Seat No.

M.C.A. (Semester - I) (New) (CBCS) Examination: Oct/Nov-2023
Object Oriented Programming Using C ++ (MCA0101)

Day & Date: Friday, 05-01-2024   Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Question 1 and 2 are compulsory.
           2) Attempt any Three from Q. No. 3 to Q. No. 7
           3) Figures to the right indicate full marks.

Q.1 A) Choose Correct Alternative.   **10**

1) Which of the following is the correct syntax to add the header file in the C++ program?
   a) #include <userdefined.h>
   b) #include"userdefined.h"
   c) <include> "userdefined.h"
   d) Both A and B

2) Which of the following is the address operator?
   a) @   b) #
   c) &   d) %

3) Which of the following comment syntax is correct to create a single-line comment in the C++ program?
   a) //Comment   b) /Comment/
   c) Comment//   d) None of the above

4) Which of the following refers to characteristics of an array?
   a) An array is a set of similar data items
   b) An array is a set of distinct data items
   c) An array can hold different types of datatypes
   d) None of the above

5) Which of the following is the correct syntax for declaring the array?
   a) in it array [ ]   b) int array [5];
   c) Array [5];   d) int array= {1,2,3,4,5}

6) Which of the following represents the tab?
   a) \tab   b) \t
   c) \r   d) \a

7) Which of the following refers to the wrapping of data and its functionality into a single individual entity?
   a) Modularity   b) Abstraction
   c) Encapsulation   d) None of the above

8) A C++ stream is_____.
   a) Associated with a particular class
   b) Flow of control through a function
   c) A function
   d) A flow of data from one place to another

9) Which one of the following is a built-in function?
   a) string length ( )   b) stringlen ( )
   c) strlen ( )   d) strlength ( )

10) _____ is the process of using the same name for two or more functions.
   a) Default function argument
   b) Default function
   c) Function overloading
   d) Operator overloading

B) State whether true or false.   06
   1) Variable is a symbolic name associated with a value and whose associated value may be changed.
   2) 'cin' is pre-defined object in C++ to correspond to the standard output stream.
   3) A member function can be defined outside the definition of class using the operator ≪.
   4) Only a single copy of the static data member is used by all the objects.
   5) In inheritance the derived class inherits all capabilities of the child class.
   6) A program extracts the bytes from input stream and inserts bytes into output stream.

Q.2 Write shorts notes on the following.   16
   a) Constructor.
   b) Function overloading.
   c) Data hiding.
   d) Manipulators.

Q.3 Answer the following.
   a) What are the different types of operators in C++?   08
   b) Explain various looping statements in C++.   08

Q.4 Answer the following
   a) What is Object Oriented Programming? How will you compare it with Structured Programming?   08
   b) What is flow chart? What are the symbols used to draw a flow chart? Draw a flow chart to calculate sum of 1 -10 integers.   08

Q.5 Answer the following
   a) Discuss exception handling in C++.   08
   b) What does polymorphism mean in C++? What are the types of polymorphism?   08

Q.6 Answer the following
   a) Write a program to read a matrix of size 3x3 and display it in the matrix format.   08
   b) What do you mean by inheritance? Give the types of inheritance supported by C++.   08

Q.7 Answer the following
   a) Write a program in C++ that uses a constructor and destructor.   08
   b) What a class template in C++? Explain.   08

Seat No.

M.C.A. (Semester - I) (New) (CBCS) Examination: Oct/Nov-2023
Data Structures (MCA0102)

Day & Date: Tuesday, 09-01-2024   Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Question no. 1 and 2 are compulsory.
       2) Attempt any three questions from Q. No. 3 to Q. No. 7.
       3) Figure to right indicate full marks.

Q.1 A) Choose correct alternative.   **10**

1) An _____, which is a finite sequence of instructions, each of which has a clear meaning and can be performed with a finite amount of effort in a finite length of time.
   a) Process   b) Algorithm
   c) Logic   d) Command Line

2) In an _____ implementation of a list, the elements are stored in contiguous cells of an _____.
   a) Linked   b) Array
   c) Graph   d) Tree

3) Inserting an element into the _____ of the list, however, requires shifting all following elements one place over in the array to make room for the new element.
   a) End   b) Middle
   c) Tail   d) Null

4) In _____ cannot be indexed directly, objects are added and removed using different methods.
   a) Array   b) List
   c) Stack   d) Double

5) _____ provide an opaque collection from which objects can be added or removed in a manner that adds value over a list-based collection.
   a) Linked List   b) Graph
   c) Stack   d) Queue

6) A _____ is a data structure where each node has 0 or more children.
   a) Array   b) Pointer
   c) Tree   d) Binary Tree

7) _____ sorting takes place in the main memory of a computer, where we can use the random access capability of the main memory to advantage in various ways.
   a) External   b) Potential
   c) Substantial   d) Internal

8) Bubble sort is a sorting algorithm that operates by making _____ passes through the array, each time moving the largest unsorted value to the right (end) of the array.
   a) Single   b) Multiple
   c) Partial   d) Double

9) _____ algorithms operate by breaking down large problems into smaller, more easily solvable problems.
   a) Multiply and conquer   b) Divide and conquer
   c) Add and conquer   d) Subtract and conquer

10) In a number of applications we may wish to traverse a list both forwards and backwards efficiently. This is made possible using _____ List.
   a) Circular Linked   b) Priority Queue
   c) Doubly Linked   d) Depth First Search

B) State True False.   **06**
   i)   Array data structure holds a heterogeneous data.
   ii)   Circular Queue has a head and tail and not having any end too.
   iii) A linked list consists of nodes where each node contains a data field and a reference to the next node in the list.
   iv)   In a Stack, we can insert elements until queue becomes full.
   v)   Depth First Search is implemented using Queue.
   vi)   In Binary Search tree, a root is smaller than right.

Q.2 Answer the following   **16**
   a) What do you mean by Priority Queue?
   b) What is Information?
   c) Explain in brief Sparse Matrix?
   d) What is Array?

Q.3 Answer the following.   **16**
   a) Discuss in detail Single and Multidimensional array with suitable example.
   b) Define Binary Tree. Explain in detail types of binary tree with suitable example?

Q.4 Answer the following.   **16**
   a) What is Data Structures? Explain evaluating Postfix expression for the given expression:

7	4	-3	*	1	5	+	/	*

   b) Define Tree. Discuss BFS and DFS tree traversal methods with suitable example.

Q.5 Answer the following.   **16**
   a) Define Queue. Discuss in detail DEqueue characteristics and its type with suitable example.
   b) What is Stack? Discuss Tower of Hanoi problem as application of Stack.

Q.6 Answer the following.   **16**
   a) Define Linked List. Discuss in detail procedure to insert element at beginning, middle and end of Doubly Linked List with suitable example.
   b) What do you mean by Data? Discuss in detail primitive and composite data types with example.

Q.7 Answer the following.   **16**
   a) Define Sorting. Use Insertion Sort to sort below given series-
          Series- 89, 45, 1005, 63, 8, 654, 78, 91, 43, 59, 12, 946, 6, 100

   b) Generate Binary Search Tree of below given series and write Pre-order, In order and Post-order traversal of the same.
          Series- 7, 3, 12, 1, 6, 9, 13, 0, 2, 4, 8, 11, 15, 5, 10, 14

Seat No.

M.C.A. (Semester - I) (New) (CBCS) Examination: Oct/Nov-2023
Advanced DBMS (MCA0103)

Day & Date: Friday, 29-12-2023   Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Question no. 1 and 2 are compulsory.
              2) Attempt any three questions from Q. No. 3 to Q. No. 7.
              3) Figure to right indicate full marks.

Q.1 A) Choose correct alternatives   **10**

1) Programmers and database administrators work at _____ level.
    a) Relational   b) Conceptual
    c) Meta   d) Physical

2) The collection of tuples held by the _____ is known as the active set.
    a) Procedure   b) Trigger
    c) Function   d) Cursor

3) _____ JOIN keyword returns all matching records from both tables whether the other table matches or not.
    a) Cross   b) Inner
    c) Right   d) Left

4) _____ Constraint is used to limit the value range that can be placed in a column.
    a) Aliases   b) Check
    c) Drop   d) Alter

5) In _____ state, a transaction executes its final operation, but the data is still not saved to the database.
    a) committed   b) aborted
    c) partially committed   d) failed

6) _____ is used to represent multivalued attribute.
    a) double oval   b) dotted oval
    c) diamond   d) Ellipse

7) _____ Level describes what data are to be stored in the database and also describes what relationship exists among those data.
    a) Foreign   b) Physical
    c) External   d) Conceptual

8) _____ is a type of mechanism where all the previous logs are removed from the system and permanently stored in the storage disk.
    a) Lock   b) Checkpoint
    c) Rollback   d) Time stamp

9) _____ cursors are programmer-defined cursors for gaining more control over the context area.
    a) View   b) Explicit
    c) Implicit   d) ERD

10) A transaction is said to be in a _____ state if it executes all its operations successfully.
a) Log b) Committed
c) View d) ERD

B) Write true/false **06**
1) 5NF is also known as Project-join normal form (PJ/NF).
2) A cursor is the skeleton structure of the database.
3) In aggregation, the relation between two entities is treated as a single entity.
4) The active state is the second state of every transaction.
5) Nested queries are a way to perform more complex queries by embedding one query within another.
6) A clustered index can be defined as an unordered data file.

Q.2 Answer the following questions. **16**
a) Elaborate on primary key & foreign key in short.
b) Discuss four properties of Transaction in brief.
c) Explain Order by & Group by with an example each.
d) Discuss four types of Database Users in short.

Q.3 Answer the following.
a) Explain the three steps in query processing in detail. **08**
b) Discuss Commit, Rollback & Save point in brief. **08**

Q.4 Answer the following.
a) Discuss any eight roles of DBA in DBMS. **08**
b) Elaborate on Implicit & Explicit cursor with an example each. **08**

Q.5 Answer the following.
a) Explain eight characteristics of RDBMS in brief. **08**
b) Discuss Views along with its advantages & disadvantages. **08**

Q.6 Answer the following.
a) Discuss two types of exceptions in PL/SQL in brief. **08**
b) Explain Replication & Fragmentation in detail. **08**

Q.7 Answer the following.
a) Explain Catastrophic and non- catastrophic failures in brief. **08**
b) Elaborate on various phases of database development life cycle. **08**

Seat No.

