



VIT

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act 1956)

REG.NO.: 24BCT0108

SLOT: E1+TE1

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING CONTINUOUS ASSESSMENT TEST - I FALL SEMESTER 2025-2026

Programme Name & Branch : B.Tech CSE
Course Code and Course Name : BCSE202L Data structures and Algorithms
Faculty Name(s) : Common to all
Class Number(s) : Common to all
Date of Examination : 21/08/2025
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:
 CO. 1: Understand the fundamental analysis and time complexity for a given problem.
 CO. 2: Articulate linear, non-linear data structures and legal operations permitted on them.
 CO. 3: Identify and apply suitable algorithms for searching and sorting.

| Q. No | Question | M | CO | BL |
|-------|--|----|----|----|
| 1 | Consider the recurrence relation $T(n) = 8T(n/2) + n^2$. Apply back substitution method and recursion tree method to show that the time complexity of the relation is $O(n^3)$. | 10 | 1 | 1 |
| 2 | a) Find the time complexity of the given algorithm. Justify through the sequence of steps. (5marks) <pre> 1 n ← length[T] 2 m ← length[P] 3 for s ← 0 to n - m 4 do if P[1..m] = T[s + 1 .. s + m] 5 then print "Pattern occurs with shift" s </pre> b) Apply Master theorem, identify the time complexity for the below recurrence relation and provide the case it belongs to $T(n)=3T(n/4) + n^2 \log n$. (5 marks) | 10 | 1 | 2 |
| 3 | Convert the given expression $a - ((b * c) + d) / ((e + h) ^ f) - g$ into a postfix expression using stack. Process the push and pop operation involved for each step. (^ symbol is the power term) | 10 | 2 | 2 |
| 4 | What are the queue data structures that help to overcome the limitations of the basic/linear queue? Discuss the insertion and deletion operation with a sample pseudo code for any of them. | 10 | 2 | 2 |
| 5 | a) Which algorithm generates partially sorted array in each iteration. Assume the elements 10, 5, 12, 9, 3, 7, 1 to prove the same. (show all the steps) (6 marks) b) Among the searching techniques, which one has the time complexity of $O(n)$ in its worst case. Write the Pseudo code for the same. (4marks) | 10 | 3 | 2 |
