

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

|     | <b><u>UNIT-I</u></b>                                                                | Marks | CO | Blooms Level |
|-----|-------------------------------------------------------------------------------------|-------|----|--------------|
| 1.  | a) Explain the advantages of DBMS over traditional file systems                     | 7M    | 1  | Understand   |
|     | b) Discuss the role of database administrators and system analysts in DBMS.         | 7M    | 1  | Apply        |
|     | <b>(OR)</b>                                                                         |       |    |              |
| 2.  | a) Draw and explain the three-schema architecture with neat diagram.                | 7M    | 1  | Understand   |
|     | b) What are the different types of database languages? Explain with examples.       | 7M    | 1  | Remember     |
|     | <b><u>UNIT-II</u></b>                                                               |       |    |              |
| 3.  | a) Explain entities, attributes, and entity sets with examples.                     | 7M    | 2  | Understand   |
|     | b) Discuss different types of relationships in ER model with examples.              | 7M    | 2  | Apply        |
|     | <b>(OR)</b>                                                                         |       |    |              |
| 4.  | a) Outline the steps in conceptual design using ER diagrams.                        | 7M    | 2  | Apply        |
|     | b) Explain the concept of Views in relational databases with SQL examples.          | 7M    | 2  | Apply        |
|     | <b><u>UNIT-III</u></b>                                                              |       |    |              |
| 5.  | a) Explain Selection and Projection operations in Relational Algebra with examples. | 7M    | 3  | Apply        |
|     | b) Discuss UNION, INTERSECT, and EXCEPT clauses in SQL with examples.               | 7M    | 3  | Apply        |
|     | <b>(OR)</b>                                                                         |       |    |              |
| 6.  | a) Explain different types of Joins in Relational Algebra with examples.            | 7M    | 3  | Apply        |
|     | b) What are Triggers in SQL? Explain with an example.                               | 7M    | 3  | Apply        |
|     | <b><u>UNIT-IV</u></b>                                                               |       |    |              |
| 7.  | a) Explain informal design guidelines for relation schema.                          | 7M    | 4  | Understand   |
|     | b) Define Third Normal Form (3NF) with example.                                     | 7M    | 4  | Apply        |
|     | <b>(OR)</b>                                                                         |       |    |              |
| 8.  | a) Define Functional Dependencies with examples.                                    | 7M    | 4  | Understand   |
|     | b) Explain Boyce-Codd Normal Form (BCNF) with example.                              | 7M    | 4  | Apply        |
|     | <b><u>UNIT-V</u></b>                                                                |       |    |              |
| 9.  | a) Define ACID properties of transactions with examples.                            | 7M    | 5  | Understand   |
|     | b) Explain Conflict Serializability with example.                                   | 7M    | 5  | Apply        |
|     | <b>(OR)</b>                                                                         |       |    |              |
| 10. | a) Describe a Simple Transaction Model with example.                                | 7M    | 5  | Understand   |
|     | b) Explain Shared and Exclusive Locks in concurrency control with examples.         | 7M    | 5  | Apply        |

