CSCI 362 Homework Assignment 3

Total Points: 100

1. (20 pt) Insert the following keys into an initially empty Binary Search Tree (BST) in the exact order shown. Draw the final tree and state its height. Count height as the number of edges on the longest path from the root to a leaf.

   52, 31, 74, 18, 43, 63, 86, 9, 24, 37, 46, 34, 40

2. (15 pt) Delete 31 from the BST in Question 1 and draw the new tree. For a node with two children, use its inorder successor (the smallest key in its right subtree). You may show your steps and pseudocode for partial credit.

3. (30 pt) Complete the following C++ methods using recursion. Do not use loops or standard-library algorithms. Assume all inputs are valid.

   (a) (15 pt) Return the sum of the digits of n. Assume n >= 0. For example, sumDigits(7406) returns 17, and sumDigits(0) returns 0.

   ```
   static int sumDigits(int n)
   {
       // To Do
   }
   ```

   (b) (15 pt) Return a new string with every occurrence of ch removed from s. For example, removeChar("banana", 'a') returns "bnn". An empty string returns an empty string. You may use string operations such as empty(), indexing, substr(), and +.

   ```
   static std::string removeChar(const std::string& s, char ch)
   {
       // To Do
   }
   ```

4. (35 pt) Consider the following keys in the exact order shown. Use the AVL insertion and deletion methods discussed in class.

   30, 12, 73, 65, 36, 42, 28, 55, 18, 24

   (a) (20 pt) Starting with an empty AVL tree, insert all keys in the given order, restoring balance after each insertion. Draw the final AVL tree.

   (b) (15 pt) Delete 30 from the AVL tree in part (a), restore balance as needed, and draw the final tree.

   You may show intermediate trees and label your rotations for partial credit.