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Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

School of Computer Science and Engineering

Winter Semester 2022-2023

Continuous Assessment Test – 2

SLOT: A1 + TA1

Programme Name & Branch: B.Tech – CSE (BCI, BCE, BCT, BDS, BCB)

Course Name & code: Data Structures and Algorithms – BCSE202L

Class Number (s): VL2022230505842, 6331, 5847, 5851, 5837, 6304, 5855, 5849, 5840

Faculty Name (s): Joshva Devadas T, Priyanka N, Sayan Sikdar, Naveenkumar J, [illegible] Sinha, Kalaivani K, Ganesh Shamrao Khekare, Sunil Kumar PV, S M Farooq.

Exam Duration: 90 Min. **Maximum Marks: 50**

General instruction(s):

All Questions carry Equal Marks.

Q.No.	Question	Max Marks
Q1.	a) You are given a Singly Linked list below. **Head → A → B → A → B → A → B → NULL** Write the procedure to perform an alternating split of the given singly linked list. The expected output after splitting the singly linked list should result in two singly linked lists each containing only similar characters. **(4 Marks)** b) Write a procedure to check if two circular linked lists are identical. What will be the time complexity of this procedure. Illustrate the working of the procedure using the given circular linked list. **List 1: 1 -> 2 -> 3 -> 1** **List 2: 1 -> 2 -> 3 -> 1** **(6 Marks)**	10
2.	Suppose you are given an array of strings that need to be sorted in lexicographic order (i.e., dictionary order). How can you modify the quicksort algorithm to handle this requirement? Illustrate the working of your modified quicksort algorithm on the following array of names. names = ["Smith", "Johnson", "Williams", "Brown", "Jones", "Garcia", "Miller", "Davis"]	10
3.	a) Construct the Binary tree from given Traversals. Inorder Traversal : { 4, 2, 1, 7, 5, 8, 3, 6 } Postorder Traversal: { 4, 2, 7, 8, 5, 6, 3, 1 } **(4 Marks)** b) Build an expression tree from the given expression:	10

	((5 * (y^2)) − (3 * y)) + 2 Also using the built expression tree extract the Postfix and prefix Expressions. **(6 Marks)**	
4.	a) Assume you have a binary search tree containing the ages of all the employees in a company. The tree is balanced and has n nodes. You need to write a pseudocode to find the 3rd youngest employee in the company. Illustrate your algorithm's working using the following binary search tree containing the ages of the employees. What is the time complexity of your algorithm for finding the 3rd youngest employee in the company. 40 / \ 30 50 / \ / \ 20 35 45 55 **(5 Marks)** b) Create an algorithm and write a pseudocode to determine if a given binary tree is also a binary search tree. The algorithm should have a time complexity of O(n) and a space complexity of O(n). **(5 Marks)**	10
5.	Assume you are given an array of integers representing the ages of people in a group: [25, 32, 40, 19, 60, 55, 22]. You need to sort this array in ascending order using heap sort with a min heap. Additionally, after sorting the array, two new people join the group with ages 35 and 18. You need to insert these two new ages into the sorted array while maintaining the sorted order. i) How would you perform heap sort on the given array using a min heap? Illustrate and write the pseudocode. ii) How would you insert the two new ages into the sorted array while maintaining the sorted order? Illustrate and write the pseudocode.	10

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