developer's & User's end
  - d) None of the mentioned
- 6) Which of the below is not a part of the Test Plan?
 

|                     |                            |
|---------------------|----------------------------|
| a) Schedule         | b) Risk                    |
| c) Incident reports | d) Entry and exit criteria |

- 7) "V" model is?
  - a) Test type
  - b) Test Level
  - c) Test design technique
  - d) Software development testing (SDLC) model
- 8) Which of the below testing is related to Non-functional testing?
  - a) Unit Testing
  - b) Black-box Testing
  - c) Performance Testing
  - d) None of the above
- 9) Software Debugging is a set of activities that can be planned in advance and conducted systematically.
  - a) True
  - b) False
- 10) \_\_\_\_\_ testing is used to check the code.
  - a) Grey box testing
  - b) Black box testing
  - c) White-box testing
  - d) Red box testing

**B) Fill in the blanks.****06**

- 1) \_\_\_\_\_ find bugs as early as possible and make sure they get fixed and also must understand the application well.
- 2) Goal of testing is to check if the system meets the \_\_\_\_\_
- 3) \_\_\_\_\_ testing re-executes a small subset of tests that have already been conducted
- 4) \_\_\_\_\_ sometimes called glass-box testing.
- 5) Beta Testing is done by the \_\_\_\_\_
- 6) A \_\_\_\_\_ model that is the demo implementation of the system.

**Q.2 Solve any Eight of the following.****16**

- a) Write any two advantages of black box testing.
- b) Define Failure, Error.
- c) Define Load Testing.
- d) What is Retest?
- e) What is Beta and Alpha testing?
- f) What is Verification?
- g) What is Smoke Testing?
- h) What is Volume Testing?
- i) What is Test case?
- j) What is AdhocTesting?

**Q.3 A) Attempt any Two of the following.****10**

- a) What is the use or need of software testing?
- b) Explain Traceability Matrix.
- c) Explain types of Test Cases.

**B) Explain Software Testing Life Cycle in detail.****06**

- Q.4 A) Attempt any Two of the following. 08**
- a) Explain Defect Life Cycle.
  - b) Explain Condition testing.
  - c) Explain Water Fall Model.
- B) Explain Test Cases Design Techniques. 08**
- Q.5 Attempt any Two of the following. 16**
- a) Explain Statement Coverage Testing, Branch Coverage Testing, Path Coverage Testing and Inspection in WBT.
  - b) Design test case for login page.
  - c) Explain Top-Down, Bottom-Up Testing.

Set P

**B.Sc. (Plain) (Semester - I) (CBCS) Examination:  
October/November – 2025  
CHEMISTRY (Paper – I)  
Physical Chemistry (22221106)**

Day & Date: Friday, 28-11-2025  
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 Multiple choice questions.

08

- 1) Reaction rates can change with \_\_\_\_\_.  
a) Temperature  
b) the addition of catalyst  
c) reactant concentration  
d) All of these
- 2) The half-life period of \_\_\_\_\_ order reaction is independent of the initial concentration of the reactant.  
a) first  
b) third  
c) Second  
d) Zero
- 3) The graph of linear equation is always in the form of \_\_\_\_\_.  
a) Sphere  
b) Circle  
c) Curve  
d) straight line
- 4) The efficiency of heat engine operating between 400 k and 300 k is \_\_\_\_\_.  
a) 0.25  
b) 0.75  
c) 0.5  
d) 1.0
- 5) Joule-Thomson expansion of an ideal gas produces \_\_\_\_\_.  
a) cooling  
b) no change in temperature  
c) heating  
d) none of the above
- 6) The unit of  $a$  in Van der Waals equation is \_\_\_\_\_.  
a)  $Nm^{-2}(dm^3)^{-2}mole^2$   
b)  $Nm^{-2}(dm^3)^{-2}mole^{-2}$   
c)  $Nm^{-2}(dm^3)mole^{-1}$   
d)  $Nm^{-2}(dm^3)^2mole^{-2}$
- 7) The compressibility factor  $Z$  for an ideal gas is \_\_\_\_\_.  
a) Equal to one  
b) greater than one  
c) Zero  
d) Less than one

- 8) Molecularity never be \_\_\_\_\_.  
a) Negative                      b) Infinity  
c) Zero                          d) All of these

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

- State first law of thermodynamics.
- Define rate of a chemical reaction.
- Give any two requirements for the liquefaction of the gases.
- Write equation for straight line.
- Give one example of second order reaction.

