Question Paper Code	14003

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025
Third Semester
Artificial Intelligence and Data Science
(Common to Artificial Intelligence and Machine Learning Science)
24AMPC302 - FOUNDATION OF DATA STRUCTURES AND ALGORITHM DESIGN
Regulations - 2024

Duration: 3 Hours   Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)
Answer ALL Questions

		Marks	K-Level	CO
1.	Which of the following notations describes the average case time complexity of an algorithm?	1	K1	CO1
	(a) O (b) Ω (c) Θ (d) φ			
2.	The recurrence relation T(n)=2T(n/2)+n belongs to which algorithmic technique?	1	K2	CO1
	(a) Divide & Conquer (b) Greedy (c) Dynamic Programming (d) Backtracking			
3.	Which operation is used to insert an element at the beginning of a linked list?	1	K2	CO2
	(a) Push (b) Enqueue (c) InsertFirst (d) Append			
4.	Postfix expression for (A + B * C) / D is:	1	K2	CO2
	9a) ABC + D/ (b) AB + CD*/ (c) ABC * + D/ (d) AB C D + /			
5.	The height of a binary tree with single node is:	1	K1	CO3
	(a) −1 (b) 0 (c) 1 (d) 2			
6.	Which traversal of BST gives data in ascending order?	1	K2	CO3
	(a) Preorder (b) Inorder (c) Postorder (d) Level order			
7.	The time complexity of BFS for an adjacency list representation is:	1	K2	CO4
	(a) O(V + E) (b) O(V²) (c) O(E log V) (d) O(V E)			
8.	Kruskal's algorithm uses which data structure?	1	K2	CO4
	(a) Stack (b) Queue (c) Disjoint Set (d) Heap			
9.	Which sorting algorithm has best case O(n) time complexity?	1	K2	CO5
	(a) Bubble (b) Insertion (c) Selection (d) Quick			
10.	Which collision resolution method uses probing sequences?	1	K2	CO6
	(a) Chaining (b) Linear Probing (c) Extendible Hashing (d) Bucket Hashing			

PART - B (12 × 2 = 24 Marks)
Answer ALL Questions

		Marks	K-Level	CO
11.	Define asymptotic notations and give examples.	2	K1	CO1
12.	Solve T(n)=T(n/2)+n using the Master Theorem.	2	K2	CO1
13.	Write the linked list representation of a polynomial.	2	K2	CO2
14.	Differentiate between stack and queue with examples.	2	K2	CO2
15.	Define AVL tree and list its rotation types.	2	K1	CO3
16.	Perform preorder traversal for the given binary tree.	2	K2	CO3
17.	Write short notes on adjacency matrix representation of graphs.	2	K2	CO4
18.	What is the difference between DFS and BFS?	2	K2	CO4
19.	Define stability in sorting algorithms.	2	K1	CO5
20.	What is the difference between linear and binary search?	2	K2	CO5
21.	What is a hash function? Give an example.	2	K1	CO6
22.	Mention any two collision resolution techniques.	2	K2	CO6

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   ***14003***

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23. a) i) Organize the different asymptotic notations used in algorithm analysis.   6   K3   CO1

    ii) Solve the recurrence relation T(n)=2T(n/2)+n and interpret the result.   5   K3   CO1

OR

   b) Discuss various methods for solving recurrence relations with examples.   11   K3   CO1

24. a) Analyze the linked list ADT and its types. Write algorithms for insertion and deletion operations.   11   K4   CO2

OR

   b) Design an algorithm to convert an infix expression to postfix and evaluate it using stack ADT.   11   K4   CO2

25. a) Describe AVL tree properties. Construct an AVL tree for the sequence [30, 40, 35, 20, 10, 25].   11   K3   CO3

OR

   b) Construct the structure and operations of red-black trees with examples.   11   K3   CO3

26. a) Analyze BFS and DFS algorithms with suitable examples and discuss their time complexities.   11   K4   CO4

OR

   b) Examine Prim's and Kruskal's algorithms for finding minimum spanning trees. Compare their performance.   11   K4   CO4

27. a) Write and explain the quick sort algorithm. Derive its best, average, and worst-case time complexities.   11   K2   CO5

OR

   b) Compare and contrast insertion, selection, and merge sort algorithms with suitable examples.   11   K2   CO5

28. a) Explain various collision resolution techniques: linear probing, quadratic probing, and double hashing with examples.   11   K2   CO6

OR

   b) Describe extendible hashing in detail with neat diagrams and an example.   11   K2   CO6