

Homework 3 (Cpt S 223)

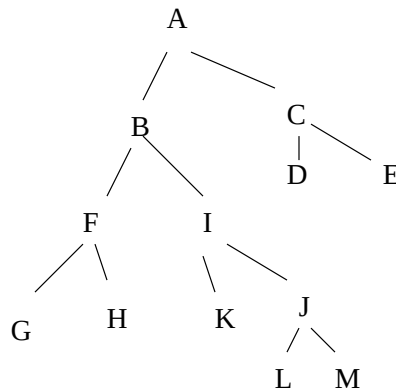
Due Date: October 8, 2010

Total points: 47

1. (3 points)

Give the expression tree for $(a+(b-c)*(d*e)-f)*(g+h-i)$.

2. (10 points)



For the above shown tree, answer the following:

- Height of the tree = ?
- Depth of node J = ?
- Height of node J = ?
- Redraw the tree by the First-child, Next-Sibling method.
- Give the post-order, pre-order and in-order traversals of the tree.

3. (6 points)

Just given the pre-order and in-order traversals of a tree, one can reconstruct the tree. To illustrate this capability, draw the tree by reconstructing it from the following traversals:

Pre-order traversal is: a, f, e, d, g, h, c; and

In-order traversal is: e, f, g, d, h, a, c.

(Note: nodes are labeled by alphabets.)

4. (7 points)

a) Draw the final BSTs that result from the following two different insertion sequences of the same set of elements:

a) Insertion sequence: 8 7 1 6 2 3 5 4

b) Insertion sequence: 5 7 3 2 8 6 4 1

For both cases, start with an empty tree.

b) Briefly state what is so markedly different between these two resulting BSTs constructed over the same set of elements but with just different insertion sequences.

5. (5 points)

Starting with an empty tree T_0 , show the set of BSTs $T_0 \Rightarrow T_1 \Rightarrow T_2 \Rightarrow \dots$ resulting from performing the following sequence of operations (in that order): Insert(5), Insert(10), Insert(2), Insert(7), Insert(8), Remove(5).

PS: you need to show the tree resulting after each insertion or removal operation.

6. (8 points)

Starting with an empty tree T_0 , show the set of AVL trees $T_0 \Rightarrow T_1 \Rightarrow T_2 \Rightarrow \dots$ resulting from performing the following sequence of operations (in that order): Insert(7), Insert(5), Insert(2), Insert(4), Insert(3), Insert(1). If at any step you need to rebalance the tree using rotation, then clearly identify: i) the node that has the imbalance, and

ii) the corresponding rotation “case” that applies there (i.e., case 1 or 2 or 3 or 4).

7. (8 points)

Exercise 4.19. (Weiss, page 177). Follow the same instructions as outlined for question #6.