VIT

Vellore Institute of Technology

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

Continuous Assessment Test (CAT-II) – October 2023

Programme	:	B.Tech (CSE)	Semester	:	Fall 2023– 2024
Course Title	:	Data structures and Algorithms	Code	:	BCSE202L
			Slot	:	D1+TD1
Faculty	:	Dr. A. Vijayalakshmi, Dr. Bharathi Raja S, Dr. Raja Sree T, Dr. Sendhil R, Dr. Ilavendhan A, Dr. Elakiya E	Class Nbr	:	CH2023240101102 CH2023240100841 CH2023240100842 CH2023240100843 CH2023240100844 CH2023240100846
Time	:	90 Minutes	Max. Marks	:	50

If any assumptions are required, assume the same and mention those assumptions in the answer script.

Answer all questions

Q.No.	Sub Sec.	Question Description	Marks
1.		Create a singly linked list and store even positive integers in it. Write a pseudo code to insert a new element between every pair of consecutive elements in the linked list. The data of the new node should be average of every two consecutive integers. For Example if the list is 12->34->56->78->16, then the average of first two consecutive integers 12 and 34 is 23 should be inserted between 12 and 34. The average of 34 and 56 is 45, which should be inserted between 34 and 56 and so on. The output after inserting the new node is 12->23->34->45->56->67->78->47->16	10
2.		Create a doubly linked list which contains N nodes of positive integers. Write a pseudo code to print the first k nodes and last k nodes of the list in reverse order separately. After that create a singly linked list by merging all the reversed nodes in ascending order and print the same. Assume that k is a given positive integer and should be less than or equal to the size of the list N. Example: Input: Doubly linked list: 4,5,7,9,6,2,8,1,3,10 and k = 4 Reverse of first k nodes: 9,7,5,4 Reverse of last k nodes: 10,3,1,8 Output: 1,3,4,5,7,8,9,10	10

3. Consider the given two Binary Search Trees (BST) T1 and T2, consisting of unique positive elements. Write a function BT_Equal () to check whether T1 and T2 contains the same set of elements or not. Print "Equal" if the elements of T1 and T2 are equal, else print "Not Equal". **10**

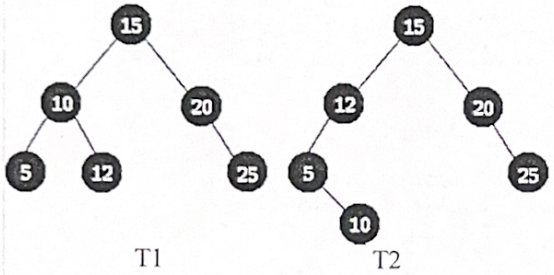

Figure 1

Two Binary Search Trees given in Figure – 1 are having same set of elements.

4. Given a binary tree, a target node, and an integer value k, Write a function find ( ), that finds all the nodes that are at distance k from the given target node. Print the resultant nodes in sorted order. **10**

For Example:

Input:

```
        20
      /   \
     8     22
   /  \
  4   12
     /  \
    10   14
```

Target Node = 8

K = 2

Output: 10, 14

5. Assume that, a cable operator in a town wishes to extend his business to a nearby village. In order to serve his customers, he sets up his office in a place (denoted by Vertex 0). In due course, he received requests from people of different localities as shown in Figure 2. Suggest a suitable vertex based algorithm to him in such a way that, he can extend the existing connection to all the localities with minimum cable usage. Illustrate a step-by-step process of solving the problem with the chosen algorithm. **10**

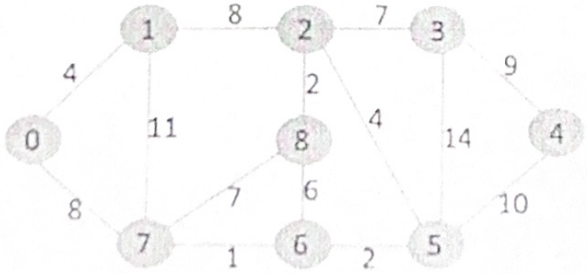

Figure 2