



School of Electronics Engineering
WINTER SEMESTER 2024-2025

CAT-1

Date: 28-01-2025

Slot: B1

Programme Name & Branch: B.Tech -ECE
Course Name & Code: BECE208E & Data Structures and Algorithms
Faculty Name (s): Jaffino G
Exam Duration: 90 Min.

Maximum Marks: 50

General instruction(s): Answer all Questions

Q. No	Question	Marks												
1.	Implement a singly linked list with the following operations: a) Create a linked list with 5 data elements. b) Insert an element at the front of the linked list. c) Delete the element at the end of the linked list. Provide algorithms and examples to demonstrate each operation.	10												
2.	Construct a binary tree with a height of 2^3 and the corresponding nodes to identify the a) Siblings, b) Internal node, c) External node, d) Ancestors, e) Descendant tree terminology at each level.	10												
3.	Find the upper bound for the function $f(n) = 2n^3 - 2n^2$.	10												
4.	Solve the recurrence relation in terms of n by using substitution method. $T(n) = T(n - 1) + 4$ and $T(0) = 1$.	10												
5.	Consider the following array of integers $N=6$. Write the step-by-step process of insertion sort, provide the algorithm and explain the time complexity of Insertion Sort. <table><tr><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>5</td><td>4</td><td>10</td><td>1</td><td>6</td><td>2</td></tr></table>	0	1	2	3	4	5	5	4	10	1	6	2	10
0	1	2	3	4	5									
5	4	10	1	6	2									