VIT
Vellore Institute of Technology

SCHOOL OF COMPUTER SCIENCE ENGINEERING AND INFORMATION SYSTEMS
CONTINUOUS ASSESSMENT TEST - II
FALL SEMESTER 2025-2026

SLOT: B2+TB2

Programme Name & Branch	**: B.Tech(CSE), Cyber Security, Artificial Intelligence, and Data Engineering**
Course Code and Course Name	**: BCSE202L, Data Structures and Algorithms**
Faculty Name(s)	**: Prof. Prabukumar M, and Prof. Jenila Vincent M**
Class Number(s)	**: VL202526010409 VL202526010403O**
Date of Examination	**: 06-October-2025**
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
- 3. Identify and apply suitable algorithms for searching and sorting.
- 4. Discover various tree and graph traversals.

Q. No	Question	M	CO	BL
1.	An airline maintains a list of passenger IDs in **ascending order**. When a new booking is made, the system must place the new passenger ID into its correct position so that the order is preserved. a) If the current list is: **105, 210, 315, 420, 525,** show the state of the list after inserting the new ID **300**. (2 marks) b) How many **comparisons** were needed to find the correct position for 300? (2 marks) c) Compare the **complexity** of inserting an element into a **sorted array** versus inserting into a **linked structure**, explaining which is more efficient and why. (6 marks)	10	3	5
2.	An e-commerce warehouse processes **5,000 product IDs** daily. Since most IDs already arrive in nearly sorted order, the warehouse team is considering two basic methods to keep the list fully ordered: 1. **Neighbor swapping method** (like repeatedly swapping adjacent out-of-order elements). 2. **Selection method** (repeatedly picking the smallest remaining element and placing it in the correct position). **Tasks:** a) Compare the performance of these two methods when the input is almost sorted. b) Perform a dry run of both methods on the sample input: [101, 103, 102, 104, 105] c) Justify which method is more efficient for this warehouse scenario.	10	3	5

SCHOOL OF COMPUTER SCIENCE ENGINEERING AND INFORMATION SYSTEMS
CONTINUOUS ASSESSMENT TEST - II
FALL SEMESTER 2025-2026

SLOT: B2+TB2

3.	A computer file system is represented as a binary search tree where left child = older file, right child = newer file. a) If 8 files are inserted in sorted increasing order, describe the resulting structure. (3 marks) b) Which traversal order will list files from newest to oldest? (2 marks) c) Analyze the height of the tree in this case and its effect on search complexity. (5 marks)	10	4	4
4.	A database query execution plan can be represented as a binary tree. • Each leaf node represents a table scan. • Each internal node represents a join operation. • Answer the following: a) If the query tree contains 15 nodes in total, how many node visits (traversals) are required to evaluate the query tree once? (3 marks) b) Specify the traversal order that guarantees all table scans are performed before their corresponding joins are executed. (2 marks) c) Discuss the time complexity of evaluating such a query tree with n nodes and explain how the height of the tree influences the performance of query execution. (5 marks)	10	4	3
5.	A stock market system needs to process and arrange 1 billion daily transactions efficiently. Three different arrangement strategies are under consideration: Divide-and-merge strategy (like merge-based approaches), Divide-around-pivot strategy (like pivot-based approaches), and Frequency counting strategy (like counting sort). Compare the strengths and weaknesses of these methods in terms of time complexity, memory requirements, and suitability for large-scale financial datasets. Then, design a decision model that indicates which method should be chosen depending on the nature of the dataset (e.g., numeric range, distribution, duplicates). Finally, recommend the most appropriate method for the stock market scenario with justification.	10	3	4

****