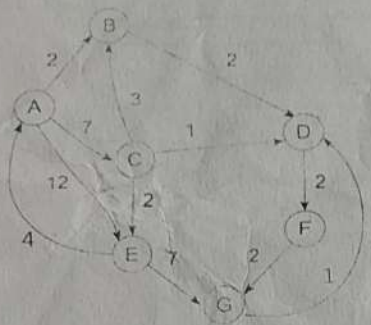
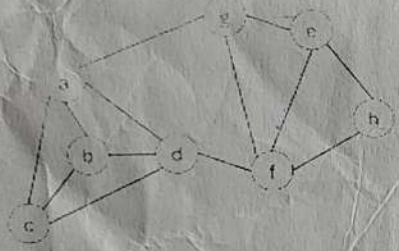


a) Using Dijkstra's Algorithm, compute the shortest paths from source vertex A to all other vertices.
b) Show the tentative distances after each vertex is relaxed(made known). Also list the vertices in the order they are settled, and specify the final shortest distance and path from A to every other vertex.
(Hint: Use a tabular form to show the step-by-step updates.)

5	A hash table of size m = 11 stores integer keys using double hashing. The primary and secondary hash functions are defined as: h1(k) = k mod 9 h2(k) = 7 - (k mod 7) To resolve collisions, the probe sequence is defined as: h(k, i) = (h1(k) + i · h2(k)) mod 11, for i = 0, 1, 2, ... You are asked to insert the following keys in order: 11, 55, 13, 35, 71, 52, 61, 9, 86 a) Show the final state of the hash table after inserting all keys using double hashing. b) How does double hashing compare with linear probing in terms of clustering behaviour?	4+1	CO2
6	Demonstrate both DFS and BFS on the graph shown below, clearly showing the use of the stack for DFS and the queue for BFS. Assume the traversal starts from vertex a.	3+2	CO3
7	Perform following operations in binary search trees (BSTs): a) Construct a binary search tree (BST) using the alphabets of the word: "SECURITY". b) Count the number of comparisons needed in insertion for constructing BST assuming that BST was initially empty. c) Present the comparison path and the number of comparisons needed for searching the node 'T'. d) Perform the traversal to generate a sorted sequence from the data in BST and state its complexity. e) Delete the root node in this sequence and draw the resultant BST.	5	CO2
8	Solve the given recurrence relation to derive a closed-form expression for $T(n)$. T(n)=2T(n/2)+n. T(1)=1.	5	CO1



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Name of the Student... Nikil Lodhi Scholar Number. 241120111129

MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY BHOPAL

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

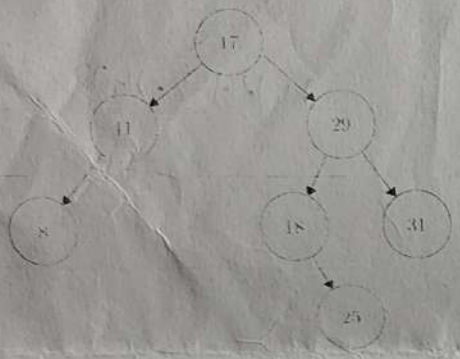
EXAMINATION: End Term MONTH and YEAR: Nov 2025

Course: B.Tech. Semester: III Branch: CSE Subject Code: CSE-24211

Subject Name: Data Structures Maximum Marks: 40

Duration: 2 hours Date: 20-11-2025 Time: 9:30 to 11:30 AM

Note: *Attempt all questions sequentially. All questions are compulsory*

Q. No.	Questions	Marks	COs
1.	The VaultIndex System is a secure digital ledger used by VaultCorp, a major banking consortium, to manage client account IDs. To ensure efficient insertions, deletions, and lookups, the system's index is implemented using an AVL Tree. As a VaultCorp engineer, you are responsible for maintaining this live AVL-based index, which is initially populated with the following client IDs:  During system updates, a sequence of new client IDs- {21,14,20,19,35} are added. Clearly show the tree that results after each insertion, deletions and make clear any rotations that must be performed.	5	CO3
2	At TaskMaster Inc. tasks are managed by an automated Priority Scheduling System. Each task has a priority value, where a smaller number means higher priority. For the given array: <table><tr><td>Index</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr><tr><td>Data (Priority)</td><td>50</td><td>30</td><td>8</td><td>22</td><td>4</td><td>6</td><td>12</td><td>65</td><td>2</td><td>13</td></tr></table> a) Show the array representation of the developed heap. b) Perform the following operations and show the tree representation of the heap: Insert(3), Extract-Min(), Increase-Key(index=5,newKey=25), Extract-Min(), Insert(1).	2+3	CO3
3.	Apply Insertion sort on the given array A consisting of 10 elements. A = [37, 12, 29, 8, 56, 24, 19, 5, 42, 31]. a) Show intermediate steps. b) Calculate the total number of comparisons and swaps made during the sorting process. c) Compute the worst case, average case, and best-case input for Insertion sort	3+1+1	CO2
4	Consider the following directed, weighted graph:	3+2	CO3