

Practice Test

October 13, 2016

1. An abbreviated version of the classes `BinaryTreeNode` and `LinkedBinaryTree` of the text is given below.

```
public class BinaryTreeNode {
    // package visible data members
    Object element;
    BinaryTreeNode leftChild;    // left subtree
    BinaryTreeNode rightChild;   // right subtree
}
public class LinkedBinaryTree implements BinaryTree {
    // instance data member
    BinaryTreeNode root; // root node
}
```

You are to write a public method `elementAtLevel(int theLevel)` which returns null if the binary tree has no element at level `theLevel`; otherwise, it returns an element at this level.

- (a) Write Java code for the public method `elementAtLevel`. You may define and implement additional methods as needed. You may not create or delete any nodes or invoke any methods for which you have not provided code. (Hint: use recursion.)
 - (b) What is the time complexity of your code as a function of the number of nodes in the binary tree?
2. Do the following exercises
 - (a) Draw the binary min heap that results from inserting 11, 9, 12, 14, 3, 15, 7, 8, 1 in that order into an initially empty binary heap. Show both the array and the tree representation.
 - (b) Draw the binary heap that results from doing 2 delete mins on the heap you created in part a. You are only required to show the final tree.
 3. Solve the following problems:
 - (a) Draw the AVL Tree that results from inserting 11, 9, 12, 14, 3, 15, 7, 8, 1 in that order into an initially empty AVL tree.
 - (b) Suppose you have a binary tree whose data fields are single characters. When the data fields of the nodes are output in inorder, the output is ABCDEFGHIJ, and when they are output in preorder, the output is BAHCEDGFJI. Draw the binary tree showing the data in each node and the pointers between nodes. Show the steps used to arrive at the result.