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

Autonomous Institute Affiliated to VTU

September / October 2023 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: Artificial Intelligence and Machine Learning **Duration: 3 hrs.**
Course Code: 22AM3PCDST **Max Marks: 100**
Course: Data Structures

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) Using the syntax of malloc (), calloc () and realloc() functions, explain how to make the program dynamic in nature with respect to memory allocations. Write the sample code snippets wherever required along with its syntax. **10**

b) Given a Singly Linked List, the requirement is to sort the data in ascending order. Write a Suitable C code to read the elements into linked list and sort them in ascending order. Use as many as temporary pointers required to accomplish the task assigned. **10**

UNIT - II

2 a) Write a C code to perform the following operations on Doubly Linked List. **10**

i. Insert nodes only from the front end.
ii. Delete a Node based on Key value and print appropriate Message when key not found.
iii. Display the contents of list.

b) By making use of a Stack, **10**

i. Convert the Infix Expression: **A - B - D * E / F + B * C** to its equivalent Postfix form.
ii. Evaluate the postfix expression: **5 2 7 ^ * 39 13 / - 9 11 * +**

OR

3 a) Sparse Matrix is a Matrix containing more number of Zeros than non-Zero elements. Write a C program to read contents of a Sparse Matrix and store non-Zero elements using Doubly Linked List and display. **10**

b) Implement the working of a Stack using a circular Doubly Linked List. **10**

UNIT - III

4 a) Write a Recursive Solution to solve the Tower of Hanoi Problem. Show that its efficiency is O(2n). **8**

b) There is a Ticket Issuing queue where any person who want to buy ticket has to enter from one end and come out of queue from the other end. By assuming that the Ticket Issuing queue can hold only 10 people together in the queue, chose a suitable data structure and implement the given scenario using the C language. **8**

c) Using pictorial representations, explain the status of a Circular queue after applying the sequence of operations: Insert 10, Insert 20, Insert 30, Delete 10, Insert 40. **4**

UNIT - IV

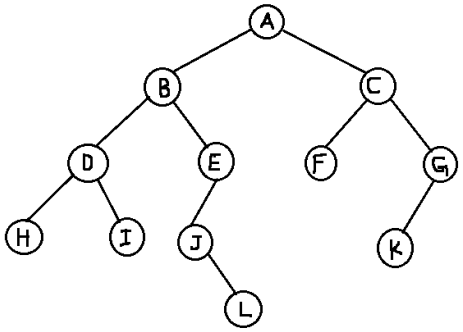
5 a) i. Prove that the maximum number of nodes at level 'L' of a binary tree is 2^L. **6**

ii. If a binary tree is of height 5, find the maximum number of nodes that the binary tree contains.

b) Construct a Binary Search Tree (BST) for the following sequence of elements: **8**

50, 70, 60, 20, 90, 10, 40, 100

c) Apply the In-order, Pre-order and Post-order traversal techniques on the tree given below and write the resultant sequences clearly. **6**

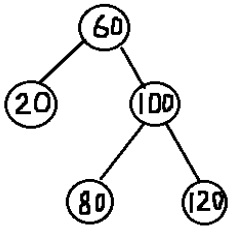


UNIT - V

6 a) Construct an AVL Tree by inserting numbers from 1 to 8. **10**

b) Explain any two properties of an AVL Tree along with the pictorial representations. **6**

c) Insert the element 70 to the given binary tree and balance the resultant tree by applying the rules of AVL tree rotations on it. **4**



OR

7	a)	List the properties of a Red- Black tree.	**4**
	b)	Construct a Red-Black Tree for the given set of elements: 10,20,30,40,50,60,70,80	**10**
	c)	Explain any 4 types of rotations that can be applied on a Splay Tree.	**6**

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