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

- a) Spontaneous processes.
- b) Rules of integration.
- c) Ideal and non-ideal gas.

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

- Derive the expression for the rate constant for first order reaction.
- Calculate the minimum amount of heat that must be withdrawn from the hot reservoir at 410 K to obtain work equal to 15 kJ per cycle. The lower temperature of the cycle is 290 K.
- What are the characteristics of second order reactions?

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

- Explain the factors which affects the rate of chemical reactions.
- Describe the deviations from ideal behavior of a real gas.

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**B.Sc. (Plain) (Semester - I) (CBCS) Examination:  
October/November – 2025  
COMPUTERS SCIENCE (Paper-II)  
Programming Using C (22221121)**

Day & Date: Friday, 28-11-2025  
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) \_\_\_\_\_ are also called as reserved words.
  - a) Operator
  - b) Variable
  - c) Keyword
  - d) Special symbol
- 2) The range of float data type varies from \_\_\_\_\_ to \_\_\_\_\_.
  - a) -128 to 127
  - b) -32768 to 32767
  - c)  $3.4 \times 10^{-38}$  to  $3.4 \times 10^{38}$
  - d) None of these
- 3) \_\_\_\_\_ format code is used to read single float type value.
  - a) %g
  - b) %d
  - c) %ld
  - d) None of these
- 4) 'C' language developed by \_\_\_\_\_.
  - a) Ken Thompson
  - b) Bill Gates
  - c) Steve Jobs
  - d) Denis Ritchie
- 5) \_\_\_\_\_ is the valid identifier in 'C' language.
  - a) 24emp
  - b) \_12emp
  - c) 12emp@
  - d) Emp\$
- 6) Which of the following is an invalid example of character constant?
  - a) 'a'
  - b) 'ab'
  - c) 'abc'
  - d) None of these
- 7) \_\_\_\_\_ is the exit controlled loop.
  - a) for
  - b) while
  - c) do-while
  - d) Both a & b
- 8) printf() function belongs to \_\_\_\_\_ header file.
  - a) stdio.h
  - b) string.h
  - c) conio.h
  - d) math.h

- Q.2 Answer any four of the following. 08**
- a) Define global variable.
  - b) What is recursion?
  - c) Explain typedef
  - d) What is Table of string
  - e) What is command line argument?
  - f) List of types of operators.
- Q.3 Write short note on following (any Two) 08**
- a) Storage classes.
  - b) Pointer.
  - c) Dynamic array.
- Q.4 Answer any two of the following. 08**
- a) Explain the features of 'C'.
  - b) What is string? Explain any three string handling functions.
  - c) Explain types of array with example.
- Q.5 Answer any one of the following. 08**
- a) Write a program to show difference between structure & union.
  - b) Explain call by value and call by reference with program.

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**B.Sc. (Plain) (Semester - I) (CBCS) Examination:  
October/November - 2025  
CHEMISTRY (Paper – II)  
Inorganic Chemistry (22221107)**

Day & Date: Saturday, 29-11-2025  
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 Multiple choice questions.****08**

- 1) Atomic number of an atom indicates \_\_\_\_\_.  
 a) quantum numbers                      b) number of neutrons  
 c) number of orbitals                      d) number of protons
- 2) Halogens have \_\_\_\_\_ electron affinity.  
 a) low                                              b) medium  
 c) high                                              d) zero
- 3) The crystal structure of NaCl is \_\_\_\_\_.  
 a) BCC                                              b) FCC  
 c) Cubic                                              d) hexagonal
- 4) The coordination number of Cs ion in CsCl is \_\_\_\_\_.  
 a) 8                                                      b) 6  
 c) 4                                                      d) None of these
- 5) The number of unpaired electrons possessed by an atom determines its \_\_\_\_\_.  
 a) valency                                              b) angular momentum  
 c) coordination number                      d) none of these
- 6) In  $\text{NH}_3$  molecules \_\_\_\_\_ bond pair of electrons are present.  
 a) 3                                                      b) 2  
 c) 1                                                      d) 4
- 7) With increase in bond order the stability of molecules \_\_\_\_\_.  
 a) increase  
 b) decrease  
 c) remain same  
 d) first increases and then decreases