Set P

M.C.A (Semester - I) (New) (CBCS) Examination: Oct/Nov-2023
Software Engineering (MCA0104)

Day & Date: Sunday, 31-12-2023　　　　　　　　　　　Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
　　　　　　　 2) Attempt any three questions from Q. No. 3 to Q. No. 7
　　　　　　　 3) Figure to right indicate full marks.

Q.1　A)　Choose correct alternative.　　　　　　　　　　　　　　　10

1) SDLC stands for _____.
   a) Software Development Life Cycle.
   b) System Development Life cycle.
   c) Software Design Life Cycle.
   d) System Design Life Cycle.

2) Which one of the following models is not suitable for accommodating any change?
   a) Build & Fix Model　　　　　b) Prototyping Model
   c) RAD Model　　　　　　　　d) Waterfall Model

3) Which of the following is/are White box technique?
   a) Statement Testing　　　　　b) Decision Testing
   c) Condition Coverage　　　　d) All of the mentioned

4) Size and Complexity are a part of _____.
   a) Product Metrics　　　　　　b) Process Metrics
   c) Project Metrics　　　　　　d) All of the mentioned

5) Number of errors found per person hours expended is an example of a __.
   a) Measurement　　　　　　　b) Measure
   c) Metric　　　　　　　　　　d) All of the mentioned

6) Which one of the following is a requirement that fits in a developer's module?
   a) Availability　　　　　　　　b) Testability
   c) Usability　　　　　　　　　d) Flexibility

7) In system modeling, which model depicts a system's static nature?
   a) Data Model　　　　　　　　b) Structural Model
   c) Context Model　　　　　　　d) Behavioural Model

8) We generally use the _____ for Software Maintenance.
   a) Integration Testing　　　　　b) Unit Testing
   c) System Testing　　　　　　　d) Regression Testing

9) What are attributes of good software?
   a) Software maintainability
   b) Software functionality
   c) Software development
   d) Software maintainability & functionality

10) Which of the following does not relate to Evolutionary Process Model?
   a) Incremental Model
   b) Concurrent Development Model
   c) WINWIN Spiral Model
   d) All of the above

B) Write true or false. **06**

1) Software Engineering is defined as systematic, disciplined and quantifiable approach for the development, operation and maintenance of software.
2) The objective for formal technical review is to core errors in software work products.
3) Data flow diagram is a graphical representation of flow of data in an information system.
4) Reverse engineering is the last activity in a reengineering project.
5) A good structured design has low cohesion and high coupling arrangements.
6) Alpha testing is done at Developer's end.

Q.2 Answer the following. **16**
   a) Explain behavioral modeling.
   b) Explain types of myths.
   c) Explain software crisis.
   d) Differentiate Product and Process.

Q.3 Answer the following.
   a) What are the elements of analysis model? **08**
   b) Describe white box testing method and explain how it is differs from black box testing method. **08**

Q.4 Answer the following.
   a) Explain difference between Waterfall model and Spiral model. **08**
   b) What is basic path testing and control structure testing? Explain it. **08**

Q.5 Answer the following.
   a) Explain management of object-oriented software projects. **08**
   b) Explain data, behavioral and functional modeling. **08**

Q.6 Answer the following.
   a) What is metric? Discuss the role of metrics in the process and product? **08**
   b) Explain data modeling and functional modeling. **08**

Q.7 Answer the following.
   a) Explain software prototyping in detail. **08**
   b) Explain communication techniques in software engineering. **08**

Seat No.

MCA (Semester - I) (New) (CBCS) Examination: Oct/Nov-2023
Operating System (MCA0105)

Day & Date: Monday, 01-01-2024   Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7
3) Figure to right indicate full marks.

Q.1 A) Choose correct alternative.   10

1) In Operating System, resource management can be done by _____.
  a) time division multiplexing   b) space division multiplexing
  c) both (a) and (b)   d) none of these

2) Inter-process communication means, _____.
  a) communication between two processes
  b) communication within the process
  c) communication between two threads of a same process
  d) none of the above

3) _____ is a deadlock avoidance algorithm.
  a) Banker's algorithm   b) Round Robin algorithm
  c) elevator's algorithm   d) A* algorithm

4) _____ address generated by CPU.
  a) Physical address   b) Absolute address
  c) Logical address   d) None of the above

5) _____ system stores and retrieves data from secondary storage for use in main memory.
  a) Mapping   b) Paging
  c) Fragmentation   d) Threading

6) Processor can access _____ memory more rapidly.
  a) main   b) virtual
  c) cache   d) read only

7) _____ is the allocation method of disk space.
  a) Linked allocation   b) Continuous allocation
  c) Indexed allocation   d) All of these

8) Tree structure displays the _____.
  a) Directory only   b) File only
  c) File and Directory both   d) None of these

9) _____ scheduling provides a latency improvement over FCFS scheduling for interactive jobs.
  a) Round Robin scheduling   b) Shortest Job First Scheduling
  c) Working Set   d) Priority scheduling

10) _____ is a Copying a process from memory to disk to allow space for other process.
  a) Deadlock   b) Swapping
  c) Page faults   d) Fragmentation

B) State true or false. 06
1) In contiguous allocation method, each file occupies a set of contiguous blocks on the disk.
2) In Deadlock, the circular wait condition can be prevented by defining a linear ordering of resource types.
3) First come first served is the most optimal scheduling algorithm.
4) Page table contains the base address of each page in physical memory.
5) The software that talks to a controller, giving it commands and accepting responses, is called an interrupt.
6) To increase CPU utilization is the main objective of multiprogramming.

Q.2 Write Short Note on. 16
a) Segmentation
b) Real Time O.S.
c) Deadlock
d) i-node

Q.3 Answer the following.
a) What is a file? Explain different types of files? 08
b) Explain Swapping in detail? 08

Q.4 Answer the following.
a) Explain different services provided by Operating System? 08
b) Explain Thread model in detail? 08

Q.5 Answer the following.
a) Explain various types of an Operation System? 08
b) Explain Round Robin and Priority Scheduling algorithm in detail? 08

Q.6 Answer the following.
a) Explain Paging and Page Table in detail? 08
b) What is system threats and explain in detail? 08

Q.7 Answer the following.
a) What is virtual memory? Explain different advantages of virtual memory? 08
b) Explain deadlock detection techniques in detail? 08

Seat No.

M.C.A. (Semester - I) (New) (CBCS) Examination: Oct/Nov-2023
Discrete Mathematical Structures (MCA0109)

Day & Date: Wednesday, 17-01-2024   Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Question 1 and 2 are compulsory.
2) Attempt any Three from Q. No. 3 to Q. No. 7
3) Figures to the right indicate full marks.

Q.1 A) Choose Correct Alternative.   **10**

1) If p is false, q is true, then $p \rightarrow q =$ _____.
   a) True   b) False
   c) 1   d) Both a and c

2) The value of $P(9,5)$ is _____.
   a) 45   b) 15120
   c) 15210   d) 126

3) If A and B are disjoint sets the $A \cap B =$ _____.
   a) A b) B
   c) ϕ d) U

4) If $A = \begin{bmatrix} 4 & 2 \\ 1 & 3 \end{bmatrix}$ then $[A] =$ _____.
   a) 12   b) 10
   c) 14   d) 11

5) In a group G which law is called commutative?
   a) $e * a = a * e = a$ b) $a * a^{-1} = a^{-1} * a = e$
   c) $a * b = b * a$ d) None of these

6) A mapping $f: A \rightarrow B$ is said to be_____ if distinct elements in A have distinct f-images in B.
   a) Many-one   b) Into
   c) One-One   d) Onto

7) If A is a skew-symmetric matrix then _____.
   a) $a_{ij=} - a_{ji}$ b) $a_{ij} = +a_{ij}$
   c) $a_{ij} = -a_{ij}$ d) $a_{ij} = a_{ji}$

8) In lattice L, $a, \leq b \ \forall \ a, b \in L$ iff _____.
   a) $a \wedge b = a$ b) $a \vee b = b$
   c) Both a & b   d) $a \wedge b = \phi$

9) If all the entries in last column of given statement pattern are F then it is called a _____.
   a) Tautology   b) Contradiction
   c) Contingency   d) None of these

10) A vertex of degree one is called as _____.
    a) One vertex   b) Pendent vertex
    c) Isolated vertex   d) None of these

B) **Write true/false.** 06
   1) The necessary and sufficient condition for a square matrix A to be invertible is that A is _____.
   2) A vertex having degree _____ is called a isolated vertex.
   3) The _____ set is a subset of every set.
   4) The identity element, if exists, of any algebraic structure is _____.
   5) The value of $C(n,r) = $ _____.
   6) The inverse of $p \to q$ is _____.

Q.2 Answer the following. 16
   a) Define directed and Undirected graph.
   b) Find the adjoint of the matrix $A = \begin{bmatrix} 4 & 5 & 6 \\ 2 & -1 & 3 \\ -3 & 2 & 1 \end{bmatrix}$

   c) Define Regular graph with an example.
   d) Find the value of
   1) $C(10,2)$
   2) $C(10,3)$

Q.3 A) **Write short note on.** 06
   1) Symmetric matrix, skew-symmetric matrix with examples.
   2) Hamiltonian Graph.

   B) **Answer the following.** 10
   1) Define Function and write the types of Functions.
   2) Prove that $Z_5 = \{0,1,2,3,4\}$ under addition modulo 5 is a group.

Q.4 Answer the following.
   a) Solve the system of linear equations: $2x - y - z = 7$; 08
   $$3x + y - z = 7;$$
   $$x + y - z = 3$$
   b) If R be relation in the set of integers Z defined by 08
   $$R = \{(x,y): x \in Z, y \in Z, (x - y) \text{ is divisible by } 6\}$$
   Then prove that R is an equivalence relation.

