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Department:

Computer Science

Paper:

Data Structures and Algorithms

Final-Semester Paper

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Q1. Sort the given list using Insertion Sort.

56, 59, 45, 40, 43, 55

(1)

Steps = 6

$n = 6 - 1 = 5$

Step 1 Element = 59

$\begin{matrix} \rightarrow \\ \leftarrow \end{matrix}$   
(56) (59) 45, 40, 43, 55  
S.L. USL.

56, 59, 45, 40, 43, 55.

Step 2 Element = 45

$\begin{matrix} \rightarrow \\ \leftarrow \end{matrix}$   
56, (59) (45), 40, 43, 55.

56, 45, 59, 40, 43, 55.

$\begin{matrix} \rightarrow \\ \leftarrow \end{matrix}$   
(56) (45) 59, 40, 43, 55

45, 56, 59, 40, 43, 55.

Step #3 Element = 40

$\begin{matrix} \rightarrow \\ \leftarrow \end{matrix}$   
45, 56, (59) (40), 43, 55.

$\begin{matrix} \rightarrow \\ \leftarrow \end{matrix}$   
45, (56) (40), 43, 55.

$\begin{matrix} \rightarrow \\ \leftarrow \end{matrix}$   
(45) (40), 56, 43, 55.

(2)

40, 45, 56, 59, 43, 55.

step # 4.

Element = 43, <sup>→ 6</sup>  
40, 45, 56, (59), (43), 55

40, 45, (56), (43), 59, 55

40, 43, 45, 56, 59, 55.

step # 5 Element = 55.

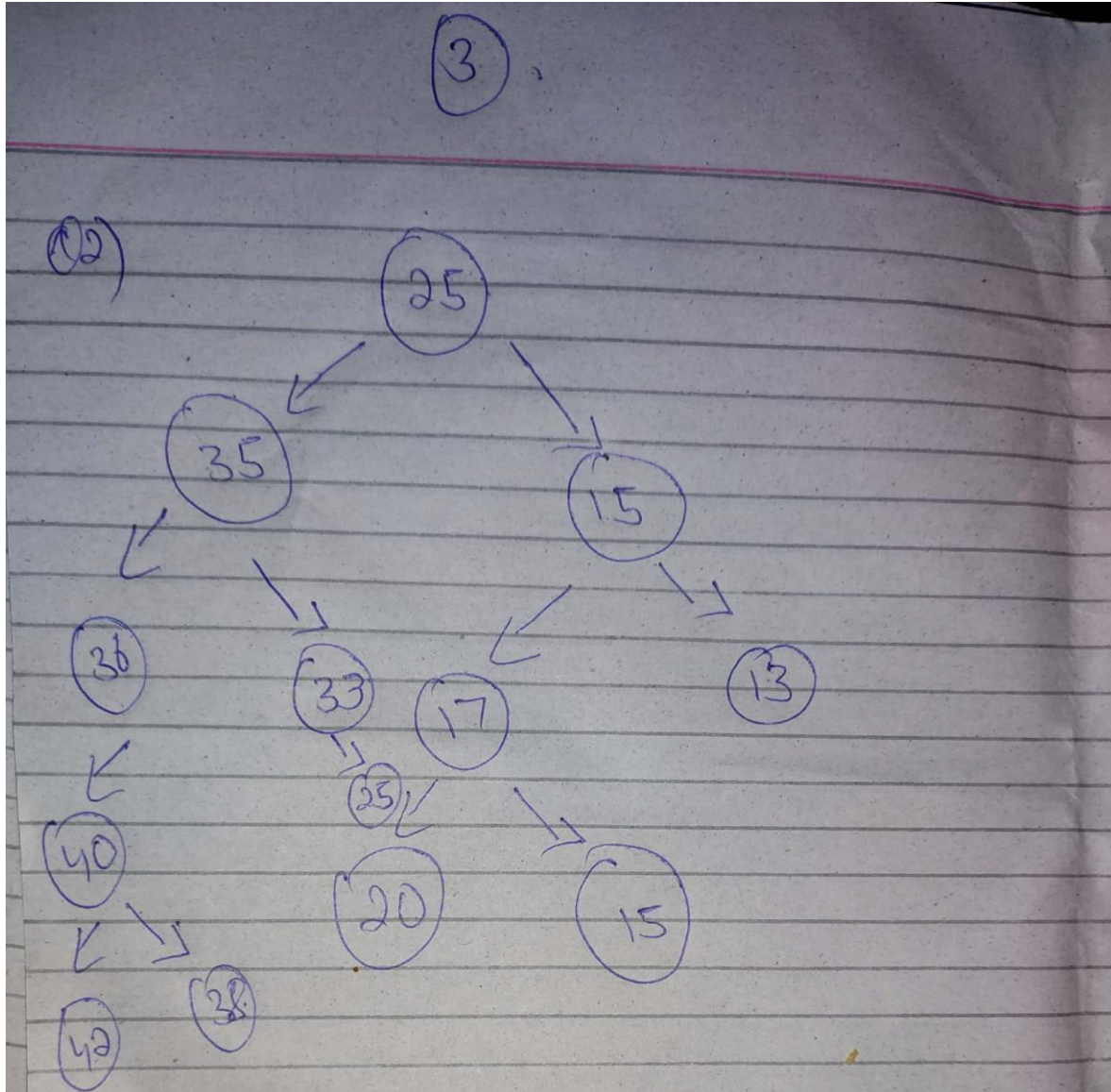
40, 43, 45, 46, (59), (55)

