



Sunbeam Institute of Information Technology
Pune and Karad
PG - DESD

Module – Data Structures

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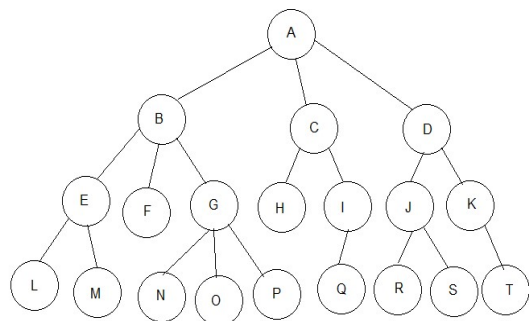


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Tree : Terminologies

- **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

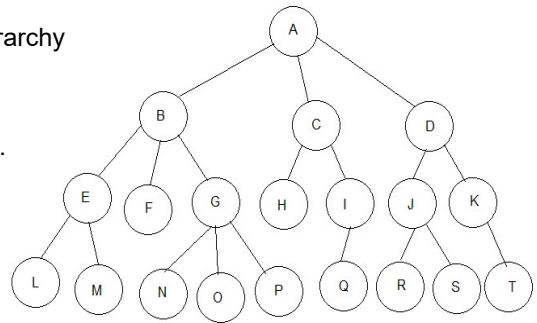


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Tree : Terminologies

- **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 = 0
- **Height of node** :- number of links from node to longest leaf.
- **Depth of node** :- number of links from root to that node
- **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 -1.

- Tree can grow up to any level and any node can have any number of Children.
- 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.



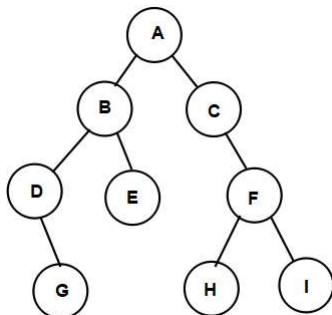
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Tree : Types

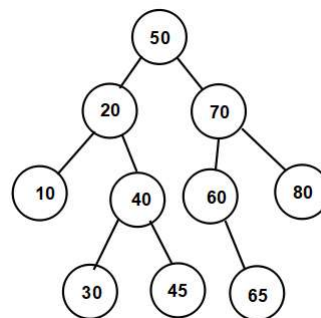
• Binary Tree

- 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

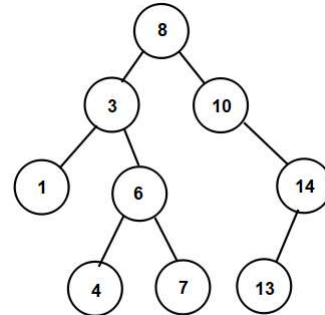


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Binary Search Tree : Traversal

- **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



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Thank you!

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