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

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|                        |                                                                                                 | Marks | CO | Blooms Level |
|------------------------|-------------------------------------------------------------------------------------------------|-------|----|--------------|
| <b><u>UNIT-I</u></b>   |                                                                                                 |       |    |              |
| 1.                     | a) Explain the components of a data communication system and different modes of data flow.      | 7M    | 1  | L2           |
|                        | b) Explain the OSI reference model and discuss the functions of each layer.                     | 7M    | 1  | L2           |
| <b>(OR)</b>            |                                                                                                 |       |    |              |
| 2.                     | a) Describe the physical structures and categories of computer networks.                        | 7M    | 1  | L2           |
|                        | b) Compare the OSI model and TCP/IP protocol suite. Explain various addressing schemes.         | 7M    | 1  | L4           |
| <b><u>UNIT-II</u></b>  |                                                                                                 |       |    |              |
| 3.                     | a) Explain the design issues of the Data Link Layer and services provided to the Network Layer. | 7M    | 2  | L2           |
|                        | b) Discuss framing techniques used in the Data Link Layer with examples.                        | 7M    | 2  | L2           |
| <b>(OR)</b>            |                                                                                                 |       |    |              |
| 4.                     | a) Explain error control and flow control mechanisms in data communication.                     | 7M    | 2  | L3           |
|                        | b) Describe Sliding Window Protocols and their working.                                         | 7M    | 2  | L4           |
| <b><u>UNIT-III</u></b> |                                                                                                 |       |    |              |
| 5.                     | a) Explain connection-oriented and connectionless services provided by the Network Layer.       | 7M    | 3  | L2           |
|                        | b) Describe the Shortest Path Routing Algorithm with a suitable example.                        | 7M    | 3  | L3           |
| <b>(OR)</b>            |                                                                                                 |       |    |              |
| 6.                     | a) Compare Distance Vector Routing and Link State Routing algorithms.                           | 7M    | 3  | L4           |
|                        | b) Explain congestion control algorithms and congestion prevention policies.                    | 7M    | 3  | L4           |
| <b><u>UNIT-IV</u></b>  |                                                                                                 |       |    |              |
| 7.                     | a) Differentiate between connection-oriented and connectionless transport services.             | 7M    | 4  | L4           |
|                        | b) Explain UDP architecture, operations and applications.                                       | 7M    | 4  | L2           |
| <b>(OR)</b>            |                                                                                                 |       |    |              |
| 8.                     | a) Describe TCP services, features and TCP segment structure.                                   | 7M    | 4  | L2           |
|                        | b) Explain TCP connection establishment, data transmission and connection termination.          | 7M    | 4  | L3           |
| <b><u>UNIT-V</u></b>   |                                                                                                 |       |    |              |
| 9.                     | a) Explain the DNS architecture and DNS name space.                                             | 7M    | 5  | L2           |
|                        | b) Discuss DNS resource records and name servers with examples.                                 | 7M    | 5  | L3           |
| <b>(OR)</b>            |                                                                                                 |       |    |              |
| 10.                    | a) Explain the architecture and services of Electronic Mail.                                    | 7M    | 5  | L2           |
|                        | b) Describe the World Wide Web architecture and explain the working of HTTP.                    | 7M    | 5  | L4           |

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|                        |    |                                                                                                                        | Ma<br>rks | CO | BTL |
|------------------------|----|------------------------------------------------------------------------------------------------------------------------|-----------|----|-----|
| <b><u>UNIT-I</u></b>   |    |                                                                                                                        |           |    |     |
| 1.                     | a) | Explain the concept of arrays in Java. Write a program to perform matrix addition using two-dimensional arrays.        | 7M        | 1  | L3  |
|                        | b) | Explain Java naming conventions and their significance in developing readable and maintainable programs.               | 7M        | 1  | L2  |
| <b>(OR)</b>            |    |                                                                                                                        |           |    |     |
| 2.                     | a) | Design and explain a Java program that uses nested loops and conditional statements to generate different patterns.    | 7M        | 1  | L6  |
|                        | b) | Discuss the String class in Java. Differentiate between String, String Buffer with examples.                           | 7M        | 1  | L4  |
| <b><u>UNIT-II</u></b>  |    |                                                                                                                        |           |    |     |
| 3.                     | a) | Illustrate the use of static variables and static methods with a suitable Java program.                                | 7M        | 2  | L3  |
|                        | b) | Write a Java program demonstrating method overloading and constructor overloading. Explain the execution process.      | 7M        | 2  | L3  |
| <b>(OR)</b>            |    |                                                                                                                        |           |    |     |
| 4.                     | a) | Explain garbage collection in Java and discuss the role of finalize() method in memory management.                     | 7M        | 2  | L4  |
|                        | b) | Design a Java application for employee management using classes, objects, constructors, methods, and access modifiers. | 7M        | 2  | L6  |
| <b><u>UNIT-III</u></b> |    |                                                                                                                        |           |    |     |
| 5.                     | a) | Describe the different types of inheritance supported in Java with suitable examples.                                  | 7M        | 3  | L2  |
|                        | b) | Explain method overriding in Java and compare it with method overloading.                                              | 7M        | 3  | L4  |
| <b>(OR)</b>            |    |                                                                                                                        |           |    |     |
| 6.                     | a) | Develop a Java program demonstrating multilevel inheritance and method overriding.                                     | 7M        | 3  | L3  |
|                        | b) | Compare inheritance and polymorphism. Explain how they contribute to code reusability and flexibility.                 | 7M        | 3  | L4  |
| <b><u>UNIT-IV</u></b>  |    |                                                                                                                        |           |    |     |
| 7.                     | a) | Compare abstract classes and interfaces with suitable examples.                                                        | 7M        | 4  | L4  |
|                        | b) | Discuss packages in Java and explain their benefits in software development.                                           | 7M        | 4  | L2  |

**(OR)**

- |   |    |                                                                                                   |    |   |    |
|---|----|---------------------------------------------------------------------------------------------------|----|---|----|
| 8 | a) | Analyze the role of interfaces and packages in building modular and reusable software systems.    | 7M | 4 | L4 |
|   | b) | Design a Java application using interfaces and packages to implement a library management system. | 7M | 4 | L6 |

