

Course Name: A Level (2nd Sem)

Topic: Types of Binary Tree

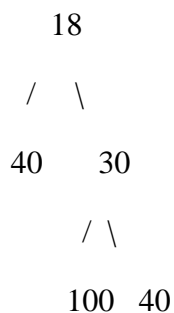
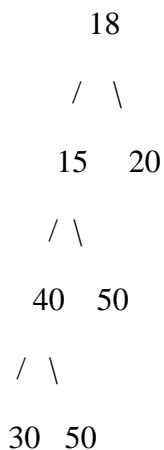
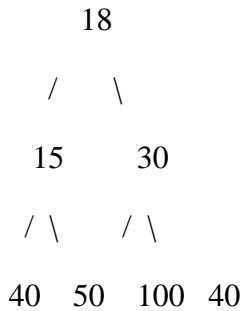
Subject: Data Structure using C++

Date: 28-04-2020

Types of Binary Tree

Full Binary Tree

A Binary Tree is full if every node has 0 or 2 children. Following are examples of a full binary tree. We can also say a full binary tree is a binary tree in which all nodes except leaves have two children.



In a Full Binary, number of leaf nodes is number of internal nodes plus 1

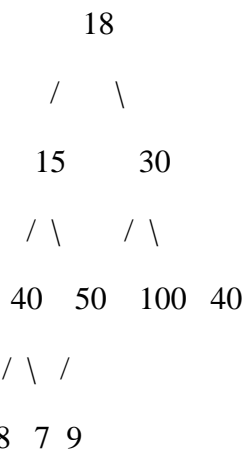
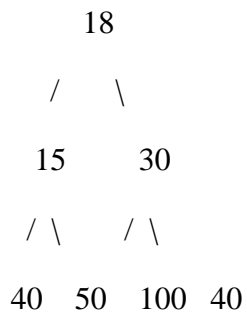
$$L = I + 1$$

Where L = Number of leaf nodes, I = Number of internal nodes

Complete Binary Tree:

A Binary Tree is complete Binary Tree if all levels are completely filled except possibly the last level and the last level has all keys as left as possible

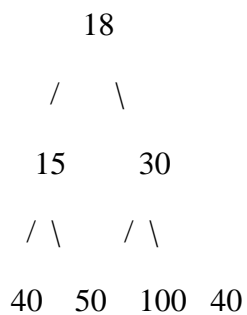
Following are examples of Complete Binary Trees



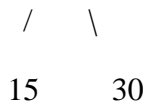
Perfect Binary Tree

A Binary tree is Perfect Binary Tree in which all internal nodes have two children and all leaves are at the same level.

Following are examples of Perfect Binary Trees.



18



A Perfect Binary Tree of height h (where height is the number of nodes on the path from the root to leaf) has $2^h - 1$ node.

Example of a Perfect binary tree is ancestors in the family. Keep a person at root, parents as children, parents of parents as their children.

Balanced Binary Tree

A binary tree is balanced if the height of the tree is $O(\log n)$ where n is the number of nodes. For Example, AVL tree maintains $O(\log n)$ height by making sure that the difference between heights of left and right subtrees is atmost 1. Red-Black trees maintain $O(\log n)$ height by making sure that the number of Black nodes on every root to leaf paths are same and there are no adjacent red nodes. Balanced Binary Search trees are performance wise good as they provide $O(\log n)$ time for search, insert and delete.

A degenerate (or pathological) tree A Tree where every internal node has one child. Such trees are performance-wise same as linked list.

10

/

20

\

30

\

40