

Time: 3 Hours**Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

Marks

- | | | | |
|----|----|--|----|
| 1. | a) | Explain the syntax of various Loop control statements in Java. | 7M |
| | b) | How one dimensional and two dimensional arrays are declared in Java? | 7M |

(OR)

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|----|----|---|----|
| 2. | a) | List and explain the features of Java language. | 7M |
| | b) | Demonstrate implicit and explicit type casting with an example program. | 7M |

UNIT-II

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|----|----|---|----|
| 3. | a) | Discuss the different levels of access protection available in Java | 7M |
| | b) | What are the special characteristics of constructors in Java. Write a Java program to initialize an object through constructor methods. | 7M |

(OR)

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|----|----|--|----|
| 4. | a) | Develop a Java program to demonstrate the behaviour of static methods & variables? | 7M |
| | b) | What is garbage collection? Explain how to call the garbage collector explicitly with an example | 7M |

UNIT-III

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|----|----|--|----|
| 5. | a) | How do we implement polymorphism in JAVA? Explain briefly | 7M |
| | b) | Demonstrate method overriding with an example java program | 7M |

(OR)

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|----|----|---|----|
| 6. | a) | Describe various forms of inheritance in java with example. | 7M |
| | b) | Is it possible to implement multiple inheritances in Java? Justify your answer. | 7M |

UNIT-IV

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|----|----|---|----|
| 7. | a) | Define package and its importance? What are the Different types of packages? How to create and import packages in Java? | 7M |
| | b) | Discuss the similarities between interfaces and classes. | 7M |

(OR)

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|----|----|--|----|
| 8. | a) | Write a program which specify that there are two classes Rectangle and Circle which implements the interface and find the area of rectangle and circle | 7M |
| | b) | What is an Interface? Give the general form of an Interface and also discuss the implementation details of Interfaces | 7M |

UNIT-V

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|----|----|--|----|
| 9. | a) | Demonstrate the class Throwable with the help of a Java program | 7M |
| | b) | What is meant by Thread Synchronization in JAVA programming? Why it is important? With an sample program, explain the JAVA's language-level support for synchronizing threads. | 7M |

(OR)

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|-----|----|--|----|
| 10. | a) | List and explain the blocks of Exception handling with example | 7M |
| | b) | Demonstrate Thread prioritization with an example program. | 7M |

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UNIT-I

Marks

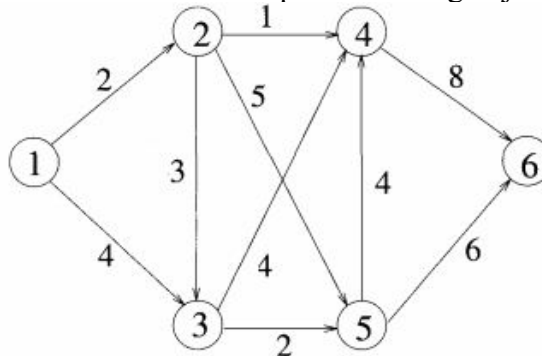
1. a) Describe the steps involved in performance analysis of algorithms. 7M
- b) Differentiate between worst-case, average-case, and best-case time complexities with examples. 7M

(OR)

2. a) Explain probabilistic analysis of algorithms with a suitable example. 7M
- b) Explain Omega notation with a graphical representation and give an example. 7M

UNIT-II

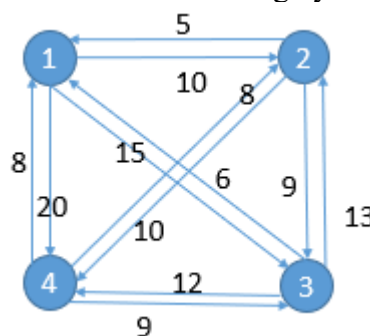
3. a) Discuss the working strategy of merge sort and illustrate the process of merge sort algorithm for the given data: 43, 32, 22, 78, 63, 57, 91 and 13. 7M
- b) Solve the Single Source Shortest Path problem using Dijkstra's algorithm. 7M

