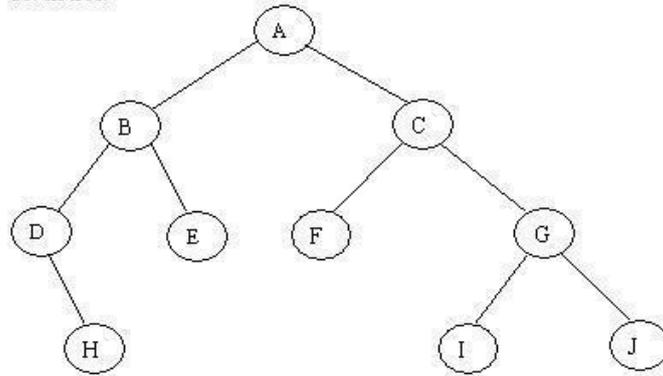


**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- SEMESTER-III EXAMINATION – WINTER 2025****Subject Code:3130702****Date:12-12-2025****Subject Name: Data Structures****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

	<b>Marks</b>
<b>Q.1</b> (a) What is data structure? Differentiate between data types and data structures	<b>03</b>
(b) Define static, dynamic, linear and non-linear data structures.	<b>04</b>
(c) Explain the concept of recursion and write a recursive C program to calculate factorial of a number.	<b>07</b>
<b>Q.2</b> (a) Compare and contrast queue, priority queue and dequeue.	<b>03</b>
(b) Evaluate the following expression using stack, show each step. $10\ 2 + 8\ 4 / * 6\ 3 - /$	<b>04</b>
(c) Write an algorithm to convert an infix expression to postfix.	<b>07</b>
<b>OR</b>	
(c) Write a C functions for insertion and deletion operation in simple queue.	<b>07</b>
<b>Q.3</b> (a) Differentiate Array and Linked lists	<b>03</b>
(b) Convert the following expression to postfix using stack. Show each step clearly $((A-B)+D)/((E+F)*G)$	<b>04</b>
(c) Write an algorithm to insert an element in an ordered link list	<b>07</b>
<b>OR</b>	
<b>Q.3</b> (a) Define :	<b>03</b>
1. Directed Graph	
2. Acyclic and cyclic graph	
3. Weighted and unweighted graph	
(b) Compare and Contrast DFS and BFS	<b>04</b>
(c) What is minimum cost spanning tree? Discuss Prim's algorithm with an example	<b>07</b>
<b>Q.4</b> (a) Explain the properties of binary tree and differentiate between complete binary tree, full binary tree and balanced binary tree	<b>03</b>
(b) Insert the following nodes into an empty BST in this order: 50, 30, 70, 20, 40, 60, 80. Draw the resulting BST after each insertion	<b>04</b>
(c) What is a binary search tree? write an algorithm to search an element in BST and show it's time complexity	<b>07</b>
<b>OR</b>	
<b>Q.4</b> (a) Define following with respect to Tree: i) M-ary tree ii) Out Degree iii) Leaf	<b>03</b>
(b) If the depth of the binary tree is k, the maximum number of nodes in the binary tree is $2^k - 1$ . Justify. Also mention atleast how many nodes a tree should have given it's depth as k.	<b>04</b>

Given tree:



- Q.5 (a)** Sort following elements using quick sort. 22 15 26 06 40 31, 92, 45, 78 **03**  
**(b)** Compare the below different hashing methods and discuss about each method in a detailed Manner. **04**  
i. Static Hashing. ii. Dynamic Hashing  
**(c)** Insert the following keys into a hash table of size 10 using linear probing: 12, 26, 31, 92, 45, 78 Show the steps and the final hash table **07**

**OR**

- Q.5 (a)** Explain AVL tree with suitable example. **03**  
**(b)** Construct the 2-3 tree for the following sequence 10, 20, 30, 40, 50, 60, 70, 80, 90. **04**  
**(c)** Write an algorithm to sort an array using selection sort method. **07**

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