SNS COLLEGE OF TECHNOLOGY
(An Autonomous Institution)
COIMBATORE- 641 035

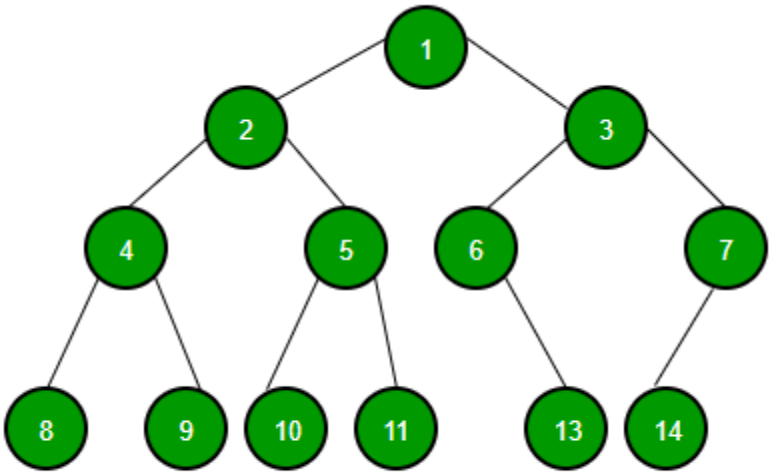
Department of Computer Science and Engineering

23ITT101 - PROGRAMMING IN C AND DATA STRUCTURES

UNIT IV STACK AND QUEUE

Binary Tree Data Structure

Binary Tree is defined as a tree data structure where each node has at most 2 children. Since each element in a binary tree can have only 2 children, we typically name them the left and right child.



Binary Tree Representation

A Binary tree is represented by a pointer to the topmost node (commonly known as the "root") of the tree. If the tree is empty, then the value of the root is NULL. Each node of a Binary Tree contains the following parts:

1. Data
2. Pointer to left child
3. Pointer to right child

Basic Operation On Binary Tree:

- Inserting an element.
- Removing an element.
- Searching for an element.
- Traversing the tree.

Auxiliary Operation On Binary Tree:

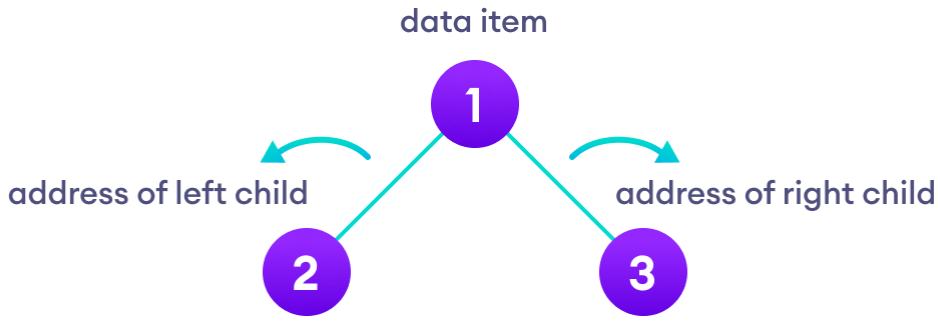
- Finding the height of the tree
- Find the level of a node of the tree
- Finding the size of the entire tree.

Binary Tree

A binary tree is a tree data structure in which each parent node can have at most two children.

Each node of a binary tree consists of three items:

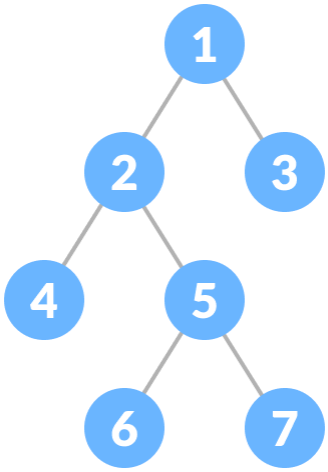
- data item
- address of left child
- address of right child



Types of Binary Tree

1. Full Binary Tree

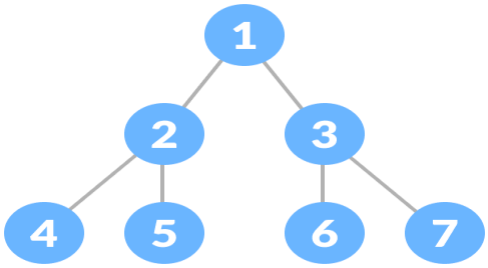
A full Binary tree is a special type of binary tree in which every parent node/internal node has either two or no children.



Full Binary Tree

2. Perfect Binary Tree

A perfect binary tree is a type of binary tree in which every internal node has exactly two child nodes and all the leaf nodes are at the same level.