Q.5 Answer the following.
   a) Explain Hasse Diagram. Draw Hasse Diagram for D_{20}. 08
   b) Prove the following logical equivalence: $(p \wedge q) \to r \equiv p \to (q \to r)$ 08

Q.6 Answer the following.
   a) Find inverse of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 3 & 3 \\ 1 & 2 & 4 \end{bmatrix}$ 08

   b) Show that:
   1) if $a \le b \Rightarrow a \vee c \le b \vee c$ 04
   2) If $a \le b \Rightarrow a \wedge c \le b \wedge c$ 04

Q.7 Answer the following.
   a) Using truth table show that:
   1) $p \leftrightarrow q \equiv (p \to q) \wedge (q \to p)$ 04
   2) $p \to q \equiv \sim p \vee q \equiv \sim q \to \sim p$ 04
   b) If A, B, C are any sets, then prove that: $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ 08
   $$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

Seat No.

M.C.A. (Semester - I) (Old) (CBCS) Examination: Oct/Nov-2023
Object Oriented Programming using C++ (MCA101)

Day & Date: Friday,05-01-2024　　　　　　　　　　　Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Question 1 and 2 are compulsory.
　　　　　　　　2) Attempt any Three from Q. No. 3 to Q. No. 7
　　　　　　　　3) Figures to the right indicate full marks.

Q.1　A)　Choose Correct Alternative.　　　　　　　　　　　　　　　**10**

1) Which of the following is not a type of constructor?
   a) Copy constructor
   b) Friend constructor
   c) Default constructor
   d) Parameterized constructor

2) The process of making an operator to exhibit different behaviors in different instances is known as_____.
   a) Function overloading　　　b) Inheritance
   c) Operator overloading　　　d) None of the above

3) Exceptions are_____.
   a) Logical error　　　　　　b) Compiler error
   c) Runtime error　　　　　　d) Syntactic error

4) Graphical representation of a problem is known as____.
   a) Algorithm　　　　　　　b) Flowchart
   c) Program　　　　　　　　d) None of the above

5) Which of the following header file includes definition of cin and cout?
   a) istream.h　　　　　　　b) ostream.h
   c) iomanip.h　　　　　　　d) iostream.h

6) Which of the following cannot be used with the keyword virtual?
   a) Class　　　　　　　　　b) Member functions
   c) Constructor　　　　　　d) Destructor

7) In C++, operator << is called as _____.
   a) an insertion operator　　b) an extraction operator
   c) get from operator　　　　d) none of the above

8) Which of the following is not a type of inheritance?
   a) Multiple　　　　　　　　b) Multilevel
   c) Distributive　　　　　　d) Hierarchical

9) _____ are the basic runtime entities in an object oriented system.
   a) Class　　　　　　　　　b) Inheritance
   c) Operator　　　　　　　　d) Object

10) The smallest individual unit in a program are known as_____.
   a) Object　　　　　　　　　b) Tokens
   c) Class　　　　　　　　　d) None of the mentioned

B) Write true/false. **06**

1) In C++, declarations can appear almost anywhere in the body of a function.
2) A destructor is used to destroy the object that have been created by constructor.
3) In operator overloading, we can change the basic meaning of an operator.
4) A derived class with only one base class is called multiple inheritance.
5) Data members of a class are by default private.
6) In looping, for loop is also called as entry control loop.

Q.2 Answer the following. **16**

a) What are the basic concepts of OOPs? Explain in short.
b) What do you mean by function prototyping? Explain with example.
c) Write a short note on Input / Output stream.
d) What are access specifiers in OOP?

Q.3 Answer the following.

a) What is constructor? Explain parameterized constructor with example. **08**
b) What is manipulator? Explain the use of width (), precision () and fill () manipulators. **08**

Q.4 Answer the following

a) Write a program in C++ for swapping of two numbers using function overloading. **08**
b) Define polymorphism. How polymorphism is achieved at compile time and run time. **08**

Q.5 Answer the following

a) What is meant by inheritance? Explain single inheritance with example. **08**
b) What is array of objects? Explain with suitable example. **08**

Q.6 Answer the following

a) What is an exception? Explain multiple catch statement with example. **08**
b) What is friend function? Write a C++ program to demonstrate friend function. **08**

Q.7 Answer the following

a) Explain call by reference and return by reference. **08**
b) What is virtual base class? Explain with example. **08**

| Seat No. | | **Set** | **P** |

M.C.A. (Semester - I) (Old) (CBCS) Examination: Oct/Nov-2023
## Data Structures (MCA102)

Day & Date: Tuesday, 09-01-2024   Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Question no. 1 and 2 are compulsory.
              2) Attempt any three questions from Q. No. 3 to Q. No. 7.
              3) Figure to right indicate full marks.

Q.1 A) Choose correct alternative. (MCQ)   **10**

1) A linked list type that navigates for an item in forward and backward direction is called _____.
   a) Doubly Linked List   b) Circular linked List
   c) Linear Linked List   d) Absolute linked List

2) The data structure required to evaluate a postfix expression is _____.
   a) Queue   b) Stack
   c) Array   d) Linked-list

3) A mathematical-model with a collection of operations defined on that model is called _____.
   a) Data Structure   b) Abstract Data Type
   c) Primitive Data Type   d) Algorithm

4) Linked List can be _____.
   a) Single   b) Double
   c) Circular   d) All of these

5) The number of edges from the node to the deepest leaf is called _____ of the tree.
   a) Height   b) Depth
   c) Length   d) Width

6) What is the time complexity to count the number of elements in the linked list?
   a) O(l)   b) O(n)
   c) O(logn)   d) $O(n^2)$

7) The following given tree is an example for?
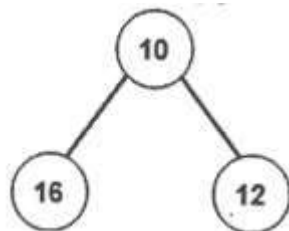
   a) Binary tree   b) Binary search tree
   c) Fibonacci tree   d) AVL tree

8) Which of the following is the correct way to declare a multidimensional array?
   a) int[] arr;   b) int arr[[]];
   c) int[][]arr;   d) int[[]] arr;

9) The postfix form of A*B+C/D is?
   a) *AB/CD+
   b) AB*CD/+
   c) A*BC+/D
   d) ABCD+/*

10) Circular Queue is also known as _____.
    a) Ring Buffer
    b) Square Buffer
    c) Rectangle Buffer
    d) Curve Buffer

B) Write True/False. 06
   1) The number of sub trees of a node is called its degree.
   2) An empty tree is height balanced.
   3) Linear search is used for searching in a sorted array.
   4) In the prefix form, the operator precedes the two operands.
   5) The queue operated in First in first out.
   6) A binary tree is a rooted tree but not an ordered tree.

Q.2 Answer the following 16
   a) What is algorithm? Explain complexity analysis of an algorithm.
   b) Define:
      i) Recursion
      ii) Stack
      iii) Linked List
      iv) Data
   c) Convert given infix expression to postfix expression using stack:
      A* (B-C)/E ^ F+G.
   d) Short note on Dequeue.

Q.3 Answer the following.
   a) Explain insertion sort algorithm and sort the given list using insertion sort. 08
      7, 4, 10, 6, 3, 12, 1, 8, 2, 15, 9, 5
   b) Explain linear queue and circular queue with suitable example. Give the 08
      advantages of circular queue over linear queue.

Q.4 Answer the following.
   a) What is linked list? Explain types of linked list. 08
   b) What is tree? Explain tree traversal with example. 08

Q.5 Answer the following.
   a) What is Queue? Explain operation of it. 08
   b) What is searching? Explain types of searching with example. 08

Q.6 Answer the following.
   a) What is stack? Explain applications of stack. 08
   b) What is array? Explain types of array with suitable examples. 08

Q.7 Answer the following.
   a) Explain binary tree with example. 08
   b) What are dynamic programming and backtracking? Give an example. 08

Seat No.	

M.C.A. (Semester - I) (Old) (CBCS) Examination: Oct/Nov-2023
Software Engineering (MCA103)

Day & Date: Friday, 29-12-2023   Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Question no. 1 and 2 are compulsory.
          2) Attempt any three questions from Q. No. 3 to Q. No. 7.
          3) Figure to right indicate full marks.

Q.1 A) Choose correct alternatives   **10**

1) Which is not a software characteristics?
    a) Software does, not wear out
    b) Software is flexible
    c) software is not manufactured
    d) Software is always correct

2) Software engineering approach is used to achieve.
    a) Better performance of hardware
    b) error free software
    c) reusable software
    d) quality software product

3) Which is not a software life cycle model?
    a) Waterfall model   b) Spiral model
    c) Prototyping model   d) Capability maturity model

4) Spiral model was developed by _____.
    a) Bev Littlewood   b) Berry Boehm
    c) Roger pressman   d) Victor Basili

5) Which is not a product metric?
    a) Size   b) Reliability
    c) Productivity   d) Functionality

6) SRS stands for _____.
    a) Software requirement specification.
    b) Software Requirement solutions
    c) System Requirement solutions
    d) None of the above

7) Which of the following is a tool in design phase?
    a) Abstraction   b) Refinement
    c) Information hiding   d) Both (a,b,c)

8) In data flow diagram, an originator or receive of data is usually designed by
    a) Arrow   b) Rectangle
    c) Circle   d) Square box

9) Data dictionary contains details of _____.
    a) Data structures   b) Data flows
    c) Data stores   d) All of the above

10) Validation is _____.
   a) Checking the product with respect to customer's expectations.
   b) Checking the product with respect to specification.
   c) checking the product with respect to constraints of the project.
   d) All of the above.

B) State True /False   06
   1) Requirements elicitation is a cyclic process.
   2) Traceability is not considered in requirement analysis.
   3) A system flow chart is not a part of a program documentation package.
   4) Software tools improve the productivity of programmers.
   5) Project risk affects the schedule or resources.
   6) Validation plan describes the approach, resources and schedule used for system validation.

Q.2 Answer the following questions.   16
   a) Explain software design principles.
   b) Differentiate functional requirement & nonfunctional requirement.
   c) Why analysis phase is important in software development life cycle?
   d) Explain the essence of software engineering practice.

