

# Trees and Graphs

(For the below tasks, you may want to create a binary tree manually and use the same tree for all of these tasks.)

**NB: All the methods as well as the main method/tester statements must be written in one class. DO NOT write a different class for each method.**

**Compile all your codes and simulation picture in ONE PDF and submit it .**

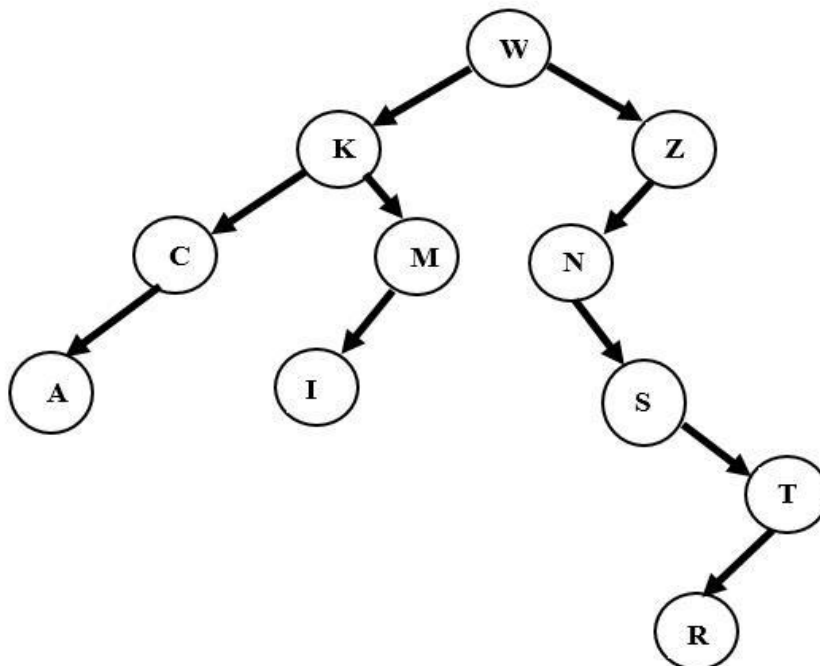
1. **RECURSIVELY** calculate the height of a tree.
2. **RECURSIVELY** calculate the level of a Node in a tree.
3. Print elements of all the Nodes of a tree using **Pre-order Traversal**.
4. Print elements of all the Nodes of a tree using **In-order Traversal**.
5. Print elements of all the Nodes of a tree using **Post-order Traversal**.

6. An adjacency matrix is given below:

|   | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| A | 0 | 1 | 0 | 1 | 1 | 0 | 0 |
| B | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| C | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| D | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| E | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| F | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| G | 0 | 0 | 0 | 0 | 1 | 1 | 0 |

a) Draw the equivalent graph.

7. Consider the following tree:

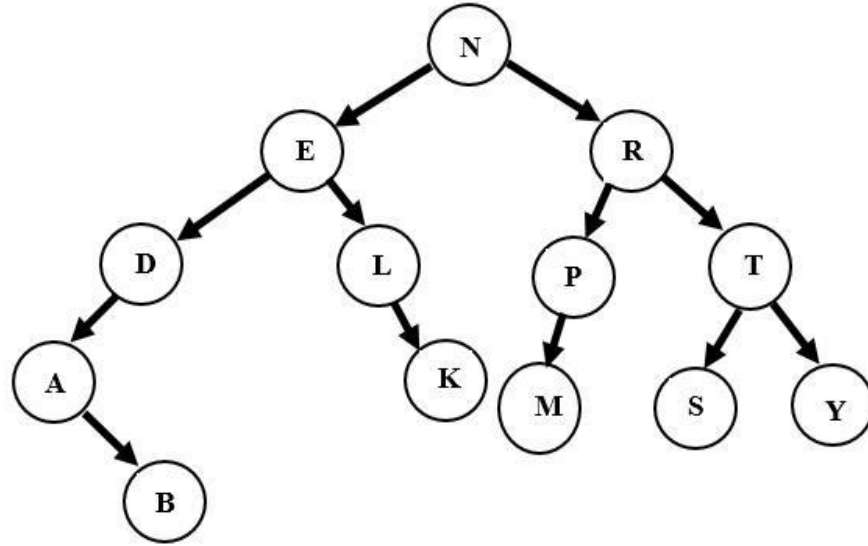


Write down the sequences for: Pre-order, in-order and Post-order Traversal. [2 + 2 + 2 Marks]

- a) Suppose we need to insert the sequence (3, 51, 6, 65, 17, 12, 1, 22, -3 and 15) into an initially empty binary search tree (of integers). Show the resultant Binary Search Tree.

[4 Marks]

b)



Do the following operations step by step on the above BST: [1 + 1 + 1 Marks]

- Step 1: Remove node E with the help of its successor.
- Step 2: Remove node N with the help of its successor.
- Step 3: Remove node R with the help of its predecessor.