Sunbeam Institute of Information Technology
Pune and Karad

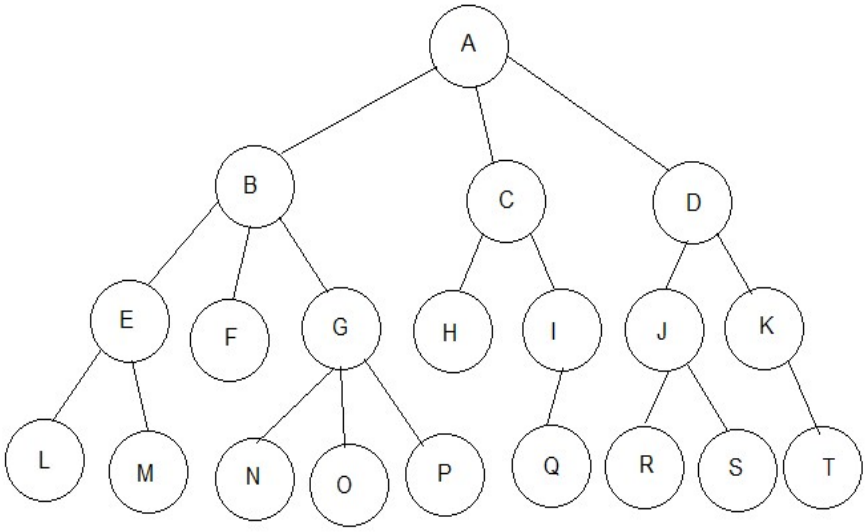
Module – Data Structures

Trainer - Devendra Dhande

Email – devendra.dhande@sunbeaminfo.com

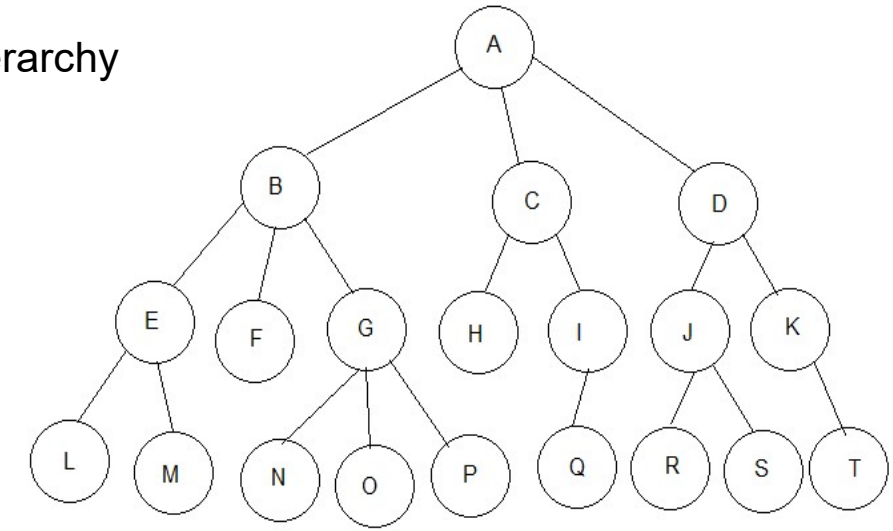
Tree : Terminologies

- **Tree** is a **non linear** data structure in which one specially designated node is called as "**root**".
- **Root** is a **starting point** of the tree.
- Remaining elements can be partitioned into m disjoint subsets where each of subset is a tree.
- All elements are connected in **Hierarchical manner**.
- Every element of a tree is called as **node** of the tree.
- **Parent node:-** having other child nodes connected
- **Child node:-** immediate descendant of a node
- **Leaf node:-**
  - Terminal node of the tree.
  - Leaf node does not have child nodes.
- **Ancestors:-** all nodes in the path from root to that node.
- **Descendants:-** all nodes accessible from the given node
- **Siblings:-** child nodes of the same parent



Tree : Terminologies

- **Degree of a node :-** number of child nodes for any given node.
- **Degree of a tree :-** Maximum degree of any node in tree.
- **Level of a node :-** indicates position of the node in tree hierarchy
  - Level of child = Level of parent + 1
  - Level of root = 1
- **Height of node :-** level of given node
- **Depth of node :-** level of node - 1
- **Height of a tree :-** Maximum height of a node
- **Depth of a tree :-** Maximum depth of a node
- Tree with zero nodes (ie empty tree) is called as