Q.3 Answer the following.
   a) What is software testing? explain various software testing strategies.   **08**
   b) Explain the mechanics of structured analysis.   **08**

Q.4 Answer the following.
   a) Explain basic path testing & control structure testing in detail.   **08**
   b) Explain the elements of the object oriented model.   **08**

Q.5 Answer the following.
   a) Explain in detail data design and architectural design.   **08**
   b) Explain "Software engineering" -a layered technology.   **08**

Q.6 Answer the following.
   a) What are the steps in software development? Explain   **08**
   b) Explain in detail data modeling and behavioral modeling.   **08**

Q.7 Answer the following.
   a) Explain white box testing and black box testing.   **08**
   b) Explain how we can perform object oriented analysis and design.   **08**

Seat No.

M.C.A. (Semester- I) (Old) (CBCS) Examination: Oct/Nov-2023
Operating System (MCA104)

Day & Date: Sunday, 31-12-2023 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7
3) Figure to right indicate full marks.

Q.1 A) Choose correct alternative. (MCQ). 10

1) _____ is used to solve the critical section problem.
   a) semaphore b) deadlock
   c) starvation d) segmentation

2) Round robin scheduling is a _____ scheduling algorithm.
   a) Non-preemptive b) Preemptive
   c) Both (a) and (b) d) None of these

3) _____ system stores and retrieves data from secondary storage for use in main memory.
   a) Fragmentation b) Paging
   c) Mapping d) None of these

4) Multiprogramming systems _____.
   a) Are easier to develop than single programming systems.
   b) Execute each job faster.
   c) Execute more jobs in the same time.
   d) Are used only on large main frame computers.

5) A process can be terminated due to _____.
   a) normal exit b) fatal error
   c) killed by another process d) all of the these

6) _____ provides a convenient interface between computer user and hardware.
   a) Linked list b) Operating system
   c) Microprocessor d) Program Stack

7) Tree structure display the _____.
   a) file only b) directory only
   c) file and directory name d) None of these

8) _____ is the essential content in each entry of a page table.
   a) page frame number b) virtual page number
   c) access right information d) None of these

9) The software that talks to a controller, giving it commands and accepting responses, is called a _____.
   a) device driver b) daemons
   c) Spooling d) system calls

10) In _____ file model, file is a sequence of fixed-length records, each with some internal structure.
    a) byte sequence b) record sequence
    c) Tree d) None of these

B) State true or false. 06

1) The scheduler is the part of an Operating System that determines the priority of each process.
2) DMA is a mechanism for allowing an I/O device to transfer data to and from memory without involving the CPU in the transfer.
3) A process in user mode cannot execute certain privileged hardware instructions.
4) Switching among threads in the seme process is more efficient than switching among processes.
5) Working set model for page replacement is based on the assumption of modularity.
6) Banker's algorithm is the deadlock avoidance algorithm.

Q.2 Write Short Note on. 16
   a) Multitasking
   b) Pop-Up Thread
   c) Semaphore
   d) Swapping

Q.3 Answer the following.
   a) Explain monolithic and microkernel structure of an operating system. 08
   b) What is scheduling? Explain scheduling algorithm in Batch system. 08

Q.4 Answer the following.
   a) Explain different types of operating system in detail. 08
   b) Explain deadlock detection and recovery techniques sin detail. 08

Q.5 Answer the following.
   a) What is paging and explain in detail? 08
   b) Explain files, file structure and file types in detail. 08

Q.6 Answer the following.
   a) What is directory? Explain different directory operations in detail. 08
   b) What is a virtual memory? Explain in detail. 08

Q.7 Answer the following.
   a) Explain different functions of an operating system in detail. 08
   b) What is attack? Explain different types of threats? 08

Seat No.

Set **P**

MCA (Semester - I) (Old) (CBCS) Examination: Oct/Nov-2023
Digital Circuits and Microprocessors (MCA105)

Day & Date: Monday, 01-01-2024   Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
               2) Attempt any three questions from Q. No. 3 to Q. No. 7
               3) Figure to right indicate full marks.

Q.1 A) Choose correct alternative.   **10**

1) The output of an AND gate with three inputs, A, B, and C, is HIGH when _____.
   a) $A = 1, B = 1, C = 0$ b) $A = 0, B = 0, C = 0$
   c) $A = 1, B = 1, C = 1$ d) $A = 1, B = 0, C = 1$

2) If a 3-input NOR gate has eight input possibilities, how many of those possibilities will result in a HIGH output?
   a) 1   b) 2
   c) 7   d) 8

3) If a signal passing through a gate is inhibited by sending a LOW into one of the inputs, and the output is HIGH, the gate is a(n):
   a) AND   b) NAND
   c) NOR   d) OR

4) Which of the following is not a basic Boolean operation?
   a) OR   b) NOT
   c) AND   d) FOR

5) A _____ digit is called a bit. Information is represented in digital computers by groups of bits.
   a) Digital   b) Binary
   c) Analog   d) Byte

6) What is the Boolean expression for a four-input OR gate?
   a) $Y = A + B + C + D$ b) $Y = A \cdot B \cdot C \cdot D$
   c) $Y = A - B - C - D$ d) $Y = A \$ B \$ C \$ Dac$

7) How many truth table entries are necessary for a four-input circuit?
   a) 4   b) 8
   c) 12   d) 16

8) Which of the following equations would accurately describe a four-input OR gate when $A = 1, B = 1, C = 0$, and $D = 0$?
   a) $1 + 1 + 0 + 0 = 01$ b) $1 + 1 + 0 + 0 = 1$
   c) $1 + 1 + 0 + 0 = 0$ d) $1 + 1 + 0 + 0 = 00$

9) Which bus is a bidirectional bus?
   a) address bus   b) data bus
   c) address bus and data bus   d) none of the above

10) The 8085A is a(n):
    a) 16-bit parallel CPU   b) 8-bit serial CPU
    c) 8-bit parallel CPU   d) none of the above

B) Write true or false.   **06**
1) A Datapath, when combined with the control unit, forms a component referred to as a CPU.
2) The basic logic gate whose output is the complement of the input is the: AND Gate.
3) Logically, the output of a NOR gate would have the same Boolean expression as a(n): OR gate immediately followed by an inverter.
4) J-K flip-flop made to toggle when J = 1, K = 1.
5) The software used to drive microprocessor-based systems is called: assembly language.
6) The register in the 8085A that is used to keep track of the memory address of the next op-code to be run in the program is the program counter.

Q.2 Answer the following.   **16**
a) What is mean by Data bus?
b) Define Binary System.
c) What is mean by IC's?
d) What is De Morgan's Law.

Q.3 Answer the following.
a) What is mean by Adder? Discuss in detail working of half adder.   **08**
b) What is Microprocessor? Explain architecture of 8085 Microprocessor.   **08**

Q.4 Answer the following.
a) What is Mux? Explain and its different types with neat diagram.   **08**
b) State and explain in detail addressing modes of 8086 Microprocessor.   **08**

Q.5 Answer the following.
a) State and explain in detail Edge-triggered Flip Flop?   **08**
b) State and explain various instruction set of Microprocessor operations.   **08**

Q.6 Answer the following.
a) Define Universal Gates. State and explain in detail truth table of Universal gates.   **08**
b) Discuss registers and shift register with suitable example.   **08**

Q.7 Answer the following.
a) What is Basic and Derived gates? State truth tables of these gates with neat diagram.   **08**
b) What is K-Map? Discuss the k-map simplification method for the following boolean function: **08**
$$F(x, y, z) = \sum (0, 4, 2, 6)$$

Seat No.

M.C.A. (Semester - II) (New) (CBCS) Examination: Oct/Nov-2023
Java Programming (MCA201)

Day & Date: Monday, 18-12-2023   Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Question no. 1 and 2 are compulsory.
            2) Attempt any three questions from Q. No. 3 to Q. No. 7.
            3) Figure to right indicate full marks.

Q.1 A) Choose correct alternatives   **10**

1) The class at the top of exception class hierarchy is _____.
   a) Arithmetic Exception   b) Throwable
   c) Class   d) Exception

2) _____ package is used by the compiler itself. So it does not need to be imported for use.
   a) java.math   b) java.awt
   c) java.applet   d) java.lang

3) What is the error in the following code?
```
class Test
{
abstract void display( );
}
```
   a) No error
   b) Method display( ) should be declared as static
   c) Test class should be declared as abstract
   d) Test class should be declared as public

4) By using _____ you can force immediate termination of a loop, bypassing the conditional expression and any remaining code in the body of the loop.
   a) Break   b) Continue
   c) Terminate   d) Loop Close

5) The information written in java after // is ignored by the _____.
   a) Interpreter   b) Compiler
   c) Programmer   d) All of the above

6) In a java program, package declaration _____ import statements.
   a) must precede   b) must succeed
   c) may precede or succeed   d) none

7) When a programming class implements an interface, it must provide behavior for _____.
   a) two methods defined in that interface
   b) any methods in a class
   c) only certain methods in that interface
   d) all methods defined in that interface

8) In Java variables, if first increment of the variable takes place and then the assignment occur. This operation is also called _____.
   a) pre-increment   b) post-increment
   c) incrementation   d) none of the above

9) _____ the looks only for a match between the value of the expression and one of its case constants.
   a) If   b) match
   c) switch   d) None of the above

10) The compiled Java program can run on any _____ platform having Java Virtual Machine (JVM) installed on it.
    a) Program   b) Java
    c) Hardware   d) nonjava

B) State True or False.   **06**
   1) + and = operators are overloaded for string objects.
   2) Using *this* keyword we can access the value of the instance variables and class variables of that class inside the method of that class itself.
   3) hide() method can be used to remove a component from thedisplay.
   4) break(); does not represents legal flow control statements.
   5) length() and equalTo() methods belong to the String class.
   6) String Literals is used for initializing the value to the string object.

