

CS 2413 001 Summer 2000 Homework #5

Quiz to be held in class 1:20pm Friday 21 July 2000

You will need extra sheets of notebook paper to write your answers on.

1. Given a preorder traversal and an inorder traversal of a binary tree, a unique binary tree that satisfies the traversals can be constructed. Given the following preorder and inorder traversals, construct the binary tree.
 - Preorder: a, e, f, h, g, b, c, d
 - Inorder: h, f, e, g, a, c, b, d
2. Let T be a binary search tree with the same structure as the tree in the previous question.
 - (a) Insert j into T . Then insert i . Show both results.
 - (b) Remove g from T . (Note that this is the **original** T , not the result after insertion.) Then remove f . Show both results.
3. Two binary trees are said to be *equivalent* if and only if they have the same structure and the same values at corresponding nodes.
 - (a) Write a method that overloads `operator==` to determine whether two trees are equivalent, using an enumerator and without recursion. What is the time complexity?
 - (b) Write a method that overloads `operator==` to determine whether two trees are equivalent, not using an enumerator and with recursion. What is the time complexity?
4. Given a binary search tree, an inorder traversal gives a sorted list. Assume that this sorted set of elements is stored in an array named A of size n . A *globally balanced binary search tree* has $A[\text{mid}]$ in the root of the tree, the left subtree is the globally balanced binary search tree of the elements in the subarray $A[0.. \text{mid}-1]$, and the right subtree is the globally balanced binary search tree of the elements in the subarray $A[\text{mid}+1.. n-1]$. Write a method to construct a globally balanced binary search tree from a sorted array A . What is the time complexity?
5. Let $T1$ and $T2$ be two binary search trees such that every element of $T1$ is less than every element of $T2$. Let x be a value such that $T1 < x < T2$. Write a method `join(T1, x, T2)` that produces a binary search tree containing the elements of $T1$, x and $T2$. Note that no node of the result of `join` should point to any node of $T1$ or $T2$; i.e., the method must copy every node of each tree. What is the time complexity of `join`?

References

S. Rhadakrishnan, L. Wise & C. N. Sekharan, *Object-Oriented Data Structures Featuring C++*, 1999.