U.S.N.										

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

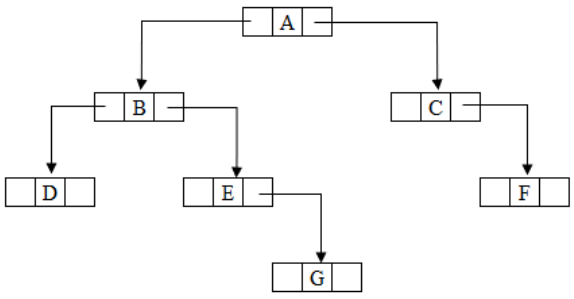
Autonomous Institute Affiliated to VTU

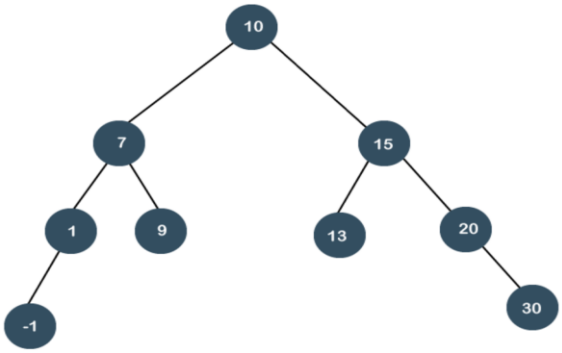
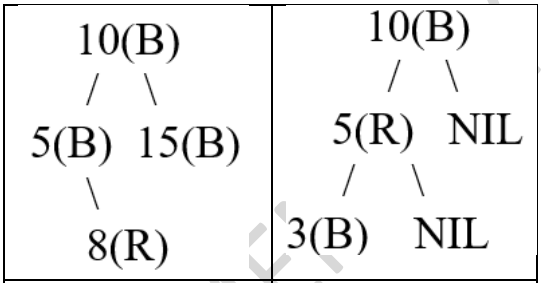
October 2024 Supplementary Examinations

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.

			CO	PO	Marks
		UNIT - I			
1	a)	Classify data structures into distinct categories. Provide suitable examples for each category.	C01	P01	**05**
	b)	Distinguish between a Static Memory and Dynamic Memory Allocation.	C01	P01	**05**
	c)	Write a python program using singly linked list to manage following information about students: student ID, name, age, and GPA. The program should support following operations: i. Adding new student details ii. Deleting exiting student details based on student ID iii. To find average age of students.	C02	P03	**10**
		UNIT - II			
2	a)	The "call" application of mobile phone is used to dial the number and make a call. Consider the following features of "call" application. Feature 1: The entered digits are appended at the rear. Feature 2: In case if the user makes a mistake in keying the digit he/she will be able to delete that digit. Identify suitable data structure to implement both the features. Give justification for the choice of data structure. Write a Python program to implement feature 1 and feature 2.	C02	P03	**10**
	b)	Write the sequence of push and pop operations and evaluate the given postfix expression. [$ to be considered as "power of"] 623+-382/+*2$.	C02	P02	**05**
	c)	Convert the given infix expression to postfix expression along with steps: A+(B*C-(D/E^F)*G)*H.	C02	P02	**05**
		UNIT - III			
3	a)	Create a recursive Python code to simulate the population dynamics of a country over 'N' years, with 'N' being greater than	C02	P03	**06**

			3, where each generation's population is determined by the sum of the populations of the previous two generations.			
		b)	Write a program to demonstrate the operations of a stack.	*C01*	*P03*	**07**
		c)	Illustrate with suitable example two different types of double ended queue.	*C01*	*P01*	**07**
			OR			
	4	a)	Differentiate between iterative function and recursive function with suitable examples.	*C02*	*P01*	**06**
		b)	A web server needs to handle the incoming requests efficiently. The webserver has a capacity to store maximum of 5 request at any given point of time and service them in the order of the arrival. Once the request is serviced it will be deleted from storage and new request will be appended. Identify a suitable data structure to efficiently manage the incoming request. Justify the choice of the data structure. Implement insertion and deletion function in python to handle the incoming requests.	*C02*	*P03*	**08**
		c)	Write a Python program to implement a priority queue using linked list, to manage tasks in a task scheduling system. Each task has a priority level assigned to it (an integer), with lower values indicating higher priorities. Program should support the following operations: I. Insert a new task into the priority queue with its priority level. II. Remove and return the task with the highest priority from the queue.	*C02*	*P03*	**06**
			UNIT - IV			
	5	a)	Illustrate distinctive characteristics of complete binary trees, full binary trees, perfect binary trees, and balanced binary trees.	*C03*	*P01*	**08**
		b)	Given the preorder traversal sequence of a binary search tree: 100, 20, 10, 30, 56, 200, 150, 104, 300 construct the corresponding binary search tree and find its post-order traversal sequence.	*C03*	*P02*	**06**
		c)	Given a Binary Search Tree  Construct a two way in-order threaded binary tree with header node.	*C03*	*P03*	**06**
			UNIT - V			
	6	a)	Illustrate different types of rotation in AVL trees.	*C03*	*P01*	**06**
		b)	Construct a Red black tree for the following data items:	*C03*	*P03*	**10**

			10, 18, 7, 15, 16, 30, 25, 40, 60, 11, 5, 2.			
		c)	Differentiate between AVL trees and Splay trees with suitable examples.	*C03*	*P02*	**04**
			OR			
	7	a)	Construct an AVL tree for the following data items: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and Balance the tree after each insertion.	*C03*	*P03*	**08**
		b)	Given a splay tree, the memory page that was most recently accessed is stored. Modify the splay tree by executing the necessary rotations following the access of memory page 13. 	*C03*	*P03*	**08**
		c)	Examine the structure of the trees depicted in figures 'A' and 'B'. Identify which one is a red-black tree and which one is not. Justify your selection with reasoning.  Figure A Figure B	*C03*	*P02*	**04**

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