Course Code: 23CSMT03

BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE

(AUTONOMOUS)

III - B.Tech II-Semester (Minor) Regular Examinations (BR23), MAY - 2026

ADVANCED DATA STRUCTURES AND ALGORITHM ANALYSIS

(MINOR – Common to CE, EEE & ECE Branches)

Time: 3 hours Max. Marks: 70

Question Paper consists of Part-A and Part-B
*Answer **ALL** the question in **Part-A andPart-B***

PART–A (10X2 = 20M)

		Marks	CO	BL
1. a)	Explain how AVL trees maintain balance after insertion and deletion operations.	(2M)	CO1	2
b)	Describe the structure and properties of a B-Tree and explain why it is suitable for disk-based storage systems.	(2M)	CO1	2
c)	Explain the Divide and Conquer strategy and illustrate its general structure.	(2M)	CO2	2
d)	Describe the working principle of Merge Sort and explain why it is considered a stable sorting algorithm.	(2M)	CO2	2
e)	Explain the Greedy Method and discuss the characteristics of problems where it can be effectively applied.	(2M)	CO3	2
f)	Describe the concept of a Minimum Cost Spanning Tree (MST) and explain its significance in network design.	(2M)	CO3	2
g)	Explain the constraints involved in the 8-Queens problem and how backtracking ensures valid solutions.	(2M)	CO4	2
h)	Describe the concept of state space tree and its role in solving optimization problems.	(2M)	CO4	2
i)	Explain the concept of polynomial-time reduction and its role in proving NP-Completeness.	(2M)	CO5	2
j)	Describe the characteristics of NP-Hard scheduling problems and why they are computationally difficult.	(2M)	CO5	2

PART–B (5X10 = 50M)

2a.	Analyze the impact of best-case, worst-case, and average-case scenarios on algorithm efficiency with examples.	5 M	CO1	4
b.	Analyze the sequence of operations in an AVL tree and determine when single rotation and double rotation are required.	5 M		4
	(OR)			
3a.	Construct an AVL tree by inserting the following elements and show all rotations step-by-step: 30, 20, 40, 10, 25, 50, 5	5 M	CO1	4
b.	Compare B-Trees with AVL Trees and mention their advantages in database and file system applications.	5 M		4

4a.	Discuss Breadth First Search (BFS) and Depth First Search (DFS) on a given graph and compare traversal orders.	10 M	CO2	3
				3
	(OR)			
5a.	Explain Quick Sort on the following list and analyze the partitioning steps: 25, 10, 35, 20, 5, 30	5 M	CO2	3
b.	Examine the worst-case and average-case time complexity of Quick Sort and explain the reasons behind them.	5 M		3
6a.	Construct a Minimum Cost Spanning Tree for a given weighted graph using Prim's or Kruskal's algorithm, and analyze the steps.	6M	CO3	4
b.	Inspect Dijkstra's algorithm on a given graph and provide the shortest path from a source to all other vertices.	4 M		3
	(OR)			
7a.	Solve the 0/1 Knapsack problem using Dynamic Programming and give the construction of the DP table.	6 M	CO3	4
b.	Examine the Floyd-Warshall algorithm to compute all-pairs shortest paths and provide intermediate steps.	4 M		3
8a.	Mention the Graph Colouring problem using backtracking and determine the minimum number of colours required for a given graph.	3 M	CO4	3
b.	Explain n-queens problem by taking n=8.	7M		4
	(OR)			
9a.	Compare Backtracking and Branch & Bound approaches by analyzing their efficiency for solving optimization problems.	5 M	CO4	3
b.	Discuss the impact of different bounding functions on the performance of Branch and Bound algorithms	5M		3
10a.	Describe the scheduling techniques to a Job Shop Scheduling problem and analyze constraints affecting feasibility.	5 M	CO5	3
b.	Compare different approaches to solve NP-Hard scheduling problems with their efficiency.	5 M		3
	(OR)			
11a.	Given an instance of the Travelling Salesperson Decision Problem (TSP), mention whether a tour exists within a specified cost.	5 M	CO5	3
b.	Given a scheduling problem instance, provide whether it can be solved in polynomial time or is NP-Hard.	5 M		3

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