Q.2 Answer the following   **16**
   a) Types of Operators
   b) Wrapper Classes
   c) Thread Priority
   d) Standard Java Packages

Q.3 Answer the following
   a) Explain the features of Java.   **08**
   b) What is Exception Handling? Explain types of Java Exceptions.   **08**

Q.4 Answer the following: -
   a) Define Variable. Explain the following types of variables with example.   **08**
      1) local
      2) instance
      3) static
   b) Write a program to create a thread by extending Thread class.   **08**

Q.5 Answer the following: -
   a) Define Inheritance. Explain types of inheritance with example.   **08**
   b) Explain Method Overriding with example.   **08**

Q.6 Answer the following: -
   a) What are the different types of layout managers in Java? Explain any one of them with example.   **08**
   b) Explain Life Cycle of Applets   **08**

Q.7 Answer the following: -
   a) What are the conditional statements in java? Explain with example.   **08**
   b) How many steps are required to connect to the database in Java using JDBC? Explain.   **08**

Seat No.	

M.C.A. (Semester - II) (New) (CBCS) Examination: Oct/Nov-2023
Advanced DBMS (MCA202)

Day & Date: Tuesday, 19-12-2023　　　　　　　　　　Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Question no. 1 and 2 are compulsory.
　　　　　　　 2) Attempt any three questions from Q. No. 3 to Q. No. 7.
　　　　　　　 3) Figure to right indicate full marks.

Q.1　A)　Choose correct alternative.　　　　　　　　　　　　　**10**

1) Which of the following is generally used for performing tasks like creating the structure of the relations, deleting relation?
   a) DML (Data Manipulation Language)
   b) DDL (Data Definition Language)
   c) Relational Schema
   d) None of these

2) Which one of the following given statements possibly contains the error?
   a) select * from emp where empid = 101;
   b) select empid from emp where empid = 106;
   c) select empid from emp;
   d) select empid where empid = 109 and Lastname = 'Pointing';

3) Which one of the following refers to the "data about data"?
   a) Directory　　　　　　　　b) Sub Data
   c) Warehouse　　　　　　　d) Meta Data

4) To which of the following the term "DBA" referred?
   a) Data Bank Administrator　b) Database Administrator
   c) Data Administrator　　　 d) None of the above

5) Which one of the following is a type of Data Manipulation Command?
   a) Create　　　　　　　　　b) Alter
   c) Delete　　　　　　　　　d) All of the above

6) Which of the following is a top-down approach in which the entity's higher level can be divided into two lower sub-entities?
   a) Aggregation　　　　　　 b) Generalization
   c) Specialization　　　　　 d) All of the above

7) Which of the following refers to the number of attributes in a relation?
   a) Degree　　　　　　　　　b) Row
   c) Column　　　　　　　　　d) All of the above

8) In SQL, which command is used to make permanent changes made by statements issue since the beginning of a transaction?
   a) ZIP　　　　　　　　　　　b) PACK
   c) COMMIT　　　　　　　　　d) SAVE

9) What are ACID properties of Transactions?
 a) Atomicity. Consistency, Isolation, Database
 b) Atomicity. Consistency, Isolation, Durability
 c) Atomicity, Consistency, Inconsistent, Durability
 d) Automatically, Concurrency, Isolation, Durability

10) A relation that has no partial dependencies is in which normal form.
 a) First   b) Second
 c) Third   d) BCNF

B) Write True or False   **06**
 1) A database is called "self-describing" because it contains a description of itself.
 2) The primary difference between the conceptual and external schema is that the external schema is an organization-wide view of the entire database.
 3) It is possible that two or more attributes can form a single key.
 4) A foreign key is an attribute in a table that is a primary key in another table.
 5) Data redundancy means reducing data duplication
 6) The group of one or more columns used to uniquely identify each row of a relation is called Foreign key.

Q.2 Answer the following   **16**
 a) What is DBMS? What are the advantages of DBMS?
 b) Explain Grant and Revoke Command.
 c) Explain Specialization.
 d) Explain Group by clause with example.

Q.3 Answer the following.
 a) Explain Trigger with example.   **08**
 b) Explain 1 NF and 2 NF.   **08**

Q.4 Answer the following.
 a) Explain Database recovery techniques in brief.   **08**
 b) Explain View with example.   **08**

Q.5 Answer the following.
 a) Explain having clause and order by clause with example.   **08**
 b) Explain Update and Alter Command.   **08**

Q.6 Answer the following.
 a) Explain Joins in detail.   **08**
 b) Explain create and Delete table command.   **08**

Q.7 Answer the following.
 a) Explain primary key, foreign key, unique key.   **08**
 b) Explain Normalization in detail.   **08**

Seat No.	

M.C.A. (Semester - II) (New) (CBCS) Examination: Oct/Nov-2023
Computer Communication Network (MCA203)

Day & Date: Wednesday, 20-12-2023   Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Question no. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figure to right indicate full marks.

Q.1 A) Choose correct alternatives   **10**

1) _____ of the following device is used to connect two systems, especially if the systems use different protocols.
   a) Repeater   b) Gateway
   c) Bridge   d) Hub

2) In OSI model, _____ layer is responsible for creating and recognizing frame boundaries.
   a) Data link   b) Network
   c) Physical   d) Transport

3) Hamming code is an error _____ code.
   a) detection   b) recovery
   c) avoidance   d) correcting

4) The ATM used in computer network stands for _____.
   a) Any time money   b) Asynchronous transfer mode
   c) Any time machine   d) Asynchronous Traffic Machine

5) E-mail uses _____ application layer protocol.
   a) HTTP   b) SMTP
   c) TCP   d) SIP

6) In _____, packet sends simultaneously to all destinations.
   a) Broadcasting   b) Spanning
   c) Congestion   d) None of these

7) The variation in the packet arrival times is called _____.
   a) Accuracy   b) Transmission Media
   c) Jitter   d) Time

8) _____ are transport layer protocols used in networking.
   a) TCP and FTP   b) TCP and UDP
   c) UDP and HTTP   d) HTTP and FTP

9) _____ in which a physical address is found for a given logical address.
   a) ARP   b) TCP
   c) RARP   d) none of these

10) SMTP uses _____ TCP port.
    a) 22   b) 25
    c) 21   d) 23

B) **State True or False.** 06
1) CSMA/CD is the multiple access protocol for channel access control.
2) The standard protocol of the Internet is Ethernet.
3) ICMP protocol reports on the success or failure of the data delivery.
4) ATM is a WAN technology that functions in the Data Link Layer.
5) HTTP uses the services of TCP
6) Token bucket algorithm is used to shape the bursty traffic into fixed rate traffic by averaging the data rate.

Q.2 **Answer the following** 16
a) What is datagram?
b) What is DNS?
c) What is Fragmentation?
d) What is RPC?

Q.3 **Answer the following**
a) What is computer network? Explain connection-oriented and connectionless services in detail? 08
b) Explain services provided by Data Link Layer to the Network Layer? 08

Q.4 **Answer the following: -**
a) Explain any two Routing algorithms in detail? 08
b) What is internetworking? Explain Tunneling mechanism in detail? 08

Q.5 **Answer the following: -**
a) Explain Transmission Control Protocol (TCP) in detail? 08
b) What is World Wide Web (WWW) in detail? 08

Q.6 **Answer the following: -**
a) What is Wireless Application Protocol (WAP) in detail? 08
b) Explain Simple Mail Transfer Protocol (SMTP) in detail? 08

Q.7 **Answer the following: -**
a) What is Computer Network? Explain different applications of computer network? 08
b) Explain LAN, MAN and WAN in detail? 08

Seat No.	

M.C.A. (Semester - II) (New) (CBCS) Examination: Oct/Nov-2023
System Software (MCA204)

Day & Date: Sunday, 07-01-2024   Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Question no. 1 and 2 are compulsory.
         2) Attempt any three questions from Q. No. 3 to Q. No. 7.
         3) Figure to right indicate full marks.

Q.1 A) Choose correct alternatives   **10**

1) Bootstrap loader is loaded at the address _____.
   a) 0   b) 80
   c) Depends on machine   d) none of the these

2) Which of the following is not a type of assembler?
   a) One pass   b) Two pass
   c) Three pass   d) Load and go

3) The main data structures involved in a one-pass macro processors are _____.
   a) DEFTAB   b) NAMTAB
   c) ARGTAB   d) All of these

4) What are the activities are performed by pass-I of multi-pass assembler?
   a) Assign address to all the statements
   b) Saves addresses assigned to be used in Pass-2
   c) Defines the symbols in the symbol table
   d) All of these

5) What are the activities are performed by pass-I of multi-pass assembler?
   a) Assign address to all the statements
   b) Saves addresses assigned to be used in Pass-2
   c) Defines the symbols in the symbol table
   d) All of these

6) Which of the following is not a feature of compiler?
   a) Execution time is more
   b) When all the syntax errors are removed execution takes place
   c) Scans the entire program first and then translate it into machine code
   d) slow for debugging

7) Which of the following system software resides in main memory always?
   a) Linker   b) Loader
   c) Text editor   d) Assembler

8) The linker?
   a) is required to create a load module
   b) is always used before programs are executed
   c) is same as the loader
   d) None of above

9) Parsing is also known as?
   a) Semantic analysis   b) Lexical analysis
   c) Syntax analysis   d) None of the Above

10) In a two pass assembler the object code generation is done during the?
   a) First pass   b) Zero pass
   c) Second pass   d) none of the above

B) Write True or False. 06
   1) A Bootstrap loader is responsible for loading the operating system.
   2) Ultra Sparc are CISC machine.
   3) Application Software is designed to control the operations of a computer.
   4) Assembler is used as a translator for high level language.
   5) Word Processors is not an example of system software.
   6) The physical devices of a computer is system software.

