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

Autonomous Institute Affiliated to VTU

December 2023 Supplementary Examinations

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

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) With the neat sketch, describe the classification of Data Structures. **05**

   b) Using structures, develop C routines to read 'n' Faculty record (Faculty Name, EID, Dept. and Salary) and to print the faculty details who has highest salary. **10**

   c) Write a C function to count number of even number in the given Singly Linked list. **05**

OR

2 a) Differentiate between malloc(), calloc() and realloc() functions. **04**

   b) A blood bank maintains a list of blood donors. Each donor's name, age, blood group and phone number is stored. Assume 'n' records of donor are stored in a singly linked list. Write C routines for the following: **10**

       i.   Search for donors for the given blood group

       ii.   Insertion of a new donor.

   c) Consider a singly linked list with header nodes. Write C routines to insert at the end of the list and display the contents of the list. **06**

UNIT - II

3 a) Implement a C routine to delete the middle node in a given Doubly linked list. **06**

   b) Design an algorithm to evaluate postfix expression. Using the same, show how the following postfix expression is evaluated 467*21+/-. **06**

   c) Write a C routine to convert the given infix expression to postfix and apply the same to convert the given expression A+ (((B – C)*(D - E) + F) / G). **08**
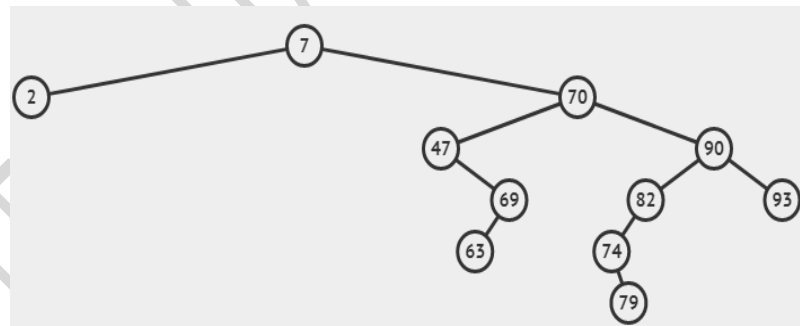
4   a)   Write a C program to implement a linear queue of characters using an array. Routines for enqueue ( ), dqueue( ) and display ( ) operations to be designed.   **10**

      b)   Differentiate between Circular queue and Linear queue.   **05**

      c)   Analyze the given recursive routine. Describe the logic and predict the output for the call display(4).   **05**

```c
int display (int n)
{
   if (n <=0)
        return 0;
   else
   {
     printf ("%d", n);
     return display (n-1) + display (n-2);
   }
}
```

UNIT - IV

5   a)   Write a iterative C routine to delete a node from Binary Search Tree(BST)   **10**

      b)   Construct a BST for the given pre-order traversal 30,20,10,15,25,23,39,35,42   **04**

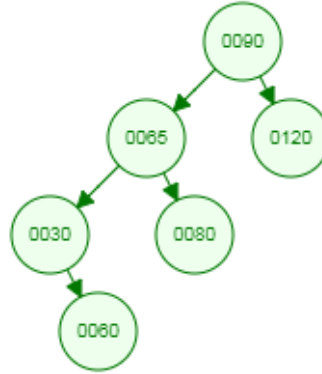   c)   Write the inorder, preorder and postorder traversals for the following Binary tree.   **06**

OR

6   a)   Explain array representation of binary trees with an example. Also discuss its advantages and disadvantages.   **05**

      b)   Write C routines to implement the following operations on a Binary Tree: **09**

           i. Find the smallest element in the tree

           ii. Post-order traversal

           iii. Count the total numbers of nodes

      c)   Why are threaded binary trees needed? Briefly explain a fully threaded binary tree.   **06**

UNIT - V

7 a) Construct AVL tree for the following sequence of values: **07**
       10,20,35,13,37,54,75,8,16,2

   b) Show the resulting Splay tree after inserting key values 130 and 95 **07**
       successively to the below given Splay tree.

   c) Write the properties of Red-Black Trees. Construct Red-Back Trees for the **06**
       following sequence of values: 35, 28, 20, 38, 67, 50, 26, 15.

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