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

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: III**

Branch: Artificial Intelligence and Machine Learning **Duration: 3 hrs.**

Course Code: 23AM3PCDST **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)	Explain different dynamic memory allocation functions with syntax and examples.	CO1	PO 1	**07**
	b)	Write a python program using singly linked list to perform the following operations: i. Insert data items (Integer) at the end of the list. ii. Compute the sum of all even numbers in the linked list. iii. Display only odd numbers present in the linked list.	CO2	PO3	**08**
	c)	Write a Python function to delete a node in singly linked list that is immediately on the right side of the specified node.	CO2	PO3	**05**
		OR			
2	a)	Classify different types of data structures and explain them in brief with an example for each.	CO1	PO1	**07**
	b)	Write a python program using singly linked list to manage following information about students: student ID, name, age, and marks. The program should support following operations: i. Adding new student details at the beginning of the list. ii. Deleting exiting student details based on student ID. iii. To find average marks of students.	CO2	PO3	**08**
	c)	Write a Python function to delete a node in singly linked list based on the given position.	CO2	PO3	**05**
		UNIT - II			
3	a)	Using stack data structure perform the following: i. Convert the infix expression to postfix expression ((8 + 2 * 5) / (1 + 3 * 2 - 4)) ^ 3 + 6 ii. Evaluate the given postfix expression 6 2 3 * + 5 4 2 * + / 9 -	CO3	PO3	**10**
	b)	A browser navigation application has to be designed with the following features:	CO2	PO2	**10**

			i. Visit a new webpage, append it to the browsing history. ii. Display the entire browsing history in the order of visits as well as in reverse order. Write a Python program to implement these features using a doubly linked list and explain why it is an appropriate data structure for browser navigation application.			
			OR			
	4	a)	Write a Python program for the following operations on a circular linked list: i. Insert at the beginning of the list. ii. Delete at the end of the list iii. Count the number of nodes in the list.	*CO2*	*PO3*	**10**
		b)	"Consider a linked list with n nodes, where each node contains a single digit (0-9). Write a Python program to check if the sequence of digits stored in the linked list forms a palindrome number. Use stack to perform this check. Describe the approach, including the role of stack in solving the above problem.	*CO3*	*PO3*	**10**
			UNIT - III			
	5	a)	Compare recursion with iteration strategy. Write a recursive python code to simulate the population dynamics of a country over 'N' years, with 'N' being greater than 3, Where each generation's population is determined by the sum of the population of the previous two generation.	*CO3*	*PO3*	**08**
		b)	Illustrate with suitable example two different types of double ended queue.	*CO1*	*PO1*	**08**
		c)	Differentiate between double ended queue and ordinary queue.	*CO1*	*PO1*	**04**
			OR			
	6	a)	Explain the process of establishing priority in a priority queue and write a python program to illustrate the concept.	*CO1*	*PO1*	**08**
		b)	Describe various types of queues with suitable examples for each.	*CO1*	*PO1*	**08**
		c)	Illustrate the limitation of linear queue. Suggest a solution to overcome the limitation of liner queue.	*CO1*	*PO1*	**04**
			UNIT - IV			
	7	a)	Construct a Binary Search Tree (BST) for the sequence of elements: 89, 10, 68, 78, 23, 12, 1, 5, 34, 56.	*CO2*	*PO3*	**06**
		b)	Using graphical representations, explain the concept of threaded binary tree, its types, storage representations and working in detail.	*CO1*	*PO1*	**10**
		c)	Explain different ways in which duplicate data can be handled in Binary Search Tree.	*CO1*	*PO1*	**04**
			OR			
	8	a)	Describe the different scenarios of deletion in binary search tree with an example for each.	*CO1*	*PO1*	**06**
		b)	Illustrate different types of binary trees with suitable example.	*CO1*	*PO1*	**10**

		c)	Write a Python function to insert a node in binary search tree.	*CO2*	*PO3*	**04**
			UNIT - V			
	9	a)	Illustrate 4 different types of rotation used in AVL trees.	*CO1*	*PO1*	**06**
		b)	Construct a Red black tree for the following data items: 10, 20, 8, 50, 5, 15, 70, 80, 60, 90, 85	*CO2*	*PO3*	**10**
		c)	Differentiate between AVL trees and Splay trees with suitable example.	*CO1*	*PO1*	**04**
			OR			
	10	a)	Give an example for each of the following Splay tree rotations. i. Zag-Zig rotation ii. Zig-Zag rotation	*CO1*	*PO1*	**06**
		b)	Construct an AVL tree for the following data items: 1,2,3,4,5,6,7,8,9,10. Show the pictorial representation at each step.	*CO2*	*PO3*	**10**
		c)	List the properties of a Red- Black tree.	*CO1*	*PO1*	**04**

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