Q.2 Write short note. 16
   a) MASM (Microsoft Assembler)
   b) MS Dos Linker
   c) ANSI C macro language
   d) YACC

Q.3 Answer the following
   a) Explain machine-independent features of Macro processor. 08
   b) What are the algorithm and data structures used for assembler? Explain in detail. 08

Q.4 Answer the following:
   a) Explain program relocation in detail. 08
   b) Explain the instruction formats and addressing modes of SIC/XE machine architecture. 08

Q.5 Answer the following:
   a) Explain different types of loader in detail. 08
   b) What is translator? Explain different translators in detail 08

Q.6 Answer the following:
   a) Explain VAX architecture for CISC machine 08
   b) Explain analysis and synthesis phases of a compiler. 08

Q.7 Answer the following:
   a) Explain machine dependant assembler features. 08
   b) What is program linking? Explain static and dynamic linking. 08

| Seat No. | | **Set** | **P** |

M.C.A. (Semester - II) (New) (CBCS) Examination: Oct/Nov-2023
UML (MCA207)

Day & Date: Thursday, 11-01-2024   Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Question no. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figure to right indicate full marks.

Q.1   A)   Choose correct alternatives   10

1)   The packaging of an object with its behaviors is called _____.
   a)   behaviors   b)   attributes
   c)   Inheritance   d)   encapsulation

2)   Things in UML can be _____.
   a)   Structural   b)   Behavioural
   c)   Grouping   d)   all of these

3)   Which model shows the flow of object interactions?
   a)   Sequence model
   b)   Subsystem model
   c)   Dynamic model
   d)   Both Sequence and Dynamic model

4)   _____ represented by In UML diagrams, relationship between component parts and object.
   a)   Ordination   b)   aggregation
   c)   Segregation   d)   increment

5)   Which diagram that helps to show Dynamic aspects related to a system?
   a)   Sequence   b)   Interaction
   c)   Deployment   d)   Use case

6)   Which diagram is used to show interactions between messages and classifiers as?
   a)   Activity   b)   State chart
   c)   Collaboration   d)   Object lifeline

7)   Which of the following attribute is a data item held by?
   a)   Class   b)   Object
   c)   Both a) and b)   d)   None of these

8)   Which of these are part of class operation specification format?
   a)   Name   b)   Parameter list
   c)   Return_type list   d)   All of these

9)   Which among these are the common notations for deployment diagrams?
   a)   Artifacts and nodes   b)   Stereotypes
   c)   Components   d)   All of the above

10) What are the different interaction diagram notations does UML have?
   a) a sequence diagram
   b) a communication diagram
   c) an interaction overview diagram
   d) all of the mentioned

B) State True or False.   **06**
1) Structure diagrams emphasize the things that must be present in the system being modeled.
2) Behavior is the packaging of several items together into one unit.
3) Activity diagrams depict the sequential flow of a use case or business process.
4) There is no need for foreign keys in a class diagram.
5) Deployment Diagram is used to represent system hardware and its software.
6) UML describes the real-time systems.

Q.2 Answer the following.   **16**
   a) Explain relationships in structural modeling.
   b) What is the importance of using UML?
   c) Describe the structural part of the collaboration.
   d) Describe action states and activity states.

Q.3 Answer the following.
   a) Draw and explain the activity diagram for online airline reservation system.   **08**
   b) Explain in detail UML software development life cycle.   **08**

Q.4 Answer the following.
   a) Explain various notations used in UML.   **08**
   b) What is interaction diagram? What is the difference between interaction   **08**
      diagram and collaboration diagram?

Q.5 Answer the following.
   a) Explain the forward engineering and reverse engineering.   **08**
   b) Draw the class diagram for the railway reservation system.   **08**

Q.6 Answer the following: -
   a) Explain generalization and specialization in detail.   **08**
   b) Explain about the different kinds of relationships among classifiers.   **08**

Q.7 Answer the following: -
   a) What is active class? Write the difference between normal class and active   **08**
      class.
   b) Describe the various steps in constructing object model.   **08**

Seat No.

MCA (Semester - III) (New) (CBCS) Examination Oct/Nov-2023
.NET Technology (MCA301)

Day & Date: Friday, 05-01-2024 Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No 3 to Q. No 7.
3) Figure to right indicate full marks.

Q.1 A) Choose correct alternative. (MCQ) 10

1) If you are using user control in ASP.NET page which directory will be used?
   a) Register b) Assembly
   c) Implements d) Aspx

2) What is the last event of web page life cycle?
   a) Page_Load b) Page_LoadComplete
   c) Page_Finish d) Page_Unload

3) The .NET Framework provides a runtime environment called_____?
   a) CLR b) CTS
   c) JIT d) JVM

4) Which object data is included in bookmarks and e-mailed URLs?
   a) View State b) Session State
   c) Query String d) Cookies

5) Which of the following is client side state management technique available in ASP.net?
   a) Application State b) Query String
   c) Session State d) Both a and

6) ASP.NET is developed by _____.
   a) IBM. b) Google
   c) Microsoft d) None of the above

7) What is the extension of the master page?
   a) .master b) .aspx
   c) .ascx d) .masterpage

8) What Is CLS?
   a) Compiler library specification
   b) Common library specification
   c) Compiler language specification
   d) Common language specification

9) _____ XML file is important in developing an ASP.NET application.
   a) Web.Config b) App.Config
   c) Machine.Config d) Web.Data

10) Which of the following is root object in the .NET hierarchy?
    a) System.Type b) System.Object
    c) System.Base d) none of the mentioned

B) **State True or False.** 06
1) Every server control must have an ID.
2) Every website must have an app.config file.
3) Master pages can be nested.
4) .NET is the product of IBM.
5) Content page uses @master directives.
6) In asp.net application DLL files are stored in app_data folder.

Q.2 **Answer the following.** 16
a) What is the use of AutoPostBack properties explain with example?
b) Short note on need of nested master page.
c) Short note on metadata in asp.net
d) Explain page life cycle event.

Q.3 **Answer the following.**
a) Design a windows application and write code to inserts a student record. 08
b) What is master page? Write stepwise process of creating master page. 08

Q.4 **Answer the following.**
a) Differentiate in between ASP and ASP.NET 08
b) What is State management? Explain Cookies in ASP.NET? 08

Q.5 **Answer the following**.
a) What is Validation? Explain Custom Validator, Validations Summary. 08
b) What is page framework? Explain any five application folder in detail. 08

Q.6 **Answer the following.**
a) What is WebPart in asp.net? Explain advantages of WebParts in details. 08
b) What is .Net framework? Explain detail architecture with suitable diagram. 08

Q.7 **Answer the following.**
a) What is client side state management? Explain any four client side state management techniques. 08
b) Explain app.config, web.config and global .asax files with suitable example. 08

Seat No.

MCA (Semester - III) (New) (CBCS) Examination: Oct/Nov-2023
Digital Image Processing (MCA302)

Day & Date: Tuesday, 09-01-2024   Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Question no. 1 and 2 are compulsory.
           2) Attempt any three questions from Q. No. 3 to Q. No. 7.
           3) Figure to right indicate full marks.

Q.1 A) Choose correct alternatives.   **10**

1) Which of the following possess maximum frequency?
   a) Gamma Rays   b) UV Rays
   c) Microwaves   d) Radio waves

2) If each element of set X is also an element of set Y, then X can be called _____ of set Y.
   a) Union   b) Subset
   c) Disjoint   d) Complement Set

3) What is the output of a smoothing, linear spatial filter?
   a) Median of pixels   b) Maximum of pixels
   c) Minimum of pixels   d) Average of pixels

4) Median filters belong to which category of filter?
   a) Frequency Domain Filter   b) Order Statistics Filter
   c) Linear Spatial Filter   d) Sharpening Filter

5) Which of the following is the correct representation of log transformation?
   a) $s = c \log(1+r)$ b) $s = c \log(1/r)$
   c) $s = c \log(1-r)$ d) $s = c \log(1 * r)$

6) Which of the following is used to resolve the dark features in the image?
   a) Sampling   b) Histogram
   c) Power-law Transformation   d) Quantization

7) What is the name of the process, which reverses the image's intensity?
   a) Linear Transformations   b) Image Negatives
   c) Log Transformations   d) None of the above

8) The sum of all components of a normalized histogram is _____.
   a) 0   b) 1
   c) 2   d) -1

9) _____ processing techniques of image enhancement are based on modifying the Fourier transform of an image.
   a) Spatial domain   b) Frequency domain
   c) both a and b   d) none of these

10) Dividing an image into its constituent regions or objects is known as _____.
    a) Compression   b) Shrinking
    c) Segmentation   d) None of these

B) State True or False. 06
1) Blurring an image with the help of a smoothing filter may lead to noise reduction.
2) The full form of JPEG is Joint Photographic Expansion Group.
3) Histogram of two different images may be same.
4) The difference between two images f(x, y) and h(x, y) is obtained by computing the difference between all pairs of corresponding pixels from f and h
5) The Hit-or-Miss transformation is defined in terms of two structuring elements.
6) Convolution in spatial domain is refereed as multiplication in frequency domain.

Q.2 Write short notes on the following. 16
a) Model of image restoration process.
b) Order statistics filter.
c) Thickening
d) Power law transformations.

Q.3 Answer the following.
a) Explain the Components of an Image Processing System with a neat diagram. 08
b) Explain various fields that use digital image processing. 08

Q.4 Answer the following.
a) Explain the following Basic Intensity Transformation: 08
    i) Image Negatives   ii) Log Transformations
b) Describe Histogram Processing. 08

Q.5 Answer the following.
a) Explain restoration in the Presence of Noise Only using Spatial Filtering. 08
b) Explain neighbors of pixel. 08

Q.6 Answer the following.
a) Explain Erosion, Dilation with an example. 08
b) Explain the following Basic Morphological Algorithm. 08
    i) Boundary Extraction   ii) Thickening

Q.7 Answer the following.
a) What are the steps involved in filtering in the frequency domain? 08
b) Explain Image Smoothing using Frequency Domain Filters. 08

Seat
No.

M.C.A. (Semester - III) (New) (CBCS) Examination: Oct/Nov-2023
Mobile Computing (MCA303)

Day & Date: Sunday, 31-12-2023   Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Question no. 1 and 2 are compulsory.
           2) Attempt any three questions from Q. No. 3 to Q. No. 7.
           3) Figure to right indicate full marks.

