

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY-GURAJADA VIZINAGARAM
II B. Tech I Semester Regular/Supply Examinations, November – 2025
ADVANCED DATA STRUCTURES & ALGORITHMS ANALYSIS
CSE(AI&ML, DS, AI&DS, CS,AI),AI&ML, , AI&DS,

Time: 3 hours

Max. Marks: 70

*Question paper consists of Part A, Part B.**Part A is compulsory, Answer all questions.**In Part B, Answer any one question from each unit.*

PART-A**(20 Marks)**

- 1 a) Give an example of an algorithm with $O(n^2)$ time complexity. [2]
- b) How is insertion performed in an AVL tree? [2]
- c) What data structure is used to implement a priority queue? [2]
- d) What is a biconnected component? [2]
- e) What is the difference between Prim's and Kruskal's algorithm? [2]
- f) Define Optimal Binary Search Tree (OBST) [2]
- g) Give one real-life example of a backtracking problem. [2]
- h) What is the 0/1 knapsack problem in branch and bound? [2]
- i) What does polynomial time mean? [2]
- j) What is the Chromatic Number Decision Problem? [2]

PART-B**(50 Marks)****Unit-1**

- 2 a) Explain the importance of asymptotic notation in algorithm analysis. [5]
 - b) Compare and contrast Big O, Big Omega, and Big Theta notations. [5]
- (OR)

- 3 a) Explain the rotation operations used in AVL trees with suitable examples. [5]
- b) Explain the algorithm for insertion in a B-tree with an example. [5]

Unit-2

- 4 a) Explain Strassen's matrix multiplication algorithm and compare it with the conventional method. [5]
 - b) Write short notes on applications of graphs in real-world problems. [5]
- (OR)

- 5 a) What are connected and biconnected components? Explain with examples. [5]
- b) Write and explain the Quick Sort algorithm and its time complexity. [5]

Unit-3

- 6 a) Explain the Greedy Method with its general strategy and characteristics. [5]
 - b) Describe Kruskal's and Prim's algorithms for finding a Minimum Spanning Tree. [5]
- (OR)

- 7 a) Describe the All Pairs Shortest Path problem using Floyd-Warshall's algorithm. [5]
- b) Write a note on constructing Optimal Binary Search Trees (OBST) using dynamic programming. [5]

Unit-4

- 8 a) Describe the N-Queens problem and explain how it is solved using backtracking. [5]
 - b) Discuss the advantages and limitations of the backtracking approach [5]
- (OR)

- 9 a) Describe how the 0/1 Knapsack problem can be solved using the branch and bound technique. [5]
- b) Compare backtracking and branch and bound in terms of efficiency and applications. [5]

Unit-5

- 10 a) Describe the importance of NP-Completeness in computational theory. [5]
b) Write short notes on polynomial-time reduction and its role in proving NP-Completeness. [5]
- (OR)
- 11 a) Compare CDP, CNDP, and TSP in terms of complexity and applications. [5]
b) Discuss the relationship between NP-Hard problems and graph-based optimization problems. [5]
