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# P.E.S. College of Engineering, Mandya - 571 401

*(An Autonomous Institution affiliated to VTU, Belagavi)*

**Third Semester, B.E. - Computer Science and Engineering**

**Semester End Examination; March / April - 2022**

**Data Structures**

*Time: 3 hrs* *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

## UNIT - I

1 a. Define data structures and its types with an example for each. 6

b. Write a 'C' program to implement various operations on stack. 10

c. Evaluate the following postfix expression: 4

42 $ 3 * 3 – 84 / 11 + / +

2 a. Develop a 'C' function for converting Infix expression to Postfix expression. Apply the same for the expression (A + B * C) to obtain its equivalent Postfix expression. 10

b. Define recursion. Write a 'C' program to implement Tower-of-Hanoi problem and trace it for three discs. 10

## UNIT - II

3 a. Differentiate static and dynamic memory allocation technique. Explain the functions malloc( ) and calloc( ) with its syntax and an example 10

b. Write a 'C' function to perform the following operations on singly linked list: 10

i) Insert an element at the front end

ii) Insert an element at the rear end

iii) Insert an element at a specified position

4 a. List the advantages and disadvantages of doubly linked list over singly linked list. Write 'C' functions to perform the following operations on DLL: 10

i) To search for a node whose info is specified

ii) To delete a node whose position is specified

b. Write 'C' routines to perform the following operations on circular linked list: 10

i) Inserting a node at the front end

ii) Delete a node from the front end

iii) Display the contents of list

## UNIT - III

5 a. With suitable example, explain the drawback of ordinary queue and how it can be resolved by circular queues? Develop 'C' functions for circular queue insert and delete. 10

b. Write a 'C' program to demonstrate ascending priority queue. 10

Contd... 2

6 a. Develop 'C' routines to;

i) Reverse a given list 10

ii) Concatenate two lists

b. Explain how a polynomial with three variables $x$, $y$, and $z$ can be represented using linked list with an example. Also write a function to allocate memory for each polynomial dynamically. 10

**UNIT - IV**

7 a. List and explain any three different types of binary tree with an example for each. 8

b. Develop recursive c routines for inorder, postorder and preorder tree traversals. Obtain the preorder, postorder and inorder traversals for the graph in Fig. Q7(b)

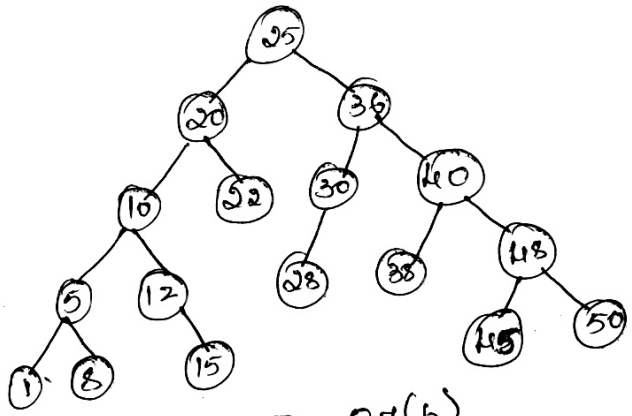


Fig. Q7(b) 12

8 a. Write a 'C' program to construct a Binary Search Tree and find a maximum element in the tree. 10

b. Write a 'C' function to perform the following:

i) Count the number of leaf nodes 10

ii) To find the height of the tree

**UNIT - V**

9 a. Write a 'C' function to sort the elements using Insertion Sort technique. Apply the same to sort the elements: 20, 10, 30, 5, 70, 40. 10

b. Write a 'C' program to sort the given elements using Quick sort method. 10

10 a. List the variations of the sequential search algorithms. Explain any two with its function definition. 10

b. Write a 'C' program to sort the given elements using Merge sort technique. 10

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