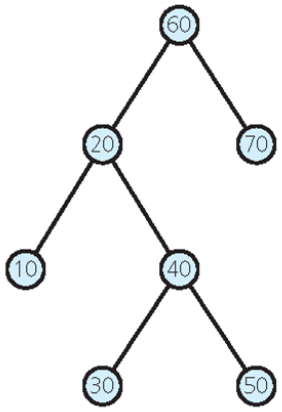
Data Structure and Advanced Programming

Homework #10
Due: 2020/5/26 08:00am (CST)

NOTE: Please upload your answers in either English or Chinese as a PDF to NTU COOL before the due date and time.

1. (15%) Consider the tree as the right figure. What node or nodes are:
   a. The tree's root?
   b. Parents of 20 and 70?
   c. Children of the node 20?
   d. Siblings of node 70?
   e. Ancestors of 50?
   f. Descendants of 10?
   g. Leaves?



2. (15%) What are the preorder, inorder, and postorder traversals of the binary tree shown as the right figure? Write the sequence of nodes visited in the traversals of the tree, respectively.

3. (30%) Consider the binary search tree as the upper-right figure.
   a. What tree results after you insert the entries 80, 65, 75, 45, 35, and 25, in that order?
   b. After inserting the nodes mentioned in the above, what tree results when you remove the entries 50 and 20?

4. (5%) Which tree traversal algorithm visits the nodes in ascending order of the values stored in nodes of a binary search tree?

5. (35%) Binary trees could be used for representing an expression containing operands and binary operators. Create the binary trees representing the following equations (^ stands for exponentiation):
   a. a + b / c
   b. (a + b) * c
   c. a + (b - c) * d ^ (e - f)