CS 102 - Data Structures
Tierce Exam

Instructions:

1. Please mention your name and roll number in the filename while submitting code on Canvas. Also keep your name and roll number commented at the top of your code.
2. Please do not copy among yourselves as we will check strongly for plagiarisms and if found, all the involved students would be penalized heavily.

Question:

Write a C/C++ program to implement the following :

A. Create a binary tree from an array of positive integers (taken as input from the command prompt) in the following manner -

1. The first item in the array would be the root node of the tree.
2. Next, follow one of the following three options randomly with equal probabilities -
    a. Put all the remaining items in the array, in the left subtree and keep the right subtree empty.
    b. Put all the remaining items in the array, in the right subtree and keep the left subtree empty.
    c. Put the first half of the remaining items in the array, in the left subtree and the second half in the right subtree.
3. Follow the same procedure recursively while creating every subtree.

Print the generated tree in such a traversal order such that it prints the items in the same order as they are in the original array.

Marks - 15

B. Assume the weight of a node in the tree is defined as the sum of all node values present in the path from itself to the root (including itself and the root). Example - if the root node has value 21 and a particular node with value 36 is connected to the root via the path [21 - 3 - 43 - 36]; then the weight of the node with value 36 would be 21+3+43+36=103.
Find the maximum weight of all the nodes present in the tree using a linear-time recursive function. Mention one/two lines in the comments regarding why do you think your function is linear-time.

Marks - 10