U.S.N.										

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

Autonomous Institute Affiliated to VTU

August 2024 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: CSE(ICB)/CSE(DS)/AI&DS **Duration: 3 hrs.**
Course Code: 23DC3PCDSC **Max Marks: 100**
Course: Data Structures

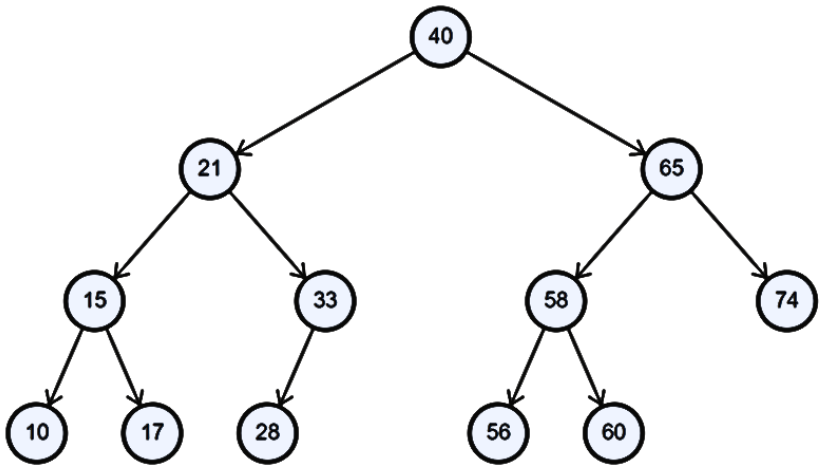
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

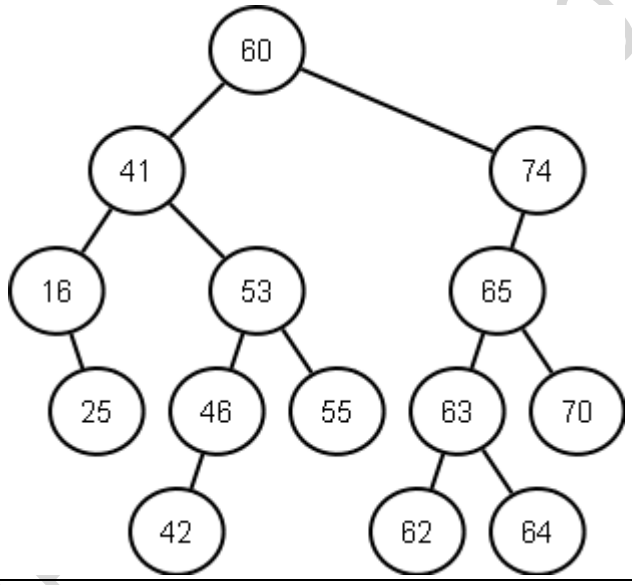
Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Compare and contrast linear and nonlinear data structures, providing examples of each and discussing their characteristics, advantages, and disadvantages.	CO 1	PO 1	6

	b)	The following code snippet is expected to identify first rank student. Analyze this code which includes errors and missing lines of code. Propose an error-free code for the said purpose.
		`struct Student {`
		`  char name[10], USN[10];`
		`  float marks;`
		`};`
		
		`void findFirstRank( struct Student [], int num_students)`
		`{`
		`  struct Student first_rank = _____ ;`
		`  for (int i = 2; i < num_students; i++)`
		`{`
		`  if (students[i].marks > first_rank)`
		`  first_rank = _____ ;`
		`  }`
		`return first_rank;`
		`}`
			CO 2	PO 2	6

	c)	Under what circumstances would you prefer dynamic memory allocation over static allocation, and why? Illustrate the dynamic allocation features in C language.	CO2	PO2	8
		UNIT - II			
2	a)	Implement C routines for the following operations on a singly linked list, where each node stores an integer value. i) Sort the linked list in ascending order ii) Insert a value at a given position	CO 3	PO 3	8

		b)	Develop a C routine to concatenate two given circular linked lists and traverse the generated resultant list.	*CO 2*	*PO 2*	**7**
		c)	Discuss with a neat diagram of how a polynomial can be represented as an ordered singly list of non-zero terms.	*CO 1*	*PO 1*	**5**
			OR			
	3	a)	A singly linked list containing integers is given. Write a C routine to create two singly linked lists (with header nodes), one containing all even numbers and the other containing odd numbers. The header nodes of the lists should record the number of nodes of the list. Display the resulting two lists.	*CO 3*	*PO 3*	**10**
		b)	An ordered Doubly Linked List (DLL) of integers is to be constructed. Write a C routines to construct the DLL and implement deleting nodes whose 'key' values are in the range 'min' and 'max'.	*CO 3*	*PO 3*	**10**
			UNIT - III			
	4	a)	Convert the infix expression A+ ((B – C *(D - E) + F) / G) into its equivalent postfix using stack.	*CO 1*	*PO 1*	**6**
		b)	Design an algorithm to efficiently implement two stacks using static array. Over flow of the two stacks should happen only when the array is completely full.	*CO 3*	*PO 3*	**6**
		c)	Implement a circular queue using a static array. Perform the following operations on the queue: i) Insert ii) Delete iii) Display	*CO 1*	*PO 1*	**8**
			UNIT - IV			
	5	a)	Construct a Binary Tree whose traversals are as given below. Pre-order : ABDCGFEH In-order : DBAFGECH	*CO 2*	*PO 2*	**6**
		b)	Prove that the maximum number of nodes in a binary tree of depth k is 2^{k+1} -1.	*CO 2*	*PO 2*	**4**
		c)	Illustrate deletion of key values 56, 33, 40 successively from the below given Binary Search Tree (BST). Also implement a C routine for deletion operation in a BST. 	*CO 1*	*PO 1*	**10**

			OR			
	6	a)	Construct a Binary Search Tree (BST) for the following list of integers; 95, 45, 12, 123, 36, 188, 22, 67, 62, 191, 115 Traverse the constructed BST using postorder and preorder.	***CO** 1*	***PO** 1*	**10**
		b)	A set of English words and their corresponding meanings are stored in a Binary Search Tree. Give the node structure for the BST and design C routines to efficiently implement the following operations on the data structure: i) Insert a word and its meaning based on the lexicographic order ii) search for the meaning of a given word.	***CO** 3*	***PO** 3*	**10**
			UNIT - V			
	7	a)	Describe the process of inserting a node into an AVL tree. How does the AVL tree maintain balance during insertion, and what rotations are performed if necessary?	***CO** 1*	***PO** 1*	**6**
		b)	Value 25 is being searched in the below given splay tree. Derive the resulting tree.  	***CO** 2*	***PO** 2*	**6**
		c)	Construct Red Black Tree for the following values inserted sequentially: 25, 90, 35, 60, 55, 20, 43	***CO** 2*	***PO** 2*	**8**

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