- 8) Out of phase combination gives \_\_\_\_\_ Mos.
- |                |                 |
|----------------|-----------------|
| a) bonding     | b) antibonding  |
| c) non-bonding | d) non-existent |

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

- a) Define ionization energy and electron affinity.
- b) Define isomorphism and radius ratio.
- c) Draw the crystal lattice structure of body centered cubic and face centered cubic.
- d) What is hybridization? What are different types of hybridization.
- e) What are conditions for successful overlap of molecular orbitals.

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

- a) Hund's rule of maximum multiplicity.
- b) Characteristics of ionic compounds.
- c) Valence Shell Electron Pair Repulsion (VSEPR) theory w.r.t  $\text{NH}_3$ .

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

- a) What is electronegativity? Why electronegativity increases from left to right in the periodic table.
- b) Distinguish between bonding and antibonding molecular orbitals.
- c) Explain the molecular orbital diagram of  $\text{Be}_2$  molecule.

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

- a) Explain the details of heteronuclear diatomic molecules CO w.r.t. bond order stability and magnetic properties.
- b) Discuss the principle of Born-Haber cycle. Give only a schematic representation of Born-Haber cycle of alkali metal halide.

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Set **P**

**B.Sc. (Plain) (Semester - I) (CBCS) Examination:**  
**October/November - 2025**  
**MICROBIOLOGY (Paper-I)**  
**Introduction to Microbiology and Microbial Diversity (22221114)**

Day &amp; Date: Saturday, 29-11-2025

Max. Marks: 40

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 wherever necessary  
 4) Use of maps stencil is allowed.

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

- 1) Who is known for first observing microorganisms through a simple microscope?
 

|                  |                           |
|------------------|---------------------------|
| a) Robert Hook   | b) Antony Van Leeuwenhoek |
| c) Edward Jenner | d) Alexander Fleming      |
- 2) Edward Jenner is known for the development of a vaccine against \_\_\_\_\_.
 

|           |             |
|-----------|-------------|
| a) Rabies | b) Smallpox |
| c) Polio  | d) Cancer   |
- 3) Serum Institute of India is famous for \_\_\_\_\_.
 

|                            |                       |
|----------------------------|-----------------------|
| a) Bioinformatics          | b) Vaccine production |
| c) Agriculture improvement | d) Dairy research     |
- 4) Who gave the concept of antiseptic surgery?
 

|            |            |
|------------|------------|
| a) Lister  | b) Jenner  |
| b) Tyndall | d) Fleming |
- 5) Mycoplasma is unique because it lacks \_\_\_\_\_.
 

|              |                 |
|--------------|-----------------|
| a) DNA       | b) Protein coat |
| c) Cell wall | d) Cytoplasm    |
- 6) Viruses that infect bacteria are known as \_\_\_\_\_.
 

|                |                   |
|----------------|-------------------|
| a) Zoophages   | b) Bacteriophages |
| c) Phytophages | d) Mycophages     |
- 7) Which microbial group has chitin in its cell wall?
 

|             |             |
|-------------|-------------|
| a) Fungi    | b) Algae    |
| c) Protozoa | d) Bacteria |

- 8) Which best differentiates prokaryotes from eukaryotes?
- a) Presence of mitochondria
  - b) Presence of polyribosomes
  - c) Presence of non-membrane-bound DNA
  - d) Habitual location

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

- a) Write any four branches of microbiology.
- b) Define Viroid and Prion.
- c) Define chemotherapy.
- d) Write any two general characteristics of fungi.
- e) Give any two economic importance of algae.

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

- a) Write a short note on the contributions by Antony Van Leeuwenhoek in the development of Microbiology.
- b) Write a short note on NIV as a National Institute related to Microbiology.
- c) Write a short note on the basic principles of nomenclature.

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

- a) Describe the spontaneous generation theory.
- b) Explain the major branches of microbiology with suitable examples.
- c) Describe the general characteristics and importance of protozoa in nature.

