

Reg. No

Name

25P135

M. Sc. DEGREE END SEMESTER EXAMINATION - NOVEMBER 2025

SEMESTER 1 - COMPUTER SCIENCE (ARTIFICIAL INTELLIGENCE)

COURSE: 24P1CAIT03 – DATA STRUCTURES AND ALGORITHMS

(For Regular 2025 Admission & Improvement/Supplementary 2024 Admission)

Time : Three Hours

Max. Weightage: 30

PART - A

Answer any 8 Questions.

Weight: 1

1. Write pseudocode for ENQUEUE in a circular queue. (A, CO2)
2. Distinguish between binary tree and binary search tree. (Ev, CO4)
3. List the different types of asymptotic notations. (U, CO1)
4. Write logic syntax to push and pop elements from a stack. (A, CO2)
5. Does insertion at the head of a singly linked list require traversal? Give a one-line reason. (An, CO3)
6. Evaluate why DFS may be preferred over BFS in certain scenarios. (Ev, CO4)
7. Define an Abstract Data Type (U, CO1)
8. Write two differences between Bubble Sort and Merge Sort. (A, CO5)
9. Compare iterative and recursive approach of Fibonacci sequence. (An, CO3)
10. State two applications of string-matching algorithms. (A, CO5)

(1 x 8 = 8)

PART - B

Answer any 6 Questions.

Weights: 2

11. Apply stack to evaluate the postfix expression: 6 3 2 + * 2 /. (A, CO2)
12. Evaluate AVL tree balancing with the insertion sequence: 50, 25, 75, 10, 30. (Ev, CO4)
13. Given this pseudocode to insert at the beginning of a singly linked list, analyze the number of pointer updates and time complexity. (An, CO3)

14. Explain time and space complexity of an algorithm with examples. (U, CO1)
15. Compare array vs singly linked list for frequent middle insertions: analyze which is better and why. (An, CO3)
16. Use KMP to find the first match index of pattern ABA in text ABABABA. Show the indices considered. (A, CO5)
17. Evaluate which is preferable for single-source shortest paths in a non-negative weighted graph: BFS or Dijkstra. Justify. (Ev, CO4)
18. Apply Insertion Sort to [32, 17, 23, 45, 3] and show the array after two passes. (A, CO5)

(2 x 6 = 12)

PART - C

Answer any 2 Questions.

Weights: 5

19. Towers of Hanoi: derive the recurrence for number of moves and analyze time complexity; list the moves for $n = 4$. (An, CO3)
20. A weighted, connected, sparse graph is given (describe or sketch any such). Evaluate and justify the choice of MST algorithm, then compute the MST and defend minimality. (Ev, CO4)
21. Implement a linked-list queue: show the sequence ENQ(7), ENQ(9), DEQ(), ENQ(5), DEQ() with front/rear changes and final list. (A, CO2)
22. Apply Merge Sort to the array [12, 4, 7, 9, 14, 3]: show split/merge steps and the final array. (A, CO5)

(5 x 2 = 10)

OBE: Questions to Course Outcome Mapping

CO	Course Outcome Description	CL (Cognitive Level)	Questions (Qn Nos. from Paper)	Total Wt. (Marks)
CO1	Understand the principles of algorithms, ADT, and complexity analysis using asymptotic notations.	Understand	Q3,Q7,Q14	4
CO2	Apply stack and queue operations to solve computational problems such as expression evaluation.	Apply	Q1,Q4,Q12	9
CO3	Analyze recursion and linked list operations to compare iterative and recursive solutions.	Analyze	Q5,Q9,Q13,Q15,Q19	11
CO4	Evaluate graph and tree traversal algorithms to determine optimal solutions.	Evaluate	Q2,Q6,Q12,Q17,Q20	11
CO5	Apply searching, sorting, and string-matching algorithms to solve data processing problems.	Apply	Q8,Q10,Q16,Q18,Q22	11

Cognitive Level (CL): E - EVALUATE; An - ANALYZE; A - APPLY; U - UNDERSTAND