

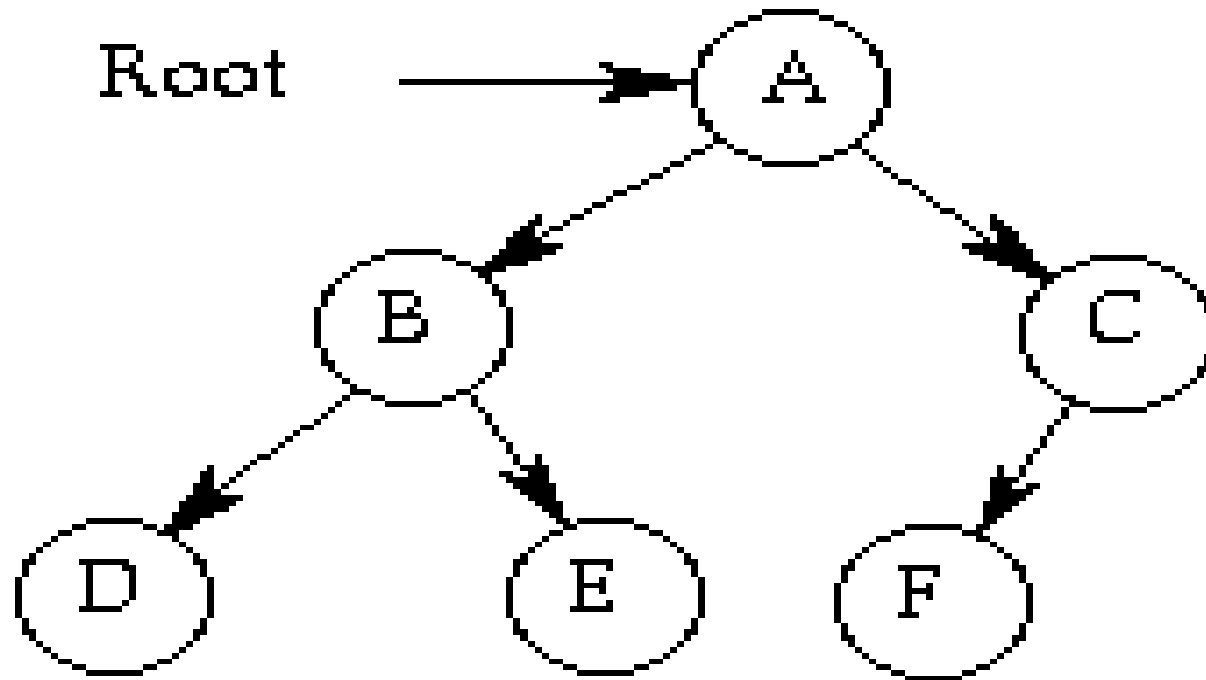
Trees

Until now, we have dealt with linear structures such as:

- arrays
- linked lists
- stacks
- queues

A tree is a nonlinear data structure where members may have multiple successors. Trees are data structures that are made up of nodes. We must define several terms before getting into the actual implementations of trees.

A tree



Tree Terminology

root – unique starting node

parent – predecessor of a node

child – successor of a node

leaf – a node with no children

siblings – two nodes with the same parent

ancestors – let A be an arbitrary node of a tree. If A is the root node, the A has no ancestors; otherwise, the parent of A and all ancestors of A 's parent are ancestors of A

What kind of definition is ancestor?

Tree Terminology

descendants – let B be an arbitrary node of a tree. If B is a leaf node, the B has no descendants; otherwise, each child of B and all descendants of each child of B are descendants of B .

subtree – an arbitrary node in the tree and all descendants of that node

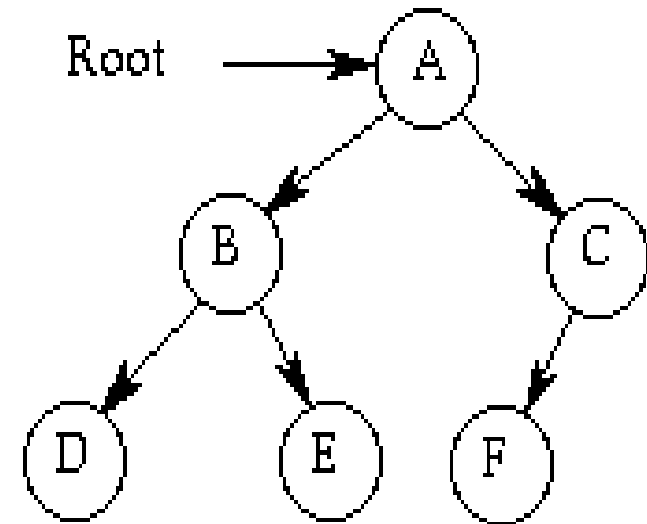
level – the root node is level 1 and every other node in the tree is at level n where n is the number of nodes in the path from the root node to the node in question

depth (or height) – maximum level of any node in the tree

Identify Tree Attributes

For the given tree, identify:

- a) root
- b) parent of E
- c) children of A
- d) leaf nodes
- e) any two siblings
- f) ancestors of B
- g) descendants of F
- h) level of D
- l) depth of the tree



Binary Tree

Characteristics of a binary tree:

- a) Each parent can have at most two children
- b) A binary tree can be empty
- c) If a binary tree has two children, the child on the left is the "left child" and the one on the right is the "right child"

Note: The left child is the root of the left subtree and the right child is the root of the right subtree

Some Binary Tree Operations

Before defining the Binary Tree ADT, let's work a few problems.

1) Write the appropriate data structure definitions for a binary tree.

2) We can define three traversal methods for a binary tree:

a) inorder: Left, Visit, Right

b) preorder: Visit, Left, Right

c) postorder: Left, Right, Visit

Identify

For the following binary tree, identify the inorder, preorder, and postorder traversals.

Write a C function that performs an inorder traversal of a binary tree.