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

- a) Explain the structural and functional differences between prokaryotic and eukaryotic cells.
- b) Describe the contributions of Martinus Beijerinck and Sergei Winogradsky in the development of microbial ecology and soil microbiology.

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**B.Sc. (Plain) (Semester - I) (CBCS) Examination:  
October/November - 2025  
PHYSICS (Paper-I)  
Mechanics and properties of Matter (22221104)**

Day & Date: Monday, 08-12-2025  
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 Question:****08**

- 1) Mass in translational motion is analogous to the \_\_\_\_\_ in rotational motion.
  - a) angular momentum
  - b) Kinetic energy
  - c) Torque
  - d) moment of inertia
- 2) C.G.S. unit of moment of inertia is \_\_\_\_\_.
  - a)  $kg.m^2$
  - b)  $gm.cm^2$
  - c)  $gm/cm^2$
  - d)  $kg.s^2$
- 3) The length of an equivalent simple pendulum of the compound pendulum is \_\_\_\_\_.
  - a)  $\frac{k^2}{l^2} + l$
  - b)  $\frac{k^2 + l^2}{2}$
  - c)  $\frac{k^2 + l^2}{l}$
  - d)  $k^2 + l^2$
- 4) The time period of compound pendulum is maximum when \_\_\_\_\_.
  - a)  $l = k$
  - b)  $l = 0$
  - b)  $l = 2k$
  - d)  $l = 3k$
- 5) The ratio of tensile stress to tensile strain is called \_\_\_\_\_.
  - a) Young's modulus
  - b) Bulk Modulus
  - c) Modulus of rigidity
  - d) Poisson's ratio
- 6) The theoretical limiting values of Poisson's ratio are \_\_\_\_\_.
  - a) -1 and +0.5
  - b) +1 and -0.5
  - c) -1 and -0.5
  - d) -1 to +1
- 7) The surface tension \_\_\_\_\_ with increase in temperature.
  - a) Increases
  - b) become zero
  - c) does not change
  - d) decreases

- 8) Bernoulli's equation deal with the law of conservation of \_\_\_\_\_.  
a) Mass                                      b) Momentum  
c) energy                                    d) work**

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

- Define moment of inertia.
- Draw centre of suspension and centre of oscillation.
- State Hooke's law of elasticity.
- State any two factors affecting surface tension.
- Define streamline flow of fluid with diagram.

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

- What is Torsional Pendulum. Obtain expression for time period in torsional pendulum.
- Poisson's ratio for a rubber tube is 0.35. When it is loaded at one end the change in volume is 1.8 cc and change in length is 1.1 cm. Calculate the area of cross section of the tube.
- Describe Jaeger's method to determine surface tension of the liquid.

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

- Calculate the difference of pressure between the two sides of the surface of a spherical drop of water of radius 0.5 mm. Surface tension of water is 0.075 N/m.
- Show that shear strain is equivalent to compression and extension strain.
- Show that the center of suspension and center of oscillation of a compound pendulum are interchangeable.

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

- Derive an expression for moment of inertia of a circular disc about axis of rotation passing through centre and perpendicular to disc.
- Obtain Poiseuille's equation to determine the coefficient of viscosity of liquid.

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Set **P**

**B.Sc. (Plain) (Semester - I) (CBCS) Examination:  
October/November - 2025  
MICROBIOLOGY (Paper-II)  
Cell cytology and Microbial Techniques (22221115)**

Day &amp; Date: Monday, 08-12-2025

Max. Marks: 40

Time: 03:00 PM To 05:00 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.  
 (At. Wts.: H=1, C=12, O=16, N=14, Na=23, Cl=35.5)