Q.1 A) Multiple choice questions.   **10**

1) It is defined as the process of transferring a call (or data transfer) in progress from one channel to another channel _____.
   a) Handover
   b) Handoff
   c) Roaming
   d) Both (a) and (b)

2) A television broadcast is an example of _____ transmission.
   a) Full-duplex
   b) Automatic
   c) Simplex
   d) Half-duplex

3) This standard defines Quality of service and prioritization _____.
   a) 802.11a
   b) 802.11e
   c) 802.11g
   d) 802.11af

4) Several directed antennas can be combined on a single pole to construct a _____.
   a) Sectorized antenna
   b) Omni-directional antenna
   c) Directional antenna
   d) Marconi antenna

5) BSS in GSM stands for _____.
   a) Basic Service Sub-system
   b) Basic Services Set
   c) Base Station Sub-system
   d) Base Station Service

6) What level does TCP uses flow and error control mechanisms?
   a) Physical level
   b) Data link level
   c) Network level
   d) Transport level

7) Congestion control involves two factors that measure the performance of a network _____.
   a) Delay
   b) Throughput
   c) Both a & b
   d) None of these

8) GSM stands for _____.
   a) Global Structure for Mobile
   b) Global System for Module communications
   c) Global Segment for Mobile
   d) Global system for mobile communications

9) In mobile computing, HLR is the abbreviation of which the following?
   a) Home Live Register
   b) Home Location Register
   c) House Live Register
   d) House Location Register

10) Which of the following protocol enables access to the internet from a mobile device?
   a) HTTP (Hypertext Transfer Protocol)
   b) TCP/IP (Transmission Control Protocol)
   c) ISD (International Subscriber Dialing)
   d) WAP (Wireless Application Protocol)

B) Fill in the Blanks. 06
   1) _____ is used to provide the data or to access the data by other applications which are stored by itself.
   2) Which file can be used to create Color Resource in Android?
   3) The main purpose of _____ is to inform the home agent of the current location for correct forwarding of packets.
   4) Forming groups of piconets called _____.
   5) PSTN stands for _____.
   6) Antenna mounted on the roof of car is called as _____.

Q.2 Answer the following 16
   a) Hidden & Exposed Terminals Problem.
   b) Color & String Resources in Android.
   c) Pinconet
   d) Slow Start & Fast Recovery.

Q.3 Answer the following. 16
   a) Explain architecture of infrastructure-based IEEE 802.11 network.
   b) What is multiplexing? Explain TDM & FDM in detail.

Q.4 Answer the following. 16
   a) Explain in detail types of Android Applications.
   b) Write a note on Snooping TCP & Mobile TCP.

Q.5 Answer the following. 16
   a) Explain Demand Assigned Multiple Access in detail.
   b) What is handover? Explain its types in detail.

Q.6 Answer the following. 16
   a) Explain Classical Aloha & Slotted Aloha in detail.
   b) Explain the concept of localization & calling in GSM.

Q.7 Answer the following. 16
   a) Write a note on Activity Life Cycle in Android.
   b) What is signal propagation? Explain the additional signal propagation effects in details.

MCA (Semester - III) (New) (CBCS) Examination: Oct/Nov-2023
Artificial Intelligence (MCA304)

Day & Date: Monday, 01-01-2024   Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.
        2) Attempt any three questions from Q. No. 3 to Q. No. 7
        3) Figure to right indicate full marks.

Q.1 A) Choose correct alternative.   **10**

1) _____ of the following is a component of an expert system.
   a) Inference engine   b) Knowledge base
   c) User interface   d) All of the above

2) _____ is a Branching Factor.
   a) Length of the shortest path from initial state to goal state.
   b) The average number of child nodes in the problem space graph.
   c) A property of an algorithm to always find an optimal solution.
   d) None of the Above

3) In a _____, information is represented as a set of nodes connected to each other by a set of labeled arcs, which represent relationship among the nodes.
   a) Frames   b) Scripts
   c) Semantic net   d) Conceptual dependency

4) _____data structure conveniently used to implement BFS.
   a) Stacks   b) Priority Queue
   c) Queues   d) All of the mentioned

5) Playing Bridge is an example of _____ AI problem.
   a) recoverable and certain outcome
   b) irrecoverable and certain outcome
   c) recoverable and uncertain outcome
   d) irrecoverable and uncertain outcome

6) In PROLOG, _____ are begin with upper case letter and _____ begin with lower case letters or numbers.
   a) Constants, variables   b) variables, constants
   c) constants, constants   d) variables, variables

7) A cryptarithmetic problem can be solved by using ……
   a) depth first technique
   b) breadth first technique
   c) constraint satisfaction technique
   d) bidirectional technique

8) A _____ representation is one in which knowledge is specified but the use to which that knowledge is to put is not given.
   a) Procedural   b) Baye's
   c) Declarative   d) Semantic net

9) _____ is the main task of a problem-solving agent.
  a) Solve the given problem and reach to goal
  b) To find out which sequence of action will get it to the goal state
  c) Both (a) and (b)
  d) None of the Above

10) Fuzzy Set theory defines fuzzy operators. Choose the fuzzy operators from the following:
  a) AND   b) OR
  c) NOT   d) All of the above

B) Fill in the blanks.   06
  1) _____ Chaing systems are Data-driven, whereas backward chaining systems are goal- driven.
  2) _____ process makes different logical expression looks identical.
  3) _____ search method takes less memory.
  4) _____ is a technique that improves the efficiency of a search process, by sacrificing claims of completeness.
  5) _____ attempts to show that the negation of the statement produces a contraction with the known statements.
  6) A _____ is a structure that describes a stereotyped sequence of events in a particular context.

Q.2 Answer the following.   16
  a) What is heuristic?
  b) What is Natural Language Processing?
  c) Explain ELIZA?
  d) What is Fuzzy Logic?

Q.3 Answer the following.
  a) Explain Depth First Search algorithm in detail?   08
  b) Explain different Artificial Intelligence tasks in detail?   08

Q.4 Answer the following.
  a) Explain the Frame problem in detail?   08
  b) Explain Forward and Backward reasoning techniques in detail?   08

Q.5 Answer the following.
  a) Explain Baye's theorem in detail?   08
  b) What is Conceptual dependency? Explain in detail with example? 08

Q.6 Answer the following.
  a) Explain Syntactic processing in NLP?   08
  b) Explain Different applications of an AI?   08

Q.7 Answer the following.
  a) What is Expert System and explain in detail?   08
  b) Explain Traveling Salesman Problem in detail.   08

Seat No.		**Set**	**P**

MCA (Semester- III) (New) (CBCS) Examination: Oct/Nov-2023
Data Mining and Warehouse (MCA307)

Day & Date: Wednesday, 17-01-2024   Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Question no. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7.
3) Figure to right indicate full marks.

Q.1 A) Choose correct alternative.   **10**

1) _____ predicts future trends & behaviours, allowing business managers to make proactive, knowledge-driven decisions.
   a) Data warehouse   b) Data mining
   c) Data marts   d) Metadata

2) A data warehouse is _____.
   a) updated by end users.
   b) contains numerous naming conventions and formats.
   c) organized around important subject areas.
   d) contains only current data.

3) The type of relationship in star schema is _____.
   a) many-to-many   b) one-to-one
   c) many-to-one   d) one-to-many

4) _____ include concept description, association, classification, prediction and clustering.
   a) Task Relevant data   b) Kinds of Knowledge
   c) Background Knowledge   d) Interestingness measure

5) Association rules that satisfy both the minimum confidence and support threshold are referred to as _____.
   a) Strong association rules   b) Weak association rule
   c) General Association Rule   d) None of these

6) An agglomerative hierarchical clustering method uses a _____ strategy.
   a) Top-down   b) Bottom-up
   c) Random   d) None of these

7) An _____ system manages current data.
   a) OLAP   b) OLEP
   c) OLTP   d) none of these

8) The deeper the abstraction level, the smaller the corresponding threshold.
   a) Reduced Support   b) Same support
   c) Uniform support   d) Minimum support

9) The _____ view includes fact tables and dimension tables.
   a) business query   b) data source
   c) top-down   d) data warehouse

10) _____ is a random error or variance in a measured variable.
    a) Noise   b) Cleaning
    c) Enhancement   d) Refresh

B) Write true/false. 06
1) Decision tree induction is the learning of decision trees from class-labeled training tuples.
2) Loose coupling means that a DM system will not utilize any function of a DB or DW system.
3) Roll-up is a visualization operation that rotates the data axes in view in order to provide an alternative presentation of the data.
4) A data cube allows data to be modelled and viewed in multiple dimensions.
5) An enterprise warehouse collects all of the information about subjects spanning the entire organization.
6) Bayesian classifiers are Not statistical classifiers.

Q.2 Answer the following. 16
a) What is Data Cleaning? Explain with suitable example.
b) What is data mining? Explain 'kind of knowledge to be mined' as a primitive.
c) Explain Unsupervised learning with example.
d) Explain Divisive Analysis hierarchical clustering method with example.

Q.3 Answer the following.
a) Define Data warehouse? Explain various OLAP operations. 08
b) What is association rule? Explain various applications of association rules. 08

Q.4 Answer the following.
a) Describe Data warehouse architecture with well labelled diagram. 08
b) Explain major four types of concept hierarchies. 08

Q.5 Answer the following.
a) Explain k-medoid algorithm with suitable example. 08
b) Explain Bayesian classification algorithm with suitable example. 08

Q.6 Answer the following.
a) What is classification? Explain two step process of model construction of classification. 08
b) What is Association Rule? Explain 'mining in multidimensional associations'. 08

Q.7 Answer the following.
a) What is Weka? Explain the tools used in weka. 08
b) Explain new trends in Data Mining. 08

Seat No.

M.C.A. (Semester - I) (Old) (CBCS) Examination: Oct/Nov-2023
Discrete Mathematical Structures (MCA109)

Day & Date: Wednesday, 17-01-2024   Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Question no. 1 and 2 are compulsory.
         2) Attempt any three questions from Q. No. 3 to Q. No. 7.
         3) Figure to right indicate full marks.

