Modern Education Society's Wadia College of Engineering, Pune

210256: DATA STRUCTURES and ALGORITHM LABORATORY (2019 C0URSE)

NAME OF STUDENT:	**CLASS:**
SEMESTER/YEAR:	**ROLL NO:**
DATE OF PERFORMANCE:	**DATE OF SUBMISSION:**
EXAMINED BY:	**EXPERIMENT NO: B5**

TITLE: Tree data structure

AIM/PROBLEM STATEMENT: A book consists of chapters, chapters consist of sections and sections consist of subsections. Construct a tree and print the nodes. Find the time and space requirements of your method.

OBJECTIVES:

1. To understand concept of tree data structure
2. To understand concept & features of object oriented programming.

Learning Outcome:

1. Define class for structures using Object Oriented features.

2. Analyze tree data structure

THEORY:

Introduction to Tree:

A tree T is a set of nodes storing elements such that the nodes have a parent-child relationship that satisfies the following

• if T is not empty, T has a special tree called the root that has no parent

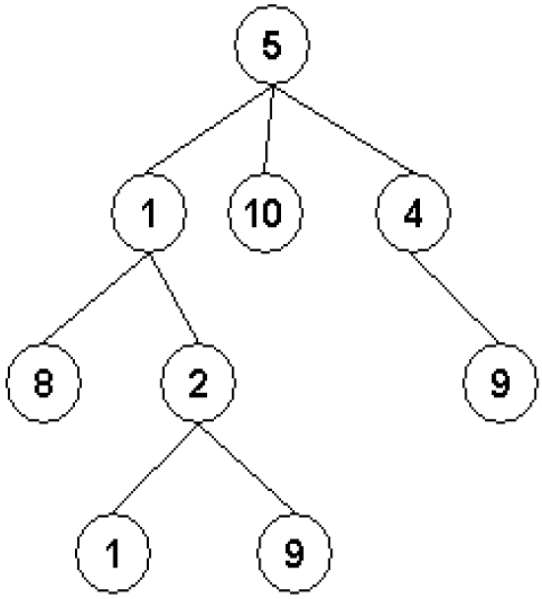
• each node v of T different than the root has a unique parent node w; each node with parent w is a child of w

Recursive definition

• T is either empty

• or consists of a node r (the root) and a possibly empty set of trees whose roots are the children of r

Tree is a widely-used data structure that emulates a tree structure with a set of linked nodes. The tree graphically is represented as below



The circles are the nodes and the edges are the links between them. Trees are usually used to store and represent data in some hierarchical order. The data are stored in the nodes, from which the tree is consisted of.

A subtree is a portion of a tree data structure that can be viewed as a complete tree in itself. Any node in a tree T, together with all the nodes below his height, that are reachable from the node, comprise a subtree of T.

Important Terms

Following are the important terms with respect to tree.

Path − Path refers to the sequence of nodes along the edges of a tree.

Root − The node at the top of the tree is called root. There is only one root per tree and one path from the root node to any node.

Parent − Any node except the root node has one edge upward to a node called parent.

Child − The node below a given node connected by its edge downward is called its child node.

Leaf − The node which does not have any child node is called the leaf node.

Subtree − Subtree represents the descendants of a node.

Visiting − Visiting refers to checking the value of a node when control is on the node.

Traversing − Traversing means passing through nodes in a specific order.

Levels − Level of a node represents the generation of a node. If the root node is at level 0, then its next child node is at level 1, its grandchild is at level 2, and so on.

Keys - Key represents a value of a node based on which a search operation is to be carried out for a node.

There are two basic types of trees. In an unordered tree, a tree is a tree in a purely structural sense — that is to say, given a node, there is no order for the children of that node. A tree on which an order is imposed — for example, by assigning different natural numbers to each child of each node — is called an ordered tree, and data structures built on them are called ordered tree data structures. Ordered trees are by far the most common form of tree data structure. Binary search trees are one kind of ordered tree.

Advantages of trees

Trees are so useful and frequently used, because they have some very serious advantages:

Trees reflect structural relationships in the data

Trees are used to represent hierarchies

Trees provide an efficient insertion and searching

Trees are very flexible data, allowing to move subtrees around with minumum effort

QUESTIONS:

1. What is class, object and data structure?
2. What is tree data structure?
3. Explain different types of tree?