COMP 203 DATA STRUCTURES AND ALGORITHMS

HOMEWORK 3 (Total=100 points)

Deadline: 13.12.2024 23:59

Read the questions and rules carefully. They are clear and well defined.

Rules:

1. **No Cheating:** You are not allowed to collaborate with your friends and use any kind of websites or AI. If your homework gives a sign of any of them, **directly it will be graded as zero**.
2. **Goal:** Please do your homework alone. Our main aim is to **learn** whatever we cover so far.
3. **Submission:** Submit your homework in **2 java files**. **No other file types will be accepted. You will submit only 2 java files. DON'T USE ZIP/RAR etc. In these cases, your points will be deducted by 30%.**
4. **Coding policy:** Explain your code in comments. **This is a must!**
5. **Latency policy:** A 10% deduction will be applied for each day of late submission.

QUESTIONS

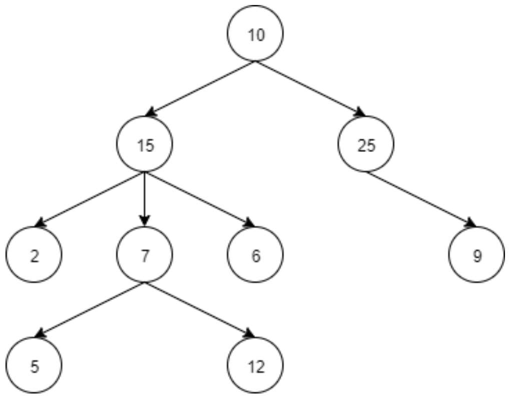
Submit QTree.java to Canvas.

1. Implement Tree abstract data structure using Node data structure. Implement the following classes and methods: **(51pt)**

Keep in mind that in a tree, a parent may have more than 2 children. That is why you should create children of a parent as a Queue data structure. Basically, a Node has "E data, Queue<Node<E>> childrenList, Node<E> parent".

1. Implement Node<E> class for Tree with constructor with the parameter E data. **(5pt)**
2. You can use Queue built in data structure of Java. You will use Queue data structure to save children of a parent. **(5pt)**
   Hint: You can create childrenList as follows:
   Queue<Node<E>> childrenList =new LinkedList<>();
3. Implement Integer QTree<E> class with the class variables and with no parameter constructor. **(5pt)**

4. deleteNode(Node<E> root, E deletedValue) that deletes the node with the given value *deletedValue* from the tree. **(10pt)**
5. Node<E> Find(Node<E> root, E value) that finds the node having the given *value* in the given tree. If it is found, it returns the found node else it returns null. **(10pt)**
6. Test your methods in the main by creating the following tree with the integer data type. (Creating the given tree: **10 pt**, testing 3 methods: **6 pt**)



Include comments of your code for each method and class.

Hint: You may use
import java.util.LinkedList;
import java.util.Queue;" to use Queue in your code.

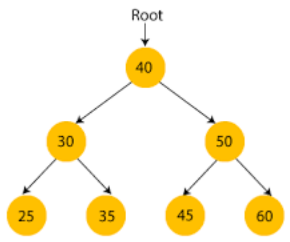
Submit BinaryTree.java to Canvas.

2. Implement Binary Tree abstract data structure using Node data structure. Implement the following classes and methods: **(49pt)**

1. Implement Node<E> class for Binary tree with constructor with the parameter E data. **(5pt)**
2. Implement Integer BinaryTree <E> class with the class variables and with no parameter constructor. **(5pt)**
3. insertLeft(Node<E> root, E value, E parentValue) that adds a new node with the given *value* to the given tree as the left child of the parent node having *parentValue*.**(10pt)**

4. insertRight(Node<E> root, E value, E parentValue) that adds a new node with the given *value* to the given tree as the left child of the parent node having *parentValue*.**(10pt)**
5. delete(Node<E> root, E value) that deletes the node having the given *value*. **(10pt)**

Test your methods in the main by creating the following binary tree with the integer data type. (Creating the given tree: **5 pt**, testing 2 methods: **4 pt**)



Include comments of your code for each method and class.