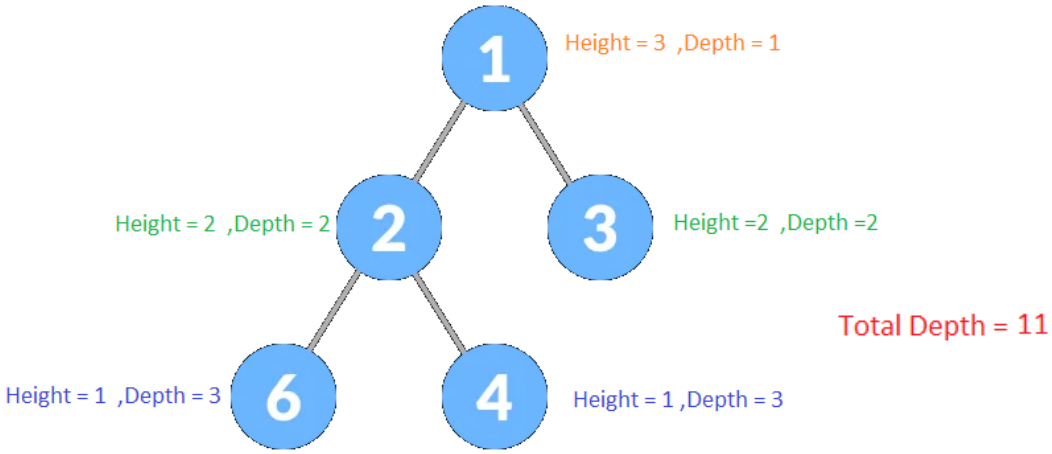
GIT Department of Computer Engineering
CSE 222/505 - Spring 2022
Homework 5 Report

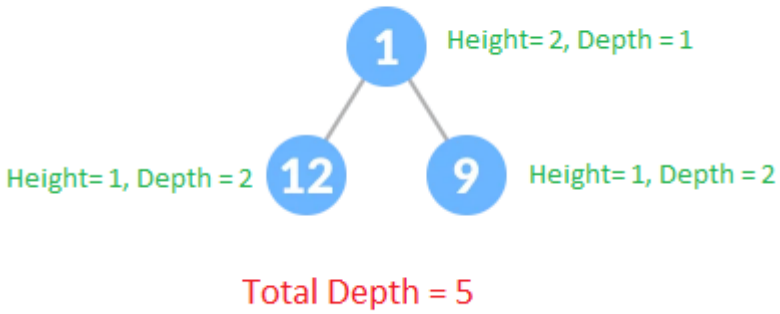
Tuba Toprak
161044116

Question 1:

a) A complete binary tree is a binary tree in which all the levels are completely filled except the lowest one, which is filled from the left. A complete binary tree is just like a full binary tree, but with two major differences. All the leaf elements must lean towards the left. The last leaf element might not have a right sibling i.e. a complete binary tree doesn't have to be a full binary tree. The depth of a node M in the tree is the length of the path from the root of the tree to M. The height of a tree is one more than the depth of the deepest node in the tree. The tree below is calculated according to our book. According to the information on the internet, the root node height is 0. According to our book, the root node height is 1.



If the tree is both perfect and complete, a connection can be made as follows.



$$\sum_{i=0}^{h-1} (2^i).(i+1)$$

my formula: Now let's do the above example according to my formula. We know that height = 3 , Solution: $2^0*(0+1) + 2^1*(1+1) = 1 + 4 = 5$

b)

Comparison cost of an element = O (log n) .

Number of All Elements = N

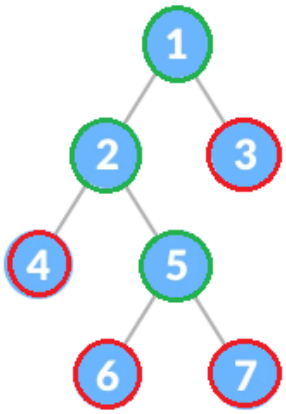
For All elements O(n log n) /2 = O (N log n)

c) Yes, there is a restriction. A Binary Tree is a full binary tree if every node has 0 or 2 children.We can also say a full binary tree is a binary tree in which all nodes except leaf nodes have two children. We know that,

If Tree has a total of N nodes, the number of internal nodes is = (N – 1)/2.

If Tree has X internal nodes, the number of leaves is = X + 1.

With these two formulas, we first find the number of internal nodes, and then we find the number of leaves.

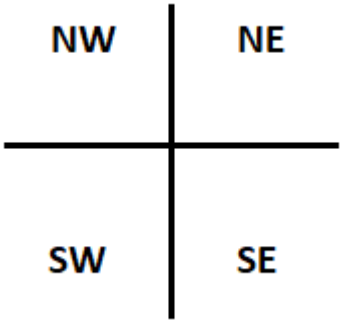


We know number of nodes : N = 7

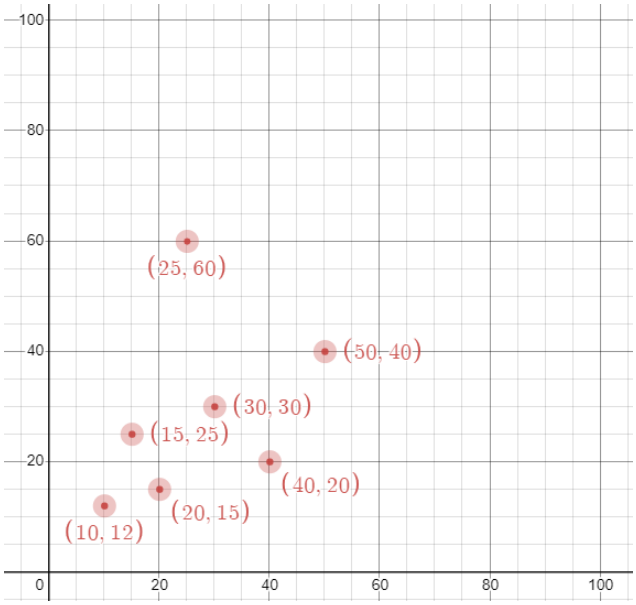
Number of Internal nodes = (N - 1) / 2 -> (7-1) /2 = 3

Number of Leaves = X + 1 = 3 + 1 = 4

Question 2:



The first element entered becomes the root. and new incoming nodes cling to the nearest node. All points are placed in the plane below. and in the image below, the other nodes are shown one by one after the root is entered.



A = (30, 30) B = (20, 15) C = (50, 40) D = (10, 20) E = (40, 20) F = (25, 60) G = (15, 25)