

INTRODUCTION

A tree is recursively defined as a set of one or more nodes where one node is designated as the root of the tree and all the remaining nodes can be partitioned into non-empty sets each of which is a sub-tree of the root.

Basic Terminology

Root node- The root node R is the topmost node in the tree. If R = NULL, then it means the tree is empty.

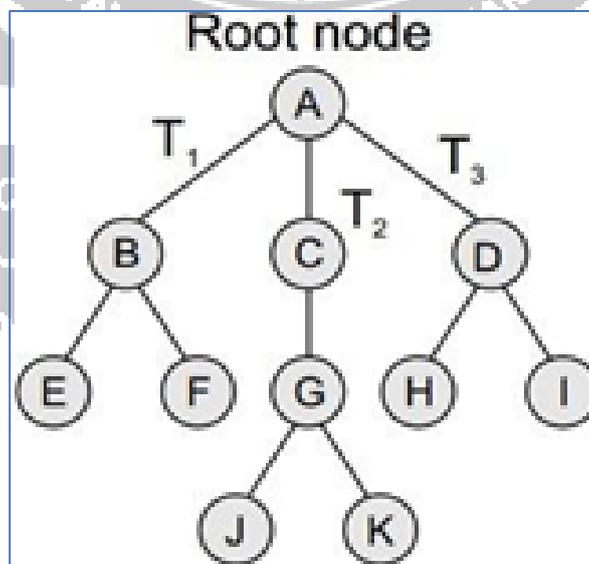
Sub-trees- If the root node R is not NULL, then the trees T₁, T₂, and T₃ are called the sub-trees of R.

Leaf node - A node that has no children is called the leaf node or the terminal node.

Path - A sequence of consecutive edges is called a path. For example, in Fig., the path from the root node A to node I is given as: A, D, and I.

Ancestor node - An ancestor of a node is any predecessor node on the path from root to that node. The root node does not have any ancestors. In the tree given in Fig., nodes A, C, and G are the ancestors of node K.

Descendant node- A descendant node is any successor node on any path from the node to a leaf node. Leaf nodes do not have any descendants. In the tree given in Fig., nodes C, G, J, and K are the descendants of node A.



TYPES OF TREES

Trees are of following 6 types:

- General trees
- Forests
- Binary trees
- Binary search trees
- Expression trees
- Tournament trees

General Trees

General trees are data structures that store elements hierarchically. The top node of a tree is the root node and each node, except the root, has a parent.

- A node in a general tree (except the leaf nodes) may have zero or more sub-trees.
- General trees which have 3 sub-trees per node are called ternary trees. However, the number of sub-trees for any node may be variable. For example, a node can have 1 sub-tree, whereas some other node can have 3 sub-trees.

Forests

- Forest is a disjoint union of trees. A set of disjoint trees (or forests) is obtained by deleting the root and the edges connecting the root node to nodes at level 1.
- Every node of a tree is the root of some sub-tree. Therefore, all the sub-trees immediately below a node form a forest. We can convert a forest into a tree by adding a single node as the root node of the tree. For example, below Fig (a) shows a forest and Fig.(b) shows the corresponding tree. Similarly, we can convert a general tree into a forest by deleting the root node of the tree.

