Data Structures and Algorithms

Depth First Traversal

Lab Sheet 08

Answer all questions.

1. What are the three types of Depth First Traversal (DFT) are?
    - ❖ Pre-order Traversal
    - ❖ In-order Traversal
    - ❖ Post-order Traversal

2. Briefly explain the identified traversal methods.

    - ❖ Pre-order Traversal: In this approach, the root node is accessed first, followed by the left subtree and then the right subtree. Root, Left, and Right are the visiting nodes in that sequence.

    - ❖ In-Order Traversal: Using this technique, the left subtree is traversed first, followed by a trip to the root node and then the right subtree. Left, Root, and Right are the visiting nodes in that sequence. Nodes in a Binary Search Tree (BST) are visited in ascending order because of the in-order traversal.

    - ❖ Post-order Traversal: Using this technique, the left subtree is surveyed first, followed by the right subtree, and then the root node. The visiting nodes are in the following order: Left, Right, Root.

3. Explain the terms used in trees.

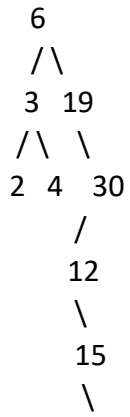
    - ❖ Root: The topmost node of the tree, which does not have any parent nodes.

- Node: The individual elements of a tree that contains data and references to its child nodes.
- Parent: A node that has one or more child nodes connected to it.
- Child: The nodes directly connected to a parent node below it in the hierarchy.
- Sibling: Nodes that share the same parent node are called siblings.
- Leaf: The nodes at the end of the tree that do not have any child nodes are called leaves.
- Height: The length of the longest path from the root to a leaf node is called the height of the tree.
- Depth: The length of the path from a node to the root is called the depth of the node.
- Binary Tree: A tree where each node has at most two child nodes, often referred to as the left child and right child.
- Binary Search Tree (BST): A binary tree where for every node, all nodes in its left subtree have values less than the node, and all nodes in its right subtree have values greater than the node.

4. You have been given the following integer array,

Array: 6, 19, 3, 4, 2, 30, 12, 15, 7.

(A) Draw a binary search tree based on the given array.



(b) Get the outputs of post-order, pre-order, and in-order using the Tree that you identified.

- Post-order: 2, 4, 3, 7, 15, 12, 30, 19, 6
- Pre-order: 6, 3, 2, 4, 19, 30, 12, 15, 7
- In-order: 2, 3, 4, 6, 7, 12, 15, 19, 30

5.Identify the practical use of the types of DFT types.

- When dealing with binary tree data structures, pre-order traversal is utilized to create a duplicate of the tree. The given expression tree is used to create a prefix expression (in Polish notation).

- To acquire the members of a binary search tree in ascending order, in-order traversal is frequently utilized. In expression evaluation, where the tree stands in for an arithmetic expression, it is also employed.

- To ensure that each node's children are eliminated before the node itself is deleted, post-order traversal, which starts at the leaves and gradually travels up to the root, is important for deleting trees. Postfix expression evaluation is another usage for it.