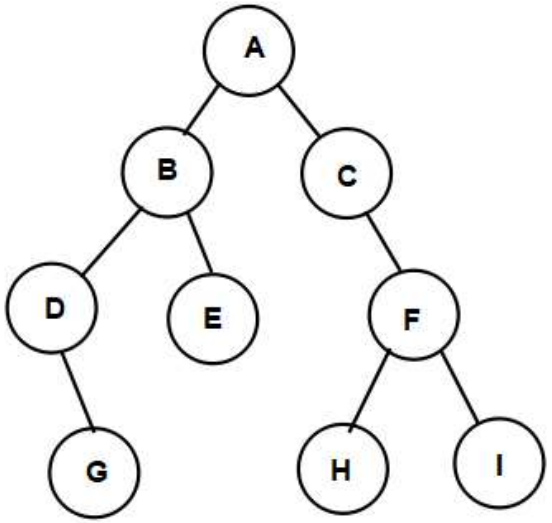


"**Null tree**". Height of Null tree is 0.

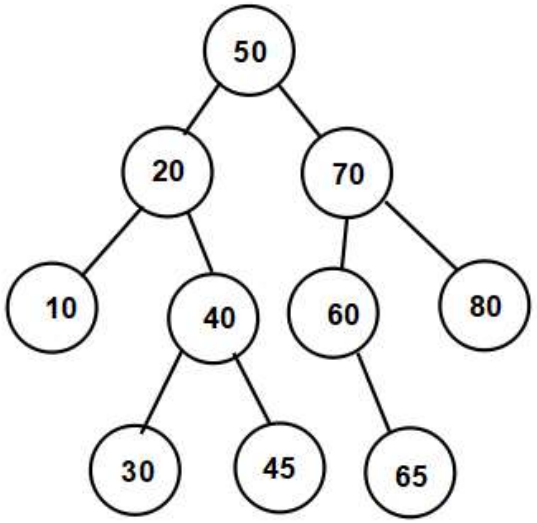
- Tree can grow up to any level and any node can have any number of Childs.
- That's why operations on tree becomes un efficient.
- Restrictions can be applied on it to achieve efficiency and hence there are different types of trees.

Tree : Types

- **Binary Tree**
  - Tree in which each node has maximum two child nodes
  - Binary tree has degree 2. Hence it is also called as 2- tree



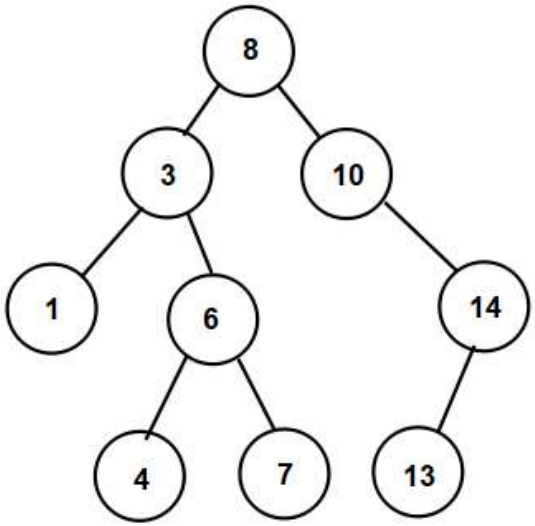
- **Binary Search Tree**
  - Binary tree in which left child node is always smaller and right child node is always greater or equal to the parent node.
  - Searching is faster
  - Time complexity : O(h) h – height of tree



Binary Search Tree : Traversal

- **Pre-Order:-** V L R
- **In-order:-** L V R
- **Post-Order:-** L R V
- The traversal algorithms can be implemented easily using recursion.
- Non-recursive algorithms for implementing traversal needs stack to store node pointers.

- **Pre-Order :-** 8 3 1 6 4 7 10 14 13
- **In-Order :-** 1 3 4 6 7 8 10 13 14
- **Post-Order :-** 1 4 7 6 3 13 14 10 8



Thank you!

Devendra Dhande
<devendra.dhande@sunbeaminfo.com>