

Code: 23IT3301

**II B.Tech - I Semester – Regular / Supplementary Examinations  
NOVEMBER 2025****ADVANCED DATA STRUCTURES AND ALGORITHMS  
(INFORMATION TECHNOLOGY)****Duration: 3 hours****Max. Marks: 70**

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Note: 1. This question paper contains two Parts A and B.  
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.  
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.  
4. All parts of Question paper must be answered in one place.

**BL – Blooms Level****CO – Course Outcome****PART – A**

		BL	CO
1.a)	List the essential characteristics of a good algorithm.	L2	CO1
1.b)	Why are B-trees preferred in databases?	L1	CO1
1.c)	Differentiate between ascending and descending priority queues.	L2	CO2
1.d)	What is a weighted graph?	L1	CO2
1.e)	State the Master Theorem.	L2	CO3
1.f)	What is the greedy method?	L1	CO3
1.g)	State the principle of optimality.	L2	CO4
1.h)	Define an Optimal Binary Search Tree.	L1	CO4
1.i)	List the applications of backtracking.	L2	CO5
1.j)	Give one application of Branch and Bound.	L1	CO5

## PART – B

			BL	CO	Max. Marks
<b>UNIT-I</b>					
2	a)	What is a rotation in an AVL tree? Explain single rotation and double rotation with examples and diagrams.	L2	CO1	5 M
	b)	Construct a B-tree of order 3 by inserting the keys: 10, 20, 5, 6, 12, 30, 7, 17. Show the steps.	L2	CO1	5 M
<b>OR</b>					
3	a)	Discuss Big-O, Big-Ω, and Θ notations with suitable examples and diagrams.	L2	CO1	5 M
	b)	Discuss deletion operation in a B-tree with suitable cases.	L2	CO1	5 M
<b>UNIT-II</b>					
4	a)	Construct a min heap for the following set of elements: 20, 15, 30, 10, 8, 25, 40 and show the steps.	L3	CO2	5 M
	b)	Write and explain the algorithm for Breadth First Search (BFS). Illustrate with an example graph.	L3	CO2	5 M
<b>OR</b>					
5	a)	Explain topological sorting with algorithm and example.	L2	CO2	5 M
	b)	Differentiate between binary search tree and heap tree with examples.	L2	CO2	5 M

### UNIT-III

6	a)	Solve the recurrence relation $T(n) = 2T(n/2) + n$ using the Master Theorem.	L3	CO3	5 M
	b)	Given jobs with deadlines and profits: <b>Job Deadline Profit</b> J1 2 100 J2 1 19 J3 2 27 J4 1 25 J5 3 15 Find the job sequence that gives maximum profit using Greedy method.			

**OR**

7	a)	Write and explain Prim's algorithm for finding minimum spanning tree with an example.	L3	CO3	5 M
	b)	Solve and Sort the following array using Quick Sort (show partitions at each step): [45,12,78,34,23,89,67]			

### UNIT-IV

8	a)	Solve using Dynamic Programming: Knapsack having Capacity W=50 <b>Item Weight      Value</b> 1      10      60 2      20      100 3      30      120 Find maximum profit and table entries.	L3	CO4	5 M
	b)	Explain the Dynamic Programming solution for Travelling Salesperson Problem (TSP) with an example.			

## OR

9	a)	Describe Floyd-Warshall algorithm for All-Pairs Shortest Paths. Illustrate with an example.	L2	CO4	5 M
	b)	Apply Bellman-Ford algorithm to find shortest path from source vertex A for the graph:  Vertices = {A, B, C, D}  Edges:  A → B (weight 1) B → C (weight 3) A → C (weight 10) C → D (weight 2) D → B (weight -4)			

## UNIT-V

10	a)	Solve the n-Queens problem for n=4. Show all possible solutions.	L3	CO4	5 M
	b)	Explain Cook's theorem in graph coloring and give its importance.			

## OR

11	a)	Given a set {10,7,5,18,12,20,15} and sum =35, use backtracking to find subsets that sum to 35.	L3	CO4	5 M
	b)	Explain the general method of Branch and Bound.			