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

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E.   Semester: VI

Branch: Electronics and Communication Engineering   Duration: 3 hrs.

Course Code: 19EC6PE3DS   Max Marks: 100

Course: DATA STRUCTURES AND APPLICATIONS

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. All codes are to be of generic type. Assume any missing data, suitably and indicate the same in your answer clearly.
3. All codes are to be accompanied with explanatory comments

			UNIT - I	CO	PO	Marks
1	a)		Compare formula based and linked representation with respect to memory efficiency and time complexity with relevant code snippets. (Full program not required)	*1*	*1*	**10**
	b)		Demonstrate how a data can be searched in a linked list. (Complete program not required).	*1*	*1*	**10**
			OR			
2	a)		With a suitable example demonstrate the advantages of using templates.	*1*	*1*	**10**
	b)		With suitable examples explain the usage of formula based and linked representation to create and maintain databases. (Codes not required, outline the application)	*1*	*1*	**10**
			UNIT - II			
3	a)		Write a codes to store data of a diagonal matrix.	*1*	*1*	**10**
	b)		Assume there exists a class array1D exists that includes functions to maintain data as a 1D array. To that class add functions for the following code to compile: Array1D<int> Arr1(10), Arr2(12), Arr3; **// Arr1 has an array of size 10, Arr2 has an array of size 12 and so on** Arr1=Arr2/2; **// To perform division of corresponding data of Arr2 and 2 and to store the quotient in corresponding position of Arr1**	*2*	*2*	**10**
			OR			
4	a)		In a supermarket that sells 20,000 different types of commodities and which has over 1M customers, a data base is to be maintained	*3*	*3*	**10**

			of who buys what. Suggest an efficient data structure for the same. Write codes to realize such a data base. Suppose the superstore has 2 outlets and wants to get the total number of customers from the 2 outlets, how would you facilitate the same? (pseudo codes)			
	b)		Demonstrate how contents of a tridiagonal matrix can be stored in a 1D array. Give codes for the same.	2	3	**10**
			UNIT - III			
5	a)		Realize a solution for tower of Hanoi using stack. Give codes for the function and explain its working.	1	1	**10**
	b)		Realize a circular queue using formula-based representation. Include functions to check empty, full conditions. Add codes to adddata) and DeLete(data) from the stack. Include a driver code to demonstrate the working of your code.	2	2	**10**
			OR			
6	a)		Give pseudo codes to check parenthesis match in an expression. Explain the working with an example.	2	2	**10**
	b)		Realize a linear queue using formula-based representation. Include functions to check empty, full conditions. Add codes to adddata) and DeLete(data) from the queue. Include a driver code to demonstrate the working of your code.	2	2	**10**
			UNIT - IV			
7	a)		State and prove the properties of binary trees.	1	1	**10**
	b)		Convert the following expression into postfix form by first writing an expression tree a*b/c+2-d*e && a/2*b >0	1	1	**10**
			OR			
8	a)		Write algorithms to traverse a tree in preorder, post order, level order and in order methods. With an example tree demonstrate the outputs of the traversal methods	2	2	**10**
	b)		Derive an expression to calculate the height of the tree given the number of nodes	2	2	**6**
	c)		Explain how a tree can be stored as a linked list.	1	1	**4**
			UNIT - V			
9	a)		The advantage of a BST is that the search time gets reduced because we effectively search only one half of the tree. However, if the BST is skewed the worst-case search time is O(n). Suggest a method that can be applied to a BST that would still facilitate optimum search time. Using the same concept, construct a tree	2	2	**10**

			for the given data: 100,50,180,160,170,165,40,120,110			
		b)	Give the algorithm for creating a priority queue. Demonstrate the same with a suitable example.	*2*	*2*	**10**
			OR			
	10	a)	Explain the process of constructing a min and max heap with sample data.	*1*	*1*	**10**
		b)	Write the algorithm for the four rotations in case of an AVL tree. With your own examples demonstrate the same	*1*	*1*	**10**

******