**(OR)**

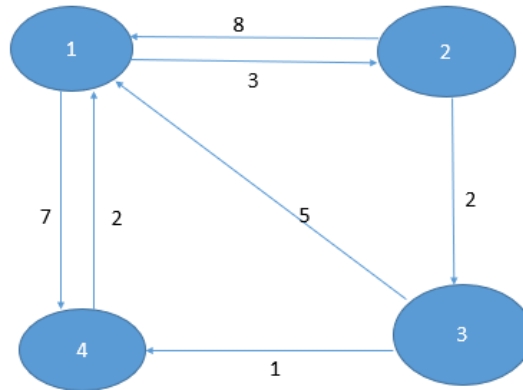
4. a) Explain Strassen's matrix multiplication with example matrices. 7M
- b) Solve the following instance of knapsack problem using greedy method where $n=7$ (objects), $m=15$, profits are $(P_1, P_2, P_3, P_4, P_5, P_6, P_7) = (10, 5, 15, 7, 6, 18, 3)$ and its corresponding weights are $(W_1, W_2, W_3, W_4, W_5, W_6, W_7) = (2, 3, 5, 7, 1, 4, 1)$. 7M

UNIT-III

5. Solve the Travelling Salesman Problem using dynamic programming. 14M

**(OR)**

- 6 Apply dynamic programming to find the All Pairs Shortest Path for a given graph. 14M



UNIT-IV

- 7 a) Write the backtracking algorithm for solving the Sum of Subsets problem. 7M
b) Demonstrate how to solve the 3-Coloring problem for a graph using backtracking. 7M

(OR)

- 8 a) Explain the general method of backtracking with a flowchart. 7M
b) Solve the 8-Queens problem and write a recursive solution. 7M

UNIT-V

- 9 a) Differentiate between LC and FIFO Branch and Bound strategies. Apply each on a small knapsack instance. 7M
b) Discuss how non-deterministic algorithms relate to NP-complete problems. 7M

(OR)

- 10 a) Give a comparison between different branch-and-bound approaches. 7M
b) Describe how reductions are used to prove a problem is NP-Complete. Use SAT as an example. 7M

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- | | | Marks |
|------------------------|---|-------|
| <u>UNIT-I</u> | | |
| 1. | a) Explain the historical development of Artificial Intelligence. Highlight key milestones. | 7 |
| | b) What are intelligent systems? Describe their characteristics with suitable examples. | 7 |
| (OR) | | |
| 2. | a) Describe various applications of AI in different domains like healthcare, education, and robotics | 7 |
| | b) Illustrate the working of the Tic-Tac-Toe game as an example of game playing in AI. | 7 |
| <u>UNIT-II</u> | | |
| 3. | a) Define a state-space search problem. Explain its components with a suitable example. | 7 |
| | b) Explain Breadth-First Search (BFS) with a suitable example. What are its advantages and limitations? | 7 |
| (OR) | | |
| 4. | a) Explain the working of Iterative Deepening Search (IDS). Why is it better than BFS and DFS in some cases? | 7 |
| | b) What is Simulated Annealing? How does it help overcome local maxima in search problems? | 7 |
| <u>UNIT-III</u> | | |
| 5. | a) Explain the role of logic in Artificial Intelligence. What are its applications? | 7 |
| | b) Differentiate between propositional logic and predicate logic. Provide examples. | 7 |
| (OR) | | |
| 6. | a) Explain the Axiomatic System in propositional logic. What are its components and importance? | 7 |
| | b) What is resolution refutation in propositional logic? Explain the steps involved using a truth table or example. | 7 |
| <u>UNIT-IV</u> | | |
| 7. | a) What is knowledge representation in AI? Explain its significance and challenges. | 7 |
| | b) Explain semantic networks with a suitable diagram. How are they used for knowledge representation? | 7 |
| (OR) | | |
| 8. | a) What are frames in knowledge representation? Explain with structure and example. | 7 |
| | b) Describe script structure for knowledge representation. Give an example of a restaurant script. | 7 |
| <u>UNIT-V</u> | | |
| 9. | a) What is an expert system? Explain its components with a neat diagram. | 7 |
| | b) What are fuzzy sets? How are they different from classical (crisp) sets? Explain with examples. | 7 |
| (OR) | | |
| 10. | a) Explain the architecture of an expert system. How does it function during inference? | 7 |
| | b) Describe various types of membership functions used in fuzzy logic systems. | 7 |

