Aror University of Art, Architecture, Design & Heritage Sukkur

Department of AI-Multimedia and Gaming

BS-AI (Sec# A and B), Fall 2024 Batch

Lab 07 and 08: Tree and Binary Tree | Subject: Data Structure (CSC221)

Date: 5 November, 2024 | Instructor: Abdul Ghafoor

Objective: By the end of this lab, students will:

1. Understand the concept of binary trees.
2. Implement a binary tree data structure using either linked lists or arrays.
3. Insert elements into the binary tree.
4. Calculate the total number of nodes in the tree.
5. Implement and perform tree traversals (Level-order, Pre-order, Post-order, and In-order).

Note: **LinkedList or Arrays for representing the binary tree. Students may also use built-in Java packages like `java.util.Queue or Stack` for traversal**.

Part 01: Create a Binary Tree Class:

- Implement a `Node` class representing a tree node with:
  - `int value` (value of the node).
  - `Node left` (pointer to left child).
  - `Node right` (pointer to right child).

- Implement a `BinaryTree` class with:
  - A root node.
  - Methods for inserting nodes (insertion method).
  - A method to count the total nodes in the tree.

Part 2: Implement Traversals

- **Level-order Traversal:**
- **Pre-order Traversal:**
- **In-order Traversal:**
- **Post-order Traversal:**

Part 3: Testing the Binary Tree

Insertion Test:

- Insert at least **7-10 elements** into the binary tree (for example: 50, 30, 20, 40, 70, 60, 80).
- After inserting each element, print the total number of nodes in the tree.

Traversal Tests:

- After inserting the elements, perform and display the results of all four traversals (Level-order, Pre-order, In-order, Post-order).

Conclusion:

This lab helps students practice fundamental concepts related to binary trees. By implementing tree insertions, counting nodes, and performing different types of traversals, students will develop a solid understanding of binary tree operations and traversal algorithms.