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

- 1) \_\_\_\_\_ is example of acidic stain.
  - a) Crystal violet
  - b) Safranin
  - c) Methylene blue
  - d) Nigrosine
- 2) The cell wall of acid fast bacteria contains \_\_\_\_\_.
  - a) Mycolic acid
  - b) Malic acid
  - c) Citric acid
  - d) Lactic acid
- 3) In Gram-Staining \_\_\_\_\_ act as mordant.
  - a) alcohol
  - b) Iodine
  - c) crystal violet
  - d) congo red
- 4) Lipopolysaccharide is part of \_\_\_\_\_.
  - a) gram positive bacterial cell wall
  - b) gram negative bacterial cell wall
  - c) pili
  - d) endospore
- 5) What will be the magnification of a microscope with 10x eyepiece and 40x objective?
  - a) 40 x
  - b) 400 x
  - c) 4000 x
  - d) 40000 x
- 6) In autoclave \_\_\_\_\_ is used for sterilization.
  - a) dry heat
  - b) moist heat
  - c) radiations
  - d) filters
- 7) What is the function of proteins in cell membranes?
  - a) Cellular transport
  - b) Photosynthesis
  - c) Cellular respiration
  - d) None of the above

- 8) What is an endospore?
- a) A reproductive structure of bacteria
  - b) A dormant, resistant form of some bacteria
  - c) A type of fungal spore
  - d) A viral inclusion body

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

- a) Define disinfection.
- b) Enlist arrangements of Flagella.
- c) Define resolving power of microscope.
- d) Define stain and dye.
- e) Give functions of flagella.

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

- a) Explain Fluid mosaic model of cell membrane
- b) Describe cell wall staining.
- c) Describe in short sterilization by Temperature

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

- a) Describe Structure and function of flagella.
- b) Define sterilization and describe in short sterilization by phenol and phenolic compounds.
- c) Write in short about differential staining method.

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

- a) Describe in detail principle, working and application of compound microscope
- b) Explain in brief cell wall of Gram - Positive bacteria.

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Set **P**

**B.Sc. (Plain) (Semester - I) (CBCS) Examination:**  
**October/November - 2025**  
**PHYSICS (Paper-II)**  
**Optics (22221105)**

Day & Date: Tuesday, 09-12-2025  
 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 and calculator is allowed.  
 4) Draw neat diagrams and give equations wherever necessary

**Q.1 Choose the correct alternatives from the followings:** **08**

- 1) In case of Fraunhofer type diffraction, source and screen are effectively at \_\_\_\_\_ from the obstacle.
  - a) finite distance
  - b) infinite distance
  - c) one meter distance
  - d) none of these
- 2) The fringes obtained in case of Newton's rings experiment are \_\_\_\_\_.
  - a) localized fringes
  - b) of equal thickness
  - c) localized and equal thickness
  - d) Delocalized
- 3) In Ramsden's eye piece, two plano convex lenses are separated from each other by 8 cm. The focal length of each lens is \_\_\_\_\_.
  - a) 24cm
  - b) 9 cm
  - c) 12 cm
  - d) 4.5 cm
- 4) The spherical aberration of convex lens is \_\_\_\_\_.
  - a) positive
  - b) negative
  - c) positive as well as negative
  - d) none of these
- 5) The resolving power of grating spectra is \_\_\_\_\_ prism spectra.
  - a) lower than
  - b) higher than
  - c) same
  - d) none of these
- 6) In biprism experiment the wavelength of monochromatic light can be calculated by using formula \_\_\_\_\_, where  $\beta$  is bandwidth
  - a)  $\lambda = \frac{\beta d}{D}$
  - b)  $\lambda = \frac{\beta D}{d}$
  - c)  $\lambda = \frac{d}{D}$
  - d)  $\lambda = \frac{d}{\beta D}$



- 7) The time taken by a ray of light to travel from one point to another in extremum is given by the mathematical condition \_\_\_\_\_.  
 a)  $\frac{dt}{dx} < 0$   
 b)  $\frac{dt}{dx} > 0$   
 c)  $\frac{dt}{dx} = 0$   
 d)  $\frac{dt}{dx} \geq 0$
- 8) According to Fermat's modified principle, a ray of light chooses that path between two points along which the time of travel is \_\_\_\_\_.  
 a) Extremum  
 b) Minimum  
 c) maximum  
 d) Zero

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

08

- Draw a neat labelled diagram of spherical aberration produced by convex lens.
- In wedge shaped air film experiment, a monochromatic source of light of wavelength  $6000\text{\AA}$  is used. Calculate the thickness of air film of  $10^{\text{th}}$  dark fringe.
- Compare between prism and grating spectra.
- A plane diffraction grating having 12500 lines on 2 inch, calculate the grating element.
- What are the applications of LASER?

