LAB SESSION 7: BINARY TREES

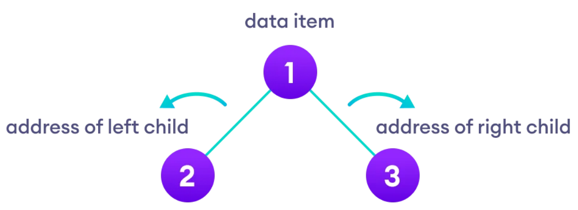
AIM: To implement Binary trees and perform the listed operations on such trees.

PROBLEM DEFINITION:
Develop C program to create a binary tree given its INORDER and POSTORDER traversal. Provide options to the user to perform the following operations on the binary tree:

1. Display height of the tree
2. Return the depth of a given node in the tree
3. Perform level order traversal
4. Perform Spiral order traversal

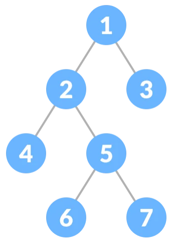
THEORY: A binary tree is a tree data structure in which each parent node can have at most two children. Each node of a binary tree consists of three items:

- data item
- address of left child
- address of right child



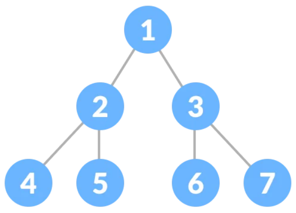
Types of Binary Tree

1. Full Binary Tree

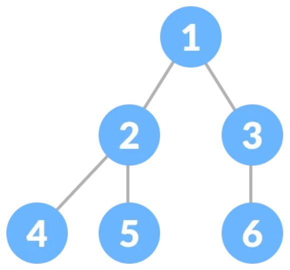


A full Binary tree is a special type of binary tree in which every parent node/internal node has either two or no children.

2. **Perfect Binary Tree**



A perfect binary tree is a type of binary tree in which every internal node has exactly two child nodes and all the leaf nodes are at the same level.



3. Complete Binary Tree

A complete binary tree is just like a full binary tree, but with two major differences

- Every level must be completely filled
- All the leaf elements must lean towards the left.
- The last leaf element might not have a right sibling i.e. a complete binary tree doesn't have to be a full binary tree.

Tree Traversals

Inorder traversal

- First, visit all the nodes in the left subtree
- Then the root node
- Visit all the nodes in the right subtree
    - inorder(root->left)
    - display(root->data)
    - inorder(root->right)

Preorder traversal

- Visit root node
- Visit all the nodes in the left subtree
- Visit all the nodes in the right subtree
    - display(root->data)
    - preorder(root->left)
    - preorder(root->right)

Postorder traversal

- Visit all the nodes in the left subtree
- Visit all the nodes in the right subtree
- Visit the root node
    - postorder(root->left)
    - postorder(root->right)
    - display(root->data)

ALGORITHM AND FLOWCHART:

1. **Finding depth of a node**
2. **Level order traversal**
3. **Spiral order traversal**