

Code: 23IT3301

II B.Tech I Semester – Supplementary Examinations – APRIL 2026**ADVANCED DATA STRUCTURES AND ALGORITHMS
(INFORMATION TECHNOLOGY)**

Duration: 3 hours

Max. Marks: 70

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.

PART – A

1.a)	What is an AVL tree?
1.b)	What does Big- Ω notation represent?
1.c)	What is topological sort?
1.d)	What is heap sort?
1.e)	What is a Knapsack problem?
1.f)	What is the time complexity of Merge Sort?
1.g)	Write the general method of Dynamic Programming.
1.h)	What is the main advantage of Bellman-Ford over Dijkstra's algorithm?
1.i)	Define P class problems.
1.j)	State the backtracking general method.

PART – B

					Max. Marks
UNIT-I					
2	a)	Construct an AVL tree for the following sequence of keys:10, 20, 30, 40, 50, 25 and show all rotations.			5 M
	b)	Explain insertion operation in a B-tree with a neat example.			5 M
OR					
3	a)	Discuss in detail the different methods of analyzing an algorithm.			5 M
	b)	Define an AVL tree. Explain how insertion and deletion are performed with suitable examples.			5 M
UNIT-II					
4	a)	Discuss heap sort with example and show how it sorts an array step by step.			5 M
	b)	Explain real-life applications of BFS, DFS, and topological sorting.			5 M
OR					
5	a)	Write and explain the algorithm for Depth First Search (DFS). Illustrate with an example graph.			5 M
	b)	Explain array representation of a heap with an example.			5 M
UNIT-III					
6	a)	Solve the recurrence relation $T(n) = T(n/2) + O(1)$ using the Master Theorem.			5 M
	b)	Write and explain Kruskal's algorithm for finding minimum spanning tree with an example.			5 M

OR				
7	a)	Find the shortest path from source vertex A to all other vertices using Dijkstra's algorithm for the following graph: Vertices: A, B, C, D, E Edges with weights: A → B = 4 A → C = 2 B → C = 5 B → D = 10 C → E = 3 E → D = 4 D → F = 11		5 M
	b)	Explain Strassen's matrix multiplication with an example.		5 M
UNIT-IV				
8	a)	Explain the Bellman-Ford algorithm with an example.		5 M
	b)	Construct the OBST and compute its cost for the following data.		5 M
		Keys	20	
	Frequency	2	1	6
OR				
9	a)	Compare Divide & Conquer, Greedy Method, and Dynamic Programming.		5 M
	b)	Explain the general method of Dynamic Programming with an example.		5 M

UNIT-V			
10	a)	Explain P, NP, NP-hard, and NP-complete classes with examples.	5 M
	b)	Explain how Branch and Bound can be applied to the Travelling Salesperson Problem.	5 M
OR			
11	a)	Explain the graph coloring problem using backtracking. Illustrate with a small graph.	5 M
	b)	Differentiate between backtracking and branch & bound approaches with examples.	5 M