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UNIT-I

Marks

1. a) Explain Client-server Architecture with a neat diagram 7M
- b) Explain how DBMS supports data independence with an example. 7M

(OR)

2. a) What is data and data model? Explain briefly 7M
- b) Explain the difference between external, internal and conceptual schemas. How are these different schema layers related to the concepts of logical and physical data independence? 7M

UNIT-II

3. a) Construct an ER diagram for Car Insurance company Database. Identify entities, attributes for each entity, relationship among entities. Represent necessary constraints in this database design process in detail. 7M
- b) Explain the Relational Model and describe its key components with examples. 7M

(OR)

4. a) What is a View in a relational database? Explain the process of creating, altering, and destroying views with SQL commands. 7M
- b) Explain the types of integrity constraints in DBMS with a suitable example. 7M

UNIT-III

5. a) Discuss about Triggers and active Database in SQL with examples. Write the differences between constraints and triggers in SQL. 7M
- b) Illustrate the complex integrity constraints in SQL. 7M

(OR)

6. a) Consider the following Relational Schemas, Student(rollno, name, degree, year, gender, deptno, advisor) Department(deptid, deptname, hod, phone) Write a query in relational algebra for: i) Obtaining the rollno and name of all girl students in the CSE department. ii) Determine the departments that do not have any girl students. 7M
- b) Discuss the UNION, INTERSECT, EXCEPT, and WITH clauses in SQL. Provide suitable query examples. 7M

UNIT-IV

7. a) What is normalization? Explain 1NF, 2NF and 3NF with suitable example? 10M
- b) Explain the steps followed for schema refinement in database design? 4M

(OR)

8. a) Define functional dependency? How can you compute the minimal cover for a set of functional dependencies? Explain it with an example. 7M
- b) Define BCNF. How does BCNF differ from 3NF? Explain with an example. 7M

UNIT-V

9. a) Describe each of the following locking protocols: i) Two phase lock ii) Conservative two phase lock. 7M
- b) Explain read-read, write-read & write-write problems in serializability. 7M

(OR)

10. a) What are ACID properties? Illustrate them through examples and also explain commit and Rollback. 7M
- b) Discuss briefly about the concurrency control. 7M

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UNIT-I

Marks

1. a) Discuss the different categories of networks. 7M
- b) Differentiate between peer-to-peer and client-server models. 7M

(OR)

2. a) Describe the process of encapsulation with a neat diagram 7M
- b) Explain the addressing methods: Physical, Logical, Port, and Specific. 7M

UNIT-II

3. a) What are the services provided by the data link layer to the network layer? 7M
- b) Discuss elementary data link protocols. 7M

(OR)

4. a) What is a sliding window protocol? Explain with a diagram. 7M
- b) Explain the design issues of the data link layer. 7M

UNIT-III

5. a) Compare Link State and Distance Vector Routing. 7M
- b) Describe IPv4 addressing with format and classes. 7M

(OR)

6. a) Compare IPv4 and IPv6. 7M
- b) What are the congestion prevention policies in network layer? 7M

UNIT-IV

7. a) Compare connection-oriented and connectionless services with examples. 7M
- b) Explain the structure of a TCP segment. 7M

(OR)

8. a) Compare TCP and UDP protocols in detail. 7M
- b) Explain UDP operations and its applications. 7M

UNIT-V

9. a) Explain the Domain Name System (DNS) and its components. 7M
- b) Explain the architectural overview of the World Wide Web. 7M

(OR)

10. a) What are the roles of a user agent in email communication? Explain message format. 7M
- b) Describe the working of HTTP and its major features. 7M