**Q.3 Answer any two of the following.**

08

- Write note on spectrometer.
- Explain the construction and working of Ruby Laser.
- A plane wavefront of monochromatic light of wavelength  $4250\text{\AA}$  falls normally on a narrow slit of width  $3.0 \times 10^{-4}\text{ cm}$ . Find the direction in which the first two minima would occur.

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

08

- a) Two thin plano-convex lenses in Ramsden's eyepiece are separated from each other by 2 cm, calculate
  - i) the focal length of each lens
  - ii) the equivalent focal length
  - iii) the position of the cross wires
- b) Explain construction and working of He-Ne Laser
- c) Describe experimental determination of wavelength of light by using a plane diffraction grating.

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

08

- a) What is an achromatic combination of lenses? Derive the condition for the achromatic combination of two thin lenses kept in contact.
- b) Derive the expression for the optical path difference between two successively reflected rays of a monochromatic light, for a thin parallel faced film.

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Set **P**

**B.Sc. (Plain) (Semester - I) (CBCS) Examination:**  
**October/November - 2025**  
**STATISTICS (Paper - II)**  
**Elementary Probability Theory (22221109)**

Day &amp; Date: Wednesday, 10-12-2025

Max. Marks: 40

Time: 12:00 PM To 02:00 PM

- 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 calculator allowed.

**Q.1 Fill in the blanks by choosing correct alternatives.****08**

- 1) A number is selected from sample space  $\Omega: \{1,2,3,4,5\}$  Define  $A: \{1,2\}$   $B: \{4,5\}$  then \_\_\_\_\_.  
 a)  $A, B$  are independent events  
 b)  $A, B$  are mutually exclusive  
 c)  $A, B$  form partition of the sample space  
 d) None of the above
- 2) The sample space of a deterministic experiment contains \_\_\_\_\_.  
 a) only one sample point  
 b) more than one sample point  
 c) countably infinite number of sample point  
 d) infinite sample points
- 3) Which of the following statement is true?  
 a)  $A$  and  $\bar{A}$  form partition of sample space  
 b)  $A$  and  $\bar{A}$  do not form partition of sample space  
 c) Only two events can't form a partition of sample space  
 d)  $A$  and  $\Omega$  form partition of sample space
- 4) If a perfect coin is tossed twice the probability of getting two heads is \_\_\_\_\_.  
 a) Zero  
 b)  $\frac{1}{8}$   
 c) 1  
 d)  $\frac{1}{4}$
- 5) If  $A$  and  $B$  are events such that  $P(A) = 0.6$ ,  $P(B) = 0.5$  and  $P(A \cap B) = 0.3$  then  $P(\bar{A} \cap B)$  is \_\_\_\_\_.  
 a) 0.4  
 b) 0.8  
 c) 0.2  
 d) 0.3



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

- a)** Define Apriori definition of probability. Prove that the Apriori definition leads to a probability measure.
- b)** If  $A, B, C$  are any three events defined on sample space  $\Omega$  with  $P(A) > 0$  then prove that
$$P(B \cup C/A) = P(B/A) + P(C/A) - P(B \cap C/A)$$

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**B.Sc. (Plain) (Semester - I) (CBCS) Examination:  
October/November – 2025  
MATHEMATICS (Paper - I)  
Algebra (22221116)**

Day & Date: Thursday, 04-12-2025  
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 question.

