B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

May 2023 Semester End Main Examinations

Programme: B.E.   **Semester:** III
Branch: Information Science and Engineering   **Duration:** 3 hrs.
Course Code: 22IS3PCDSC   **Max Marks:** 100
Course: Data Structures   **Date:** 15.05.2023

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Compare Static and Dynamic Memory Allocation.   **04**

b) Write C functions to perform the following operations: **12**
   i.   To reverse a given singly linked list
   ii. To check whether the elements in a given singly linked list form a palindrome
   iii. To delete a given element in a given singly linked list

c) Design a C function to find the sum of all the even numbers in a given singly linked list.   **04**

OR

2 a) Design C routines to perform the following operations: **08**
   (i) To insert an element at a given position in a given singly linked list
   (ii) To find the middle element in a given singly linked list containing odd number of elements

b) Develop a C program to add two given polynomials using linked list.   **12**

UNIT - II

3 a) Design a C function to insert an element after a given element in a doubly linked list. **06**

b) Design an algorithm to convert a given infix expression to an equivalent postfix expression. Show how the following infix expression is converted to postfix expression using this algorithm.   **10**
$$((a + b) * c / d - m + (n / p) + k)$$

c) Write PUSH and POP functions to implement stacks using arrays.   **04**

UNIT - III

4 a) Compare iteration and recursion with examples.   **04**
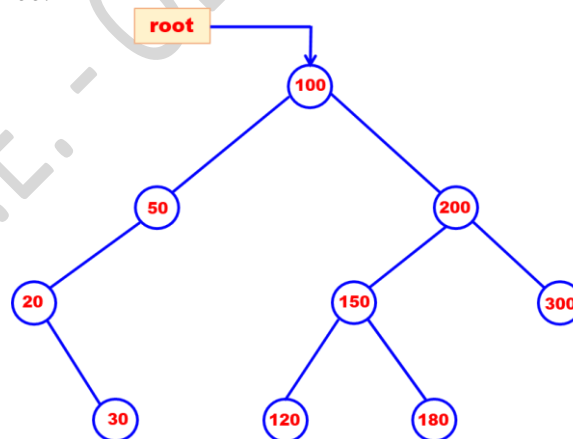
b) Write recursive functions for the following: **08**
    (i)   To find the nth Fibonacci number
    (ii)   To solve the Tower of Hanoi problem
    (iii)   To find the GCD of two numbers

c) Write a C program to implement Circular Queue using arrays. **08**

UNIT - IV

5 a) Show how a Binary Search Tree is created using the following elements in sequence. **08**
        24, 69, 10, 15, 100, 59, 02, 200, 46
 Also, write a C function to create a Binary Search Tree.

b) Write a iterative function for the Preorder traversal of a binary tree. **06**

c) Create a Binary Search Tree when the following traversals are given: **06**
    (i)   Preorder: F B G D H C I J A E K
          Inorder: G D B H F I C A J K E
    (ii)   Postorder: Z C G H D F A I B E
          Inorder: Z D C G H E B A F I

OR

6 a) Write C functions for the following: **04**
    (i) To find the height of a Binary Search Tree
    (ii)   To find the minimum element in a Binary Search Tree

b) Write a iterative C function for Inorder traversal of a given binary tree. **06**

c) Show how the elements 300, 20 and 150 are deleted from the following Binary Search Tree. Also, write a C function to delete an element from a Binary Search Tree. **10**

UNIT - V

7 a) Define balance factor in AVL tree. Write a C routine for left single rotation in an AVL tree. **06**

b) Construct a splay tree for the following sequence of elements. **06**
        15, 10, 17, 7, 13, 16

c) Write the properties of Red-Black trees. Construct a Red-Black tree for the following sequence of numbers: **08**
        8, 18, 5, 15, 17, 25, 40

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