University of Central Punjab

Faculty of Information Technology

Data Structures and Algorithms
Spring 2023

Graded Lab 03	
Topic	• Trees
Objective	The basic purpose of this lab is to test students on recursive Trees

Graded Tasks

Task 1: Write a C++ program that finds the maximum element in a binary tree using recursion. The user will enter the values for each node of the tree.

Your task is to implement a recursive function `findMaxElement` to efficiently traverse the tree and find the maximum element. The function should handle both empty trees and non-empty trees.

Example:
Enter the values for the binary tree:
Root node: 3
Left child of 3: 9
Right child of 3: 2
Left child of 9: 7
Right child of 9: 5
Right child of 2: 8

The maximum element in this tree is 9.

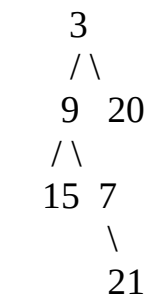
Task 2: Write a C++ program that checks if a binary tree is balanced using recursion. The user will enter the values for each node of the tree.

Your task is to implement a recursive function `isBalanced` to traverse the tree and check the balance condition at each node and determines whether the tree is balanced or not. A balanced tree is defined as a tree in which the heights of the left and right subtrees of every node differ by at most 1. The function should handle both empty trees and non-empty trees.

In the `main` function, prompt the user to enter the values for each node of the binary tree. Construct the binary tree using the user's inputs and call the `isBalanced` function on the root node. Finally, print whether the tree is balanced or not to the console.

Example:

Enter the values for the binary tree:
Root node: 3
Left child of 3: 9
Right child of 3: 20
Left child of 9: 15
Right child of 9: 7
Left child of 20: -1
Right child of 20: -1
Left child of 7: -1
Right child of 7: 21



In this tree, the left subtree of the root has a height of 3, and the right subtree has a height of 1. The difference in heights is greater than 1, making the tree unbalanced.