**UNIT-V**

- |    |    |                                                                       |    |   |    |
|----|----|-----------------------------------------------------------------------|----|---|----|
| 9. | a) | Discuss built-in exceptions in Java and explain how they are handled. | 7M | 5 | L2 |
|    | b) | Develop a Java program to create and use a user-defined exception.    | 7M | 5 | L3 |

**(OR)**

- |     |    |                                                                                                                                      |    |   |    |
|-----|----|--------------------------------------------------------------------------------------------------------------------------------------|----|---|----|
| 10. | a) | Explain thread synchronization and discuss its significance in concurrent programming.                                               | 7M | 5 | L4 |
|     | b) | Design a real-world Java application integrating exception handling, multiple threads, synchronization, and user-defined exceptions. | 7M | 5 | L6 |

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**UNIT-I**

- |       |                                                                     | Marks | CO  | BTL |
|-------|---------------------------------------------------------------------|-------|-----|-----|
| 1. a) | What are the characteristics of an algorithm?<br>Explain in detail. | 7M    | CO1 | L2  |
| b)    | How to specify an algorithm? Explain in detail with example.        | 7M    | CO1 | L2  |

**(OR)**

- |       |                                                                                  |    |     |    |
|-------|----------------------------------------------------------------------------------|----|-----|----|
| 2. a) | What are the Asymptotic notations? Explain each Asymptotic notation with example | 7M | CO1 | L2 |
| b)    | Write the pseudo code for matrix addition                                        | 7M | CO1 | L2 |

**UNIT-II**

- |       |                                                                                                                                                              |    |     |    |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|----|
| 3. a) | Explain the working of quick sort alg. while sorting the following list of numbers {2,4,6,4,2,1,0,9,3}<br>Analyze the alg. and generate the time complexity. | 7M | CO2 | L3 |
| b)    | Discuss Strassen's matrix multiplication with an example and derive its time complexity                                                                      | 7M | CO2 | L3 |

**(OR)**

- |       |                                                                                                     |    |     |    |
|-------|-----------------------------------------------------------------------------------------------------|----|-----|----|
| 4. a) | Find an optimal solution for the following knapsack problem by applying Greedy technique with m=15. | 7M | CO2 | L3 |
|-------|-----------------------------------------------------------------------------------------------------|----|-----|----|

|         |    |   |    |   |   |    |   |
|---------|----|---|----|---|---|----|---|
| Objects | 1  | 2 | 3  | 4 | 5 | 6  | 7 |
| Profits | 10 | 5 | 15 | 7 | 6 | 18 | 3 |
| weights | 2  | 3 | 5  | 7 | 1 | 4  | 1 |

- |    |                                                                                                    |    |     |    |
|----|----------------------------------------------------------------------------------------------------|----|-----|----|
| b) | What is a Spanning tree? Explain Prim's Minimum cost spanning tree algorithm with suitable example | 7M | CO2 | L3 |
|----|----------------------------------------------------------------------------------------------------|----|-----|----|

**UNIT-III**

- |       |                                                                                                                   |    |     |    |
|-------|-------------------------------------------------------------------------------------------------------------------|----|-----|----|
| 5. a) | Find optimal solution for the following matrices using dynamic programming?<br>A1(3X2), A2(2X4), A3(4X2), A4(2X5) | 7M | CO3 | L3 |
| b)    | Construct the OBST for the given keys with frequencies<br>Key = { 10, 20, 30, 40 }; Freq = { 3, 1, 4, 2 }.        | 7M | CO3 | L3 |

**(OR)**

6. a) Explain about Travelling Salesman Problem (TSP) for following adjacency matrix? 7M CO3 L3

| T | 1 | 2  | 3  | 4  |
|---|---|----|----|----|
| 1 | 0 | 10 | 15 | 20 |
| 2 | 4 | 0  | 9  | 11 |
| 3 | 5 | 13 | 0  | 10 |
| 4 | 7 | 7  | 8  | 0  |

- b) Find the maximum profit for the following example using 0/1 knapsack problem using dynamic programming with given bag capacity=6. 7M CO3 L3

| Objects | 1 | 2 | 3 | 4 |
|---------|---|---|---|---|
| Weight  | 2 | 3 | 4 | 5 |
| Profit  | 3 | 4 | 5 | 6 |

#### UNIT-IV

7. a) Show the state space for 4 queens problem. 7M CO4 L2  
b) Explain the state-space tree for the Hamiltonian Cycle problem. 7M CO4 L2

(OR)

