(T) Roll No. .....

PAPER ID—10709

B.Tech. Computer Science and Engineering (Internet of things and Cyber Technology including block Chain Technology), B. Tech. (Computer Science and Engineering) B. Tech. (Electrical Engineering) Etc.

EXAMINATION, 2025

(Second Semester)

DATA STRUCTURE USING C

(Common for All Branches B.Tech.)

Time : 3 *Hours* *Maximum Marks :* 70

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.

Compulsory Question

1. (a) How are pointer variables declared and initialized ? Explain with an example. **2**

(b) Compare linear search and binary search in terms of algorithmic complexity and applicability. **2**

(c) Explain the process of array declaration and initialization in C. What happens when you try to access an element outside the bounds of an array ? **2**

(d) Discuss stack overflow and underflow in the context of stack data structures. Provide an example scenario of each. **2**

(e) Make a comparison between a linked list and a linear array. Which one will you prefer to use and when ? 2

(f) How do you reverse a singly linked list ? 2

(g) What properties must a Binary Search Tree (BST) satisfy ? Given the sequence [15, 10, 20, 8, 12] construct the BST. 2

Unit I

2. Explain the concept of pointers in C and how they can be used to directly manipulate memory. How do pointers enhance the functionality of arrays in dynamic memory management ? Provide examples of pointer-based array manipulations, including how pointers can be used for passing arrays to functions. 14

3. (a) Write an algorithm to sort a set of 'N' numbers using quick sort. Demonstrate the algorithm for the following set of numbers : 98, 11, 22, 44, 66, 99, 45, 67, 54, 25. 7

(b) Write an algorithm to implement merge sort with suitable example. 7

Unit II

4. (a) Given two sparse matrices represented as triplets, 7

Matrix A : (1,2,3), (2,1,5), (3,3,7)

Matrix B : (1,2,6), (2,1,4), (3,3,1)

Write the algorithm to add these matrices and show the resulting sparse matrix.

(b) Write the algorithm to implement stack using linked list. Show push and pop operations with examples. 7

5. Convert the following infix expression into postfix form : 14

A + B * C + (D * E + F) * G

Evaluate the above postfix expression for A=2, B=2, C=1, D=4, E=6, F=4, G=3. Also, write algorithm to demonstrate infix to postfix expression conversion using a stack.

Unit III

6. Explain the concept and implementation of a linked list in C. Implement a singly linked list to add, delete, and display elements. Write a program that also demonstrates how to reverse the list. 14

7. Write an algorithm for insertion and deletion in a doubly linked list. Given the list [10, 20, 30, 40], delete the node containing 20 and show the updated doubly linked list. 14

Unit IV

8. What is a binary tree ? The binary tree has the following inorder and preorder traversal. Draw the tree and give the postorder traversal. **14**

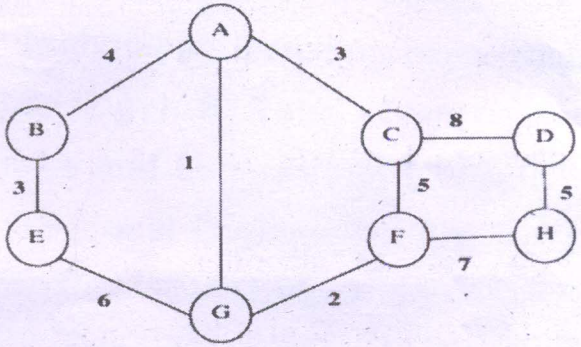
Inorder : A B C E D F J G I H

Preorder : J C B A D E F I G H

Also write an algorithm for inorder and postorder traversal of a binary tree.

9. (a) Create a binary search tree for the following numbers start from an empty binary search tree. 45, 26, 10, 60, 70, 30, 40. Delete keys 10, 60 and 45 one after the other and show the trees at each stage. **7**

(b) What is a minimum spanning tree ? Write an algorithm to find a minimum spanning tree and determine the minimum spanning tree of the following graph : 7



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