40, 43, 45, (56), (55), 59.

40, 43, 45, 55, 56, 59.

∴ list is sorted.

Q2. Construct Binary Trees from given list of numbers and then verify the tree. 25, 15, 35, 17, 33, 36, 25, 13, 15, 40, 38, 42, 20



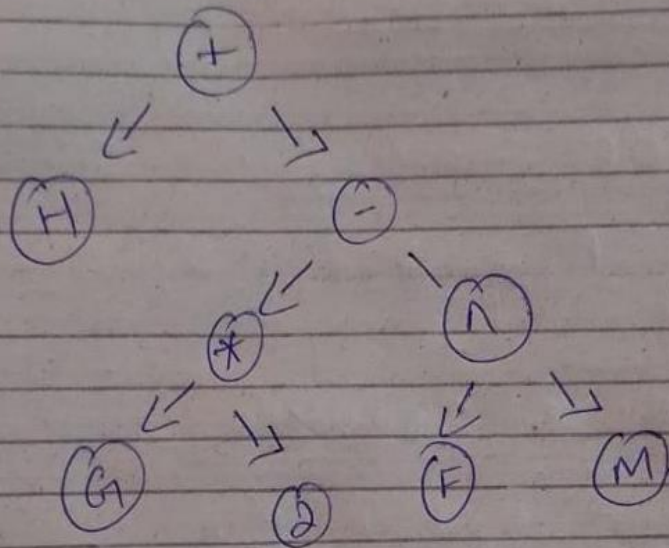
Verification:-

42, 40, 38, 36, 35, 33, 25, 20,  
17, 15, 13.

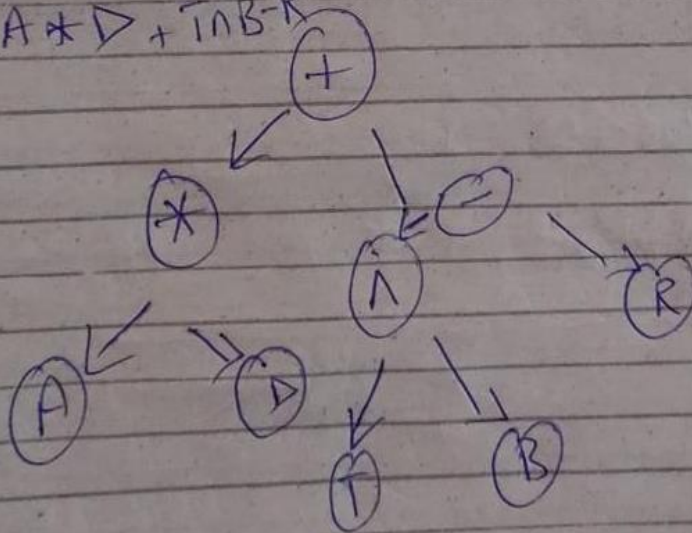
# Q3. Construct Binary Trees from given Mathematical Expressions

4

Q3 a  $H + G \times 2 - (F \wedge M)$



Q3 b  $A * D + T \wedge B - R$



Q4. Apply all the three Binary Tree Traversal Techniques on each of the Tree constructed in Q#3.

(5)

(i)

In order Traversal.

H, t, G, \*, 2, F, A, M, -

Pre-order Traversal.

t, H, -, \*, G, 2, A, F, M.

Post-order Traversal.

H, G, 2, \*, F, M, A, -, t.

(ii)

In order Traversal.

A, x, d, +, I, A, B, -, R.

Pre-order Traversal.

+ , x, A, d, -, I, A, T, B, R.

Post-order Traversal.

A, d, x, T, B, A, -, +.

## Q5.

- i. Elements of a Tree are called **Node**.
- ii. The graphical line drawn between Nodes of a Tree is called **Edge**.
- iii. Level Number of a Root is **First Subset**.
- iv. All the nodes with same Level Number belong to **Same Family**.
- v. The Left-Most Child Node is **Older** Node.
- vi. The Right-Most Child Node is **Younger** Node.
- vii. A Tree is a **Non- Linear** Data Structure.
- viii. An Ordered Set of Ordered Trees is called a **Forest**.