8. a) Explain the Graph – coloring problem. And draw the state space tree for  $m=2$  colors  $n=4$  vertices graph. Discuss the time and space complexity. 7M CO4 L3  
b) Consider a set  $S=\{7,11,13,24\}$  and  $m=31$ . Find sum of subsets solution using backtracking? 7M CO4 L3

#### UNIT-V

9. a) Define P, NP, NP – Hard and NP – Complete and give one example for each. 7M CO5 L2  
b) Apply Least Cost Branch and Bound (LCBB) method for the following instance of 0/1 Knapsack problem to get the optimal solution. Knapsack Capacity  $W = 15$  7M CO5 L3

| Item No. | 1  | 2  | 3  | 4  |
|----------|----|----|----|----|
| Weight   | 2  | 4  | 6  | 9  |
| Value    | 10 | 10 | 12 | 18 |

(OR)

10. a) Explain the concept of Branch and Bound and explain the types of Branch and Bound? 7M CO5 L2  
b) Write a note on deterministic and non-deterministic algorithms. 7M CO5 L2

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|                        |                                                                                                                                                      | <b>Marks</b> | <b>CO</b> | <b>Blooms Level</b> |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------|---------------------|
| <b><u>UNIT-I</u></b>   |                                                                                                                                                      |              |           |                     |
| 1.                     | a) Discuss the Intelligent systems and foundational concepts of artificial intelligence (AI).                                                        | 7M           | 1         | L2                  |
|                        | b) Explain the Tic – Tac – Toe game playing problem using min-max algorithm?                                                                         | 7M           | 1         | L2                  |
| <b>(OR)</b>            |                                                                                                                                                      |              |           |                     |
| 2.                     | a) Explain the current trends and applications of Artificial Intelligence.                                                                           | 7M           | 1         | L2                  |
|                        | b) Illustrate the detailed development of AI languages                                                                                               | 7M           | 1         | L2                  |
| <b><u>UNIT-II</u></b>  |                                                                                                                                                      |              |           |                     |
| 3.                     | a) Define state space representation and explain it with water jug Problem                                                                           | 7M           | 2         | L2                  |
|                        | b) Describe in detail about the hill climbing search algorithm                                                                                       | 7M           | 2         | L2                  |
| <b>(OR)</b>            |                                                                                                                                                      |              |           |                     |
| 4.                     | a) Describe about BFS(Breadth First search )Algorithm with an example                                                                                | 7M           | 2         | L2                  |
|                        | b) Write and explain the A* algorithm with an example                                                                                                | 7M           | 2         | L3                  |
| <b><u>UNIT-III</u></b> |                                                                                                                                                      |              |           |                     |
| 5.                     | a) Describe different types logic used in Artificial Intelligence. Explain their advantages and disadvantages.                                       | 7M           | 3         | L3                  |
|                        | b) Describe in detail about the natural deduction systems                                                                                            | 7M           | 3         | L2                  |
| <b>(OR)</b>            |                                                                                                                                                      |              |           |                     |
| 6.                     | a) What are the advantages of predicate logic over propositional logic                                                                               | 7M           | 3         | L4                  |
|                        | b) Explain the semantic tableau system in propositional logic describe the $\alpha$ (alpha) and $\beta$ (beta) expansion rule with suitable example. | 7M           | 3         | L3                  |
| <b><u>UNIT-IV</u></b>  |                                                                                                                                                      |              |           |                     |
| 7.                     | a) Describe the various key issues in Knowledge Representation.                                                                                      | 7M           | 4         | L2                  |
|                        | b) What are the approaches of knowledge representation? Give differences between database and knowledge base.                                        | 7M           | 4         | L4                  |
| <b>(OR)</b>            |                                                                                                                                                      |              |           |                     |
| 8.                     | a) Describe the knowledge representation using semantic nets with an example.                                                                        | 7M           | 4         | L2                  |
|                        | b) Explain the advanced knowledge representation of script structure for “going to a restaurant”.                                                    | 7M           | 4         | L2                  |
| <b><u>UNIT-V</u></b>   |                                                                                                                                                      |              |           |                     |
| 9.                     | a) Explain the various phases in building expert system                                                                                              | 7M           | 5         | L2                  |
|                        | b) Give different types of fuzzy membership functions and explain.                                                                                   | 7M           | 5         | L2                  |
| <b>(OR)</b>            |                                                                                                                                                      |              |           |                     |
| 10.                    | a) Explain the characteristics and applications of expert systems                                                                                    | 7M           | 5         | L2                  |
|                        | b) Discuss the architecture of fuzzy systems.                                                                                                        | 7M           | 5         | L2                  |