Q.1 A) Choose correct alternatives   **10**

1) The sum of the diagonal elements of a square matrix A is called as
   _____ of A.
   a) Rank   b) Determinant
   c) Nullity   d) Trace

2) If A and B are any two matrices of same order then _____.
   a) $(A + B)^T = A^T B^T$ b) $(AB)^T = A^T - B^T$
   c) $(A + B)^T = A^T + B^T$ d) $(A + B)^T = B^T A^T$

3) If the edges of the walk W are distinct then W is called _____.
   a) trail   b) path
   c) cycle   d) closed walk

4) In a lattice L, If $a \lesssim b$ then _____.
   a) $a \lor c \lesssim b \land c$ b) $a \land c \lesssim b \lor c$
   c) $(a \lor c) \lesssim (b \lor c)$ d) All of these

5) The co-factor of an element occurring in r^{th} row and s^{th} column is _____.
   a) $(-1)^{rs}$ times its minor   b) $(-r)^s$ times its minor
   c) $(-1)^{r-s}$ times its minor   d) $(-r)^{r+s}$ times its minor

6) If A is a subset of B and B is a subset of C then _____.
   a) A is a subset of C b) B is a subset of A
   c) C is a subset of B d) $A = C$

7) If any five integers from 1 to 8 are chosen, then at least two of them will
   have a sum _____.
   a) 9   b) 11
   c) 12   d) 10

8) The generating function of the sequence $0, 1, 2, 3,$ _____ is _____.
   a) $\sum_{k=0}^{\infty} x^k$ b) $\sum_{k=0}^{\infty} (k+1) . x^k$
   c) $\sum_{k=0}^{\infty} k . x^{-k}$ d) $\sum_{k=0}^{\infty} k . x^k$

9) Which of the following is a Group with respect to addition modulo 6?
   a) {0,1,2,3,4,5}   b) {0,2,3,4,5,6}
   c) {1,2,3,4,5}   d) {1,2,3,4,5,6,7}

10) If p is true and q is false then _____.
    a) $p \land q$ is true   b) $p \lor q$ is true
    c) $p \lor q$ is false   d) None of these

B) **Fill in the blanks.** 06
1) If a finite set S has n elements, then the power set of S has _____ elements.
2) The determinant of the matrix $\begin{bmatrix} 1 & z & -y \\ -z & 1 & x \\ y & -x & 1 \end{bmatrix}$ is ____.
3) If A and B are subsets of a universal set U then, $(A \cap B)^{\sim} = $ _____.
4) A graph G that contains a cycle which includes all the vertices of G is called _____.
5) If $G = \{1, -1, i, -i\}$ is a multiplicative Group then order of an element $-i$ is ___.
6) If for any two vertices u and v of a graph G there is a path from u to v then G is _____.

Q.2 **Answer the following.** 16
a) State and prove Handshaking lemma.
b) Prove that the set $\{0,1,2,3,4\}$ is a finite abelian group of order 5 under addition modulo 5.
c) What is a sum and a product rule?
d) Find the trace and determinant of the matrix $\begin{bmatrix} 3 & 8 & 7 \\ 0 & 5 & 0 \\ 0 & 0 & 2 \end{bmatrix}$.

Q.3 **Answer the following.**
a) Using truth tables, prove the following logical equivalences 08
1) $(p \wedge q) \equiv \sim (p \to \sim q)$
2) $(p \wedge q)r \equiv p \to (q \to r)$
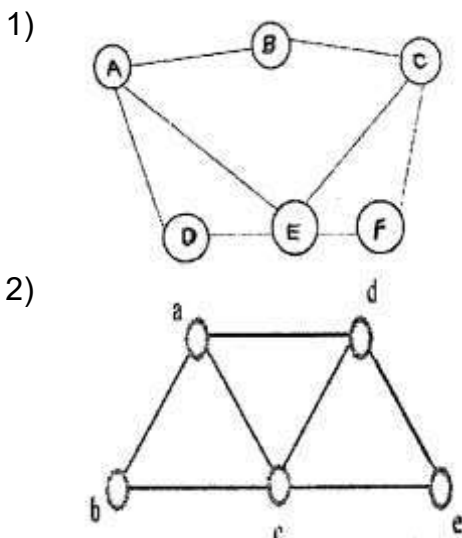**b)** If $(L, \precsim)$ be a lattice then for a,b,c,d in L prove that, 08
1) $a \precsim b \Rightarrow a \vee c \precsim b \vee c$
2) $a \precsim b \Rightarrow a \wedge c \precsim b \wedge c$
3) $a \precsim b$ and $c \precsim d \Rightarrow a \vee c \precsim b \vee d$
4) $a \precsim b$ and $c \precsim d \Rightarrow a \wedge c \precsim b \wedge d$

Q.4 **Answer the following.**
a) Find the distance and diameter of the following graphs. 08
1)

2)

b) Find the adjoint of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 7 & 4 & 5 \\ 6 & 8 & 9 \end{bmatrix}$ 08

Q.5 **Answer the following.**
  a) Solve the system of equations by matrix method   **10**

$4x + 3y + z = 16$
$2x + y + 3z = 19$
$x + 2y + 4z = 25$

  b) Prove that in any graph G, the number of vertices of odd degree is always even.   **06**

Q.6 **Answer the following.**
  a) If A, B and C are any three sets then show that,   **10**
      1) $A \cup (B \cup C) = (A \cup B) \cup C$
      2) $A \cap (B \cap C) = (A \cap B) \cap C$
      3) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$
      4) $(A \cap B)' = A' \cup B'$

  b) Prove that the necessary and sufficient condition for a square matrix A to be invertible is that A is non-singular.   **06**

Q.7 **Answer the following.**
  a) Explain the following statement patterns with truth table.   **10**
      1) Conjunction
      2) Disjunction
      3) Conditional
      4) Biconditional
  b) Prove that, $n_{C_r} + n_{Cr-1} = n + 1_{C_r}; 0 \leq r \leq n.$ **06**

| Seat No. | | **Set** | **P** |

MCA (Semester - III) (New) (CBCS) Examination: Oct/Nov-2023
Finite Automata (MCA308)

Day & Date: Wednesday, 17-01-2024   Max. Marks: 80
Time: 11:00 AM To 02:00 PM

Instructions: 1) Question 1and 2 are compulsory.
         2) Attempt any Three from Q.3 to Q.7.
         3) Figure to right indicate full marks.

Q.1 A) Choose the correct alternatives from the given options.   **10**

1) The logic of pumping lemma is a good example of _____.
    a) Pigeon-hole principle
    b) Divide-and-conquer technique
    c) Recursion
    d) Iteration

2) What is the transitional function of a DFA?
    a) $QX\Sigma \rightarrow Q$ b) $QX\Sigma \rightarrow 2^Q$
    c) $QX\Sigma \rightarrow 2^n$ d) $QX\Sigma \rightarrow Q^n$

3) A push down automaton employs _____ data structure.
    a) Queue   b) Linked List
    c) Hash Table   d) Stack

4) If $\Sigma = \{0,1\}$,then Φ^* will result to:
    a) ϵ b) Φ
    c) Σ d) None of the mentioned

5) A turing machine that is able to simulate other turing machines:
    a) Nested Turing machines   b) Universal Turing machine
    c) Counter machine   d) None of the mentioned

6) Which of the operations are eligible in PDA?
    a) Push   b) Delete
    c) Insert   d) Add

7) The set of all strings over the alphabet $S = \{a, b\}$ (including e) is denoted by _____.
    a) $(a + b)^*$ b) $(a + b)^+$
    c) a^+b^+ d) a^*b^*

8) What is the highest type number which can be applied to the following grammar?
S→Aa   A→Ba   B→abc
    a) Type 0   b) Type 1
    c) Type 2   d) Type 3

9) Push down automata accepts _____ languages.
    a) Type 3   b) Type 2
    c) Type 1   d) Type 0

10) Which of the following a Turing Machine does not consist of?
    a) Input tape   b) Head
    c) State register   d) none of the mentioned

B) Write True or False.   06
  1) The production is in the form of A→aB refers to Greibach Normal Form.
  2) The finite automata accept the following languages Regular Languages.
  3) Both NFA and Є-NFA recognize exactly the same languages.
  4) A Turing machine operates over finite memory tape.
  5) Concatenation of R with, Φ output is R.
  6) The decision problem is the function from string to int.

Q.2 Answer the following.   16
  a) Give the applications of Regular Expression.
  b) Define Turing Machine.
  c) Show that $(a + b)^* = (a + b)^* + (a + b)^*$
  d) Construct FA for the following expression: -
       $((a + b)^* + a\,b\,b)^*$

Q.3 Answer the following.
  a) Prove that Diagonalization Language (L_d) is not Recursively Enumerable.   08
  b) Prove that Regular Language is closed under Kleene Star and   08
       Complementation.

Q.4 Answer the following.
  a) Consider the string "$a + a * a$". Check whether the following grammar is   08
       ambiguous or not, for the given string. If found ambiguous, remove the
       ambiguity and rewrite an equivalent unambiguous grammar
       $E \rightarrow E + E \mid E * E \mid a$
  b) Find a grammar in GNF for the given CFG   08
       $S \rightarrow AB$
       $A \rightarrow BS \mid b$
       $B \rightarrow SA \mid a$

Q.5 Answer the following.
  a) Design a TM which recognizes words of the form $a^n\,b^n\,c^n \mid n >= 0$ 08
  b) Give a PDA to accept the language through Empty Stack and Final State   08
       $L = \{a^m\,b^n \mid n < m\}$

Q.6 Answer the following.
  a) Find an equivalent DFA for the Є-NFA given in the following table: 08

δ	Є	a	b	c
→p	Φ	p	q	r
q	p	q	r	Φ
r*	q	r	Φ	p

  b) Prove that the following language is not regular.   08
       $L = \{0^m\,1^n\,0^{m+n} \mid m >= 1 \text{ and } n >= 1\}$

Q.7 Answer the following.
  a) Convert the following NFA to DFA.   08

δ	0	1
→p	p, q	p
q	r	r
r	s	Φ
s*	s	s

  b) Convert the grammar given below to its equivalent CNF.   08
       S→0Q 1P P
       P→0 0S 1PP
       Q→1 1S 0QQ