VIT
Vellore Institute of Technology

REG.NO.: [redacted]

SLOT: E1+TE1

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
CONTINUOUS ASSESSMENT TEST - II
WINTER SEMESTER 2025-2026

Programme Name & Branch	**: M.Tech (Integrated) CSE & Spl.**
Course Code and Course Name	**: IACSI101 - Data Structures and Algorithms**
Faculty Name(s)	**: Dr. KARTHIK K, Dr. MURALI S, Dr. ANTONY SEBA P**
Class Number(s)	**: VL2025260501859, 1924, 2549**
Date of Examination	**: 20-03-2026**
Exam Duration	**: 90 minutes**

Maximum Marks: 50

General instruction(s):

- Answer All Questions
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)
- Course Outcomes
  CO3 - Analyze the various searching, sorting and hashing algorithms.
  CO4 – Implement all operations in basic and advanced tree structures.
  CO5 – Experiment the graph algorithms for impactful real-world problem-solving.

Q. No	Question	Module	Marks	CO	BL
1.	A company needs to arrange the following customer transaction amounts (in lakh) in ascending order: [45, 23, 78, 12, 56, 89, 34]. Using the Quick Sort algorithm by choosing the first element as the pivot, perform the first partitioning step. Show the array after completing the first partition. Determine the final position of the pivot element after partitioning. Derive the worst-case time complexity of Quick Sort and justify when it occurs.	3	10	CO3	3
2.	A digital library system stores book accession numbers in a hash table to enable fast retrieval. The table size is 11, and the hash function used is: $h(k) = k mod 11$ To resolve collisions, the system uses quadratic probing with the formula: $h_i(k) = (h(k) + i^2) mod 11$ where $i = 0,1,2,3,...$The following accession numbers are inserted sequentially:22,41,53,46,30,13. Compute the hash value for each key and insert them into the hash table using quadratic probing. Clearly show all collision resolutions step-by-step. Draw the final hash table after all insertions.	3	10	CO3	3
3.	a.Construct a Binary Search Tree using the given preorder and inorder traversals. Preorder Traversal: 50, 30, 20, 40, 70, 60, 80 Inorder Traversal: 20, 30, 40, 50, 60, 70, 80	4	5	CO4	3
	b.A logistics company maintains a dynamic database of parcel tracking IDs in such a way that searching, insertion, and deletion operations must always be efficient. The system	4	5	CO4	3

	automatically reorganizes the structure whenever it becomes height-imbalanced to ensure that the difference in height between left and right substructures of any node never exceeds one. The following tracking IDs arrive sequentially: 50, 40, 30, 60, 70, 65				
4.	A cloud computing company manages server workloads using a priority-based scheduling system. The higher the workload value, the higher the execution priority. The following workload priorities arrive sequentially: 35, 20, 50, 15, 40, 60 The system uses a Max-Heap to manage task execution. Construct the Max-Heap by inserting the elements one by one. Show each intermediate step. Draw the final heap after all insertions.	4	10	CO4	3
5.	An ambulance dispatch system must compute the shortest travel time from Hospital H to Accident Location G. The weighted graph is: Edges: A-B is 7, A-E is 1, B-E is 8, B-C is 3, E-C is 2, E-D is7, D-C is 6. Apply Dijkstra's Algorithm from A. Show the distance update process at each step. Identify the shortest path from A to C.	5	10	CO5	3

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