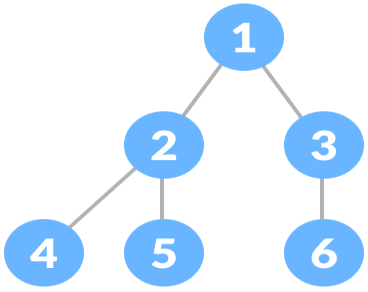


Perfect Binary Tree

3. Complete Binary Tree

A complete binary tree is just like a full binary tree, but with two major differences

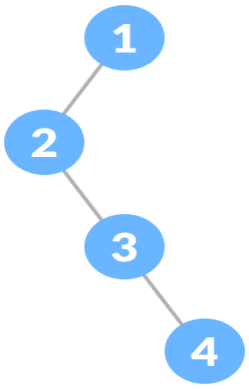
1. Every level must be completely filled
2. All the leaf elements must lean towards the left.
3. The last leaf element might not have a right sibling i.e. a complete binary tree doesn't have to be a full binary tree.



Complete Binary Tree

4. Degenerate or Pathological Tree

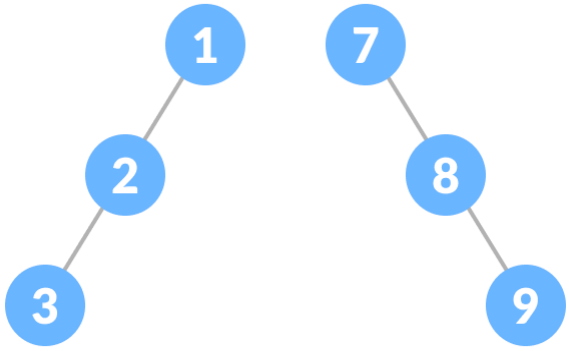
A degenerate or pathological tree is the tree having a single child either left or right.



Degenerate Binary Tree

5. Skewed Binary Tree

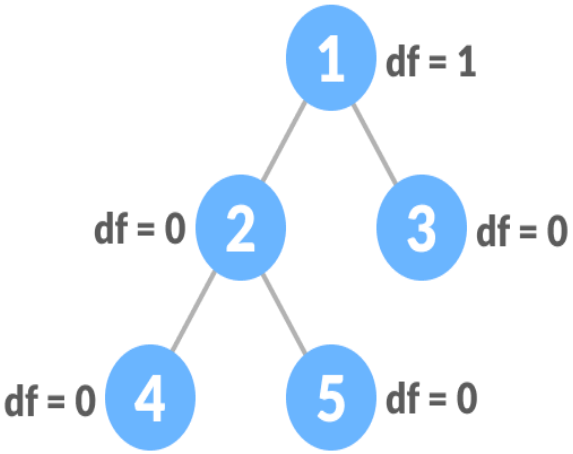
A skewed binary tree is a pathological/degenerate tree in which the tree is either dominated by the left nodes or the right nodes. Thus, there are two types of skewed binary tree: **left-skewed binary tree** and **right-skewed binary tree**.



Skewed Binary Tree

6. Balanced Binary Tree

It is a type of binary tree in which the difference between the height of the left and the right subtree for each node is either 0 or 1.

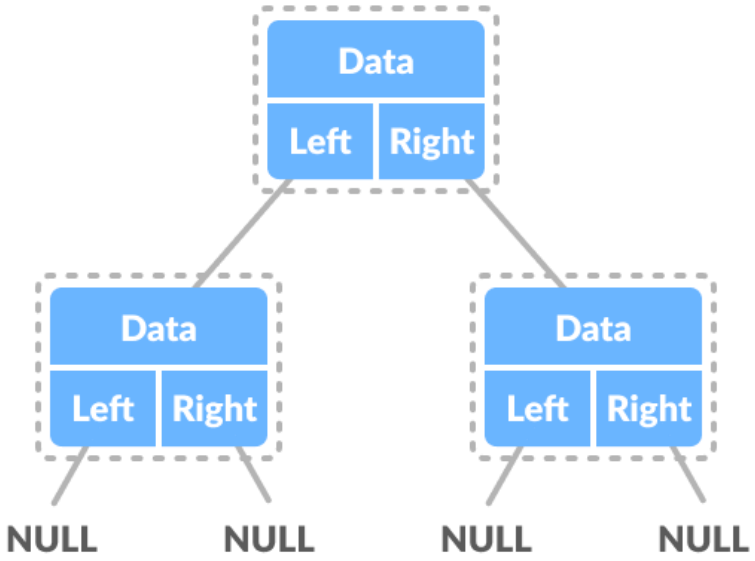


Balanced Binary Tree

Binary Tree Representation

A node of a binary tree is represented by a structure containing a data part and two pointers to other structures of the same type.

```
struct node
{
 int data;
 struct node *left;
 struct node *right;
};
```



Binary Tree Representation

Binary Tree Applications

- For easy and quick access to data
- In router algorithms
- To implement heap data structure
- Syntax tree