

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY-GURUJADA VIZINAGARAM
II B. Tech I Semester Regular Examinations, November – 2024
ADVANCED DATA STRUCTURES & ALGORITHMS ANALYSIS
(CSE(AI&ML,AI, DS, AI&DS, CS), 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) Define asymptotic notations. Explain their significance. [2]
- b) Describe the process of insertion in an AVL tree. [2]
- c) What are min-heaps? Write one application. [2]
- d) Explain the representation of graphs using adjacency lists. [2]
- e) Define the greedy method and list its applications. [2]
- f) Explain the Bellman-Ford Algorithm. [2]
- g) What is backtracking? Provide one real-world application. [2]
- h) State the differences between backtracking and branch-and-bound techniques. [2]
- i) Define NP-complete problems and explain their importance. [2]
- j) What is the clique decision problem? Provide an example. [2]

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

- 2 a) **Write and explain an algorithm to insert an element into a B-tree.** [5]
- b) Perform the deletion operation on an AVL tree for the elements 10,20,30,25,40 deleting 25. Show intermediate steps. [5]

(OR)

- 3 a) Discuss the space and time complexities of AVL and B-trees with examples. [5]
- b) Explain the applications of AVL and B-trees in database indexing. [5]

Unit-2

- 4 a) Perform heap sort for the array [50,30,20,15,10,8,16]. Show all intermediate steps. [5]
- b) Write steps to implement priority queues using heaps. [5]

(OR)

- 5 a) Describe the algorithm for finding biconnected components in a graph with an example. [5]
- b) Explain the convex hull problem and solve it for a set of points using the Graham's Scan algorithm. [5]

Unit-3

- 6 a) Solve the job sequencing problem for $n=5$ jobs with deadlines [2,1,2,1,3] and profits [100,50,20,10,40] using the greedy method. [5]
- b) Write an algorithm to construct an optimal binary search tree and explain it with an example. [5]

(OR)

- 7 a) Apply the dynamic programming approach to solve the 0/1 knapsack problem with the weights [2,3,4,5], values [3,4,5,6], and capacity 5. [5]
- b) Explain Dijkstra's algorithm to find the shortest path from a source vertex to all other vertices with an example. [5]

Unit-4

- 8 a) Solve the 8-Queens problem using the backtracking approach. [5]
b) Write and explain an algorithm for graph coloring using backtracking. [5]

(OR)

- 9 a) Explain the branch-and-bound approach to solving the traveling salesperson problem. [5]
Provide an example.
b) Discuss the advantages and limitations of branch-and-bound techniques compared to [5]
dynamic programming.

Unit-5

- 10 a) Write an algorithm to solve the chromatic number decision problem for a graph and [5]
explain it with an example.
b) Explain the NP-hard problem of job shop scheduling with a suitable example. [5]

(OR)

- 11 a) Discuss the importance of studying NP-complete problems in computer science. [5]
b) Compare and contrast the traveling salesperson decision problem and the traveling [5]
salesperson optimization problem .