08

- 1)** The Rank of the matrix  $\begin{bmatrix} 1 & 2 & 4 \\ 0 & 3 & 1 \\ 0 & 0 & 0 \end{bmatrix}$  is \_\_\_\_\_.  
a) 0                                      b) 1  
c) 2                                      d) 3
- 2)** The characteristic equation of the matrix  $A = \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$  is \_\_\_\_\_.  
a)  $\lambda^2 + 3\lambda + 4 = 0$                       b)  $\lambda^2 - 3\lambda - 4 = 0$   
c)  $\lambda^2 - 3\lambda + 4 = 0$                       d)  $\lambda^2 + 3\lambda - 4 = 0$
- 3)** If  $\text{rank}[A] = \text{Rank } [A : B] = \text{number of unknowns}$ , then the system of equations  $AX = B$  have \_\_\_\_\_.  
a) no solution  
b) unique solution  
c) infinite number of solutions  
d) only two solutions
- 4)** The Eigen values of the matrix  $\begin{bmatrix} 1 & 2 & 7 \\ 0 & -5 & 3 \\ 0 & 0 & 4 \end{bmatrix}$  are \_\_\_\_\_.  
a) 1, -5, 7                                  b) 1, -5, 3  
c) 1, -5, 4                                  d) 2, -5, 4
- 5)** The Polar form of the complex number  $\sqrt{3} + i$  is \_\_\_\_\_.  
a)  $2 \left( \cos \frac{\pi}{2} + \sin \frac{\pi}{2} \right)$                       b)  $2 \left( \cos \frac{\pi}{3} + \sin \frac{\pi}{3} \right)$   
c)  $2 \left( \cos \frac{\pi}{4} + \sin \frac{\pi}{4} \right)$                       d)  $2 \left( \cos \frac{\pi}{6} + \sin \frac{\pi}{6} \right)$

- 6)** If  $z = \cos \theta + i \sin \theta$  then  $z^n + z^{-n} = \underline{\hspace{2cm}}$ .
- a)  $2 \sin n\theta$                       b)  $2 \cos n\theta$
- c)  $\sin n\theta$                          d)  $\cos n\theta$
- 7)**  $\cosh z + \sinh z = \underline{\hspace{2cm}}$ .
- a)  $e^z$                                   b)  $e^{-z}$
- c)  $e^{2z}$                                 d)  $e^{-2z}$
- 8)**  $\sin(iz) = \underline{\hspace{2cm}}$ .
- a)  $i \sin z$                             b)  $\sinh z$
- c)  $-i \sinh z$                         d)  $i \sinh z$

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

08

- Reduce the matrix  $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 2 & 1 \\ 1 & 2 & 2 \end{bmatrix}$  into Row Echelon Form and find its rank.
- Solve the system of Linear equations  $x + 2y - 3z = 0$ ,  $2x - 3y + z = 0$ , and  $4x - y - 2z = 0$
- Find all the eigen values of the matrix  $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$
- Find all the values of  $(-1)^{1/3}$
- Prove that  $\cosh^2 z - \sinh^2 z = 1$

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

08

- a)** Verify Cayley-Hamilton theorem for the matrix  $A = \begin{bmatrix} 1 & \sqrt{2} & 0 \\ \sqrt{2} & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$
- b)** Solve the system of Linear equations  
 $x - 3y - 8z = -10$ ,  $3x + y - 4z = 0$ ,  $2x + 5y + 6z = 13$
- c)** If  $\alpha$  and  $\beta$  are the roots of equations  $x^2 - 2x + 4 = 0$  then prove that  
 $\alpha^n + \beta^n = 2^{(n+1)} \cos\left(\frac{n\pi}{3}\right)$

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

08

- a)** State and prove De Moivre's Theorem.
- b)** Test for consistency the following equations and if possible, solve  $x + y + z = -3$ ,  $3x + y - 2z = -2$ ,  $2x + 4y + 7z = 7$
- c)** If  $\sin(\alpha + i\beta) = x + iy$  then prove that
- i) 
$$\frac{x^2}{\cosh^2 \beta} + \frac{y^2}{\sinh^2 \beta} = 1$$
- ii) 
$$\frac{x^2}{\sin^2 \alpha} - \frac{y^2}{\cos^2 \alpha} = 1$$

**Q.5 Answer the following. (Any One)****08****a)** State and prove Cayley-Hamilton theorem.**b)** If  $x$  is real then prove that

i)  $\cosh^{-1} x = \log \left( x + \sqrt{x^2 - 1} \right)$

ii)  $\sinh^{-1} x = \log \left( x + \sqrt{x^2 + 1} \right)$

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Set **P**

**B.Sc. (Plain) (Semester - I) (CBCS) Examination:  
October/November - 2025  
MATHEMATICS (Paper - II)  
Calculus (22221117)**

