(6 pages) **Reg. No. :** .....

Code No. : 10875 E **Sub. Code : FSCL 21/ FSCI 21**

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2026.

Second Semester

Computer Science with Artificial Intelligence and Machine Learning/Computer Science with Artificial Intelligence

Skill Enhancement Course — DATA STRUCTURES

(For those who joined in July 2025 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Identify the time complexity of accessing an element in an array.

   (a) O(n) (b) O(1)

   (c) O(log n) (d) $O(n^2)$

2. Recognize the notation used to represent the worst-case complexity of an algorithm.

   (a) Θ (b) Ω

   (c) O (d) α

3. Select the data structure that follows the LIFO principle.

   (a) Queue (b) Stack

   (c) Tree (d) Graph

4. Determine which traversal visits the root node first.

   (a) Inorder (b) Postorder

   (c) Preorder (d) Level order

5. Recall the best-case time complexity of Linear Search.

   (a) O(1) (b) O(n)

   (c) O(log n) (d) O(n log n)

6. Choose the sorting algorithm that uses divide and conquer strategy

   (a) Merge Sort (b) Insertion Sort

   (c) Bubble Sort (d) Selection Sort

7. Recognize the representation of graphs Using a two-dimensional matrix.

(a) Adjacency List (b) Adjacency Matrix

(c) Incidence List (d) Edge List

8. Identify the algorithm commonly used for Minimum Spanning Tree.

(a) Dijkstra's Algorithm

(b) Prim's Algorithm

(c) Binary Search

(d) Depth First Search

9. Recall the classical problem solved using backtracking technique.

(a) Tower of Hanoi (b) 8-Queens Problem

(c) Binary Search (d) Insertion Sort

10. Select the optimization technique used in the Travelling Sales Person Problem.

(a) Greedy Method

(b) Branch and Bound

(c) Recursion

(d) Dynamic Programming

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Explain the concept of Abstract Data Type (ADT) with suitable examples.

Or

(b) Discuss asymptotic notations and their significance in complexity analysis.

12. (a) Describe the structure and operations of a stack with illustration.

Or

(b) Outline the various binary tree traversal techniques with examples.

13. (a) Demonstrate the working of Insertion Sort using an example list.

Or

(b) Illustrate the steps involved in Binary Search with a suitable example.

14. (a) Analyze the representation of graphs using adjacency matrix and adjacency list.

Or

(b) Differentiate between Breadth First Search (BFS) and Depth First Search (DFS).

15. (a) Assess the effectiveness of the backtracking approach in solving the 8-Queens problem.

Or

(b) Evaluate the Branch and Bound technique used in the Travelling Sales Person Problem.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain in detail the structure and operations of singly linked lists with diagrams.

Or

(b) Interpret the advantages and limitations of doubly linked lists compared with singly linked lists.

17. (a) Construct a binary search tree for the following elements and show the insertion process :

45, 20, 60, 10, 30, 50, 70.

Or

(b) Apply queue operations to illustrate the working of a circular queue.

18. (a) Compare Quick Sort and Merge Sort based on algorithm steps and time complexity.

Or

(b) Examine the performance of Linear Search and Binary Search with suitable examples.

19. (a) Justify the use of Minimum Cost Spanning Tree algorithms in network design.

Or

(b) Appraise graph traversal methods and explain their importance in problem solving.

20. (a) Summarize the steps involved in solving the Graph Colouring problem using backtracking.

Or

(b) Present the algorithm and working principle of the Travelling Sales Person Problem using Branch and Bound.

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