Day & Date: Friday, 05-12-2025  
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) The value on  $\lim_{x \rightarrow 0} \frac{3^x - 2^x}{x} = \underline{\hspace{2cm}}$ .
  - a)  $\log \frac{1}{3}$
  - b)  $\log \frac{1}{2}$
  - c)  $\log \frac{2}{3}$
  - d)  $\log \frac{3}{2}$
- 2) If  $y = \log(5x + 4)$  then  $y_n = \underline{\hspace{2cm}}$ .
  - a)  $\frac{(-1)^n (n-1)! 5^n}{(5x+4)^n}$
  - b)  $\frac{(-1)^{n-1} (n-1)! 5^n}{(5x+4)^{n-1}}$
  - c)  $\frac{(-1)^{n-1} (n-1)! 5^n}{(5x+4)^n}$
  - d)  $\frac{(-1)^{n-1} (n-1)! 5^n}{(5x+4)^{n+1}}$
- 3)  $x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots$  is an infinite series expansion of \_\_\_\_\_.
  - a)  $e^x$
  - b)  $\sin x$
  - c)  $\cos x$
  - d)  $\tan x$
- 4) The degree of homogeneous function  $f(x, y) = \frac{x^{1/2} + y^{1/2}}{x^{1/3} + y^{1/3}}$  is \_\_\_\_\_.
  - a)  $-\frac{1}{6}$
  - b)  $-\frac{2}{6}$
  - c)  $\frac{2}{6}$
  - d)  $\frac{1}{6}$
- 5) If  $u = \sin^{-1} \left( \frac{x}{y} \right)$  then  $\frac{\partial u}{\partial x} = \underline{\hspace{2cm}}$ .
  - a)  $\frac{x}{\sqrt{y^2 - x^2}}$
  - b)  $\frac{x}{\sqrt{x^2 - y^2}}$
  - c)  $\frac{1}{\sqrt{y^2 - x^2}}$
  - d)  $\frac{1}{\sqrt{x^2 - y^2}}$
- 6) The value of  $\int_0^{\pi/2} \sin^7 x \, dx = \underline{\hspace{2cm}}$ .
  - a)  $\frac{1}{35}$
  - b)  $\frac{16\pi}{35}$
  - c)  $\frac{16}{35}$
  - d)  $\frac{\pi}{35}$



- [illegible]

**Q.2 Answer Any Four of the following.**

08

- Evaluate  $\lim_{x \rightarrow 0} \frac{1 - \cos x}{3x^2}$
- Expand  $\cos x$  in powers of  $x$  using Maclaurin's Series.
- If  $u = x^3 - 3xy^2$  and  $v = 3x^2y - y^3$  then find the value of  $\frac{\partial u}{\partial x} - \frac{\partial v}{\partial y}$
- Evaluate  $\int_0^{\pi/2} \sin^8 x \, dx$
- If  $\phi = x^2 + y^2 + z^2$  then find  $\text{grad} \phi$  at point  $(1, 2, -1)$

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

08

- Find  $n^{th}$  derivative of  $y = x^3 \cdot \sin x$
- If  $z = f(x, y)$  is a homogeneous function of  $x$  and  $y$  of degree  $n$  then show that  $x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} = nz$
- If  $\vec{f} = (2xy^2 + yz)\hat{i} + (2x^2y + xz + 2yz^2)\hat{j} + (2y^2z + xy)\hat{k}$  then show that  $\vec{f}$  is an irrotational.

**Q.4 Answer Any Two of the following.**

08

- a)** Evaluate  $\int_0^{\pi/2} \sin^7 x \cos^7 x \, dx$
- b)** If  $u = \log(x^2 + y^2)$  then show that  $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$
- c)** If  $\vec{f} = x^2 z \hat{i} - 2y^3 z^2 \hat{j} + xy^2 z \hat{k}$  then find  $\text{div } \vec{f}$  and  $\text{curl } \vec{f}$  at  $(1, -1, 1)$

**Q.5 Answer Any One of the following.**

08

- a)** State and prove Leibniz's Theorem.
- b)** i) If  $z = f(x, y)$  is a homogeneous function of  $x$  and  $y$  of degree  $n$  and  $z = f(u)$  then show that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = n \frac{f(u)}{f'(u)}$
- ii) If  $u = \sin^{-1} \left( \frac{x^{1/3} + y^{1/3}}{x^{1/2} - y^{1/2}} \right)$  then show that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = -\frac{1}{6} \tan u$