INSTITUTE OF INFORMATION TECHNOLOGY

JAHANGIRNAGAR UNIVERSITY

Number of Assignment : 01

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Course Code **:** ICT - 1207

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Question : 01

What is Tree Traversal and how many they are? with example explain different tree Traversal and respective algorithm.

Solution : In Computer Science tree traversal is a form of graph traversal and refers to the Process of visiting each node in a tree data structure exactly once. Such traversals are classified by the order in which the nodes are visited. The following algorithms are described for a binary tree but they may be generalized to other trees as well.

Example :
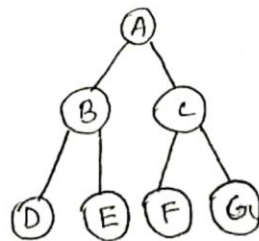
The output of traversal of this tree will be →

$$A \to B \to C \to D \to E \to F \to G$$
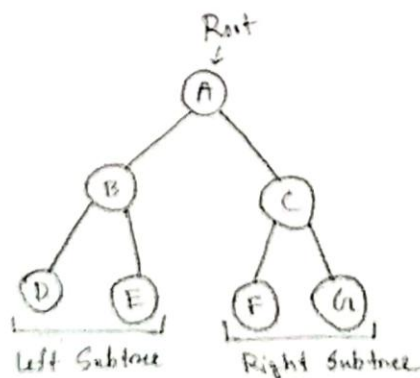
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There are three ways which we use to traverse a tree -

    1. In-Order Traversal

    2. Pre-Order Traversal

    3. Post-Order Traversal

<u>In-Order Traversal</u> : In this method the left subtree is visited first, then the root and later the right sub-tree. We should always remember that every node may represent a subtree itself.

If a binary tree is traversed in-order the output will Produce sorted key values in as ascending Order.

Left Subtree   Right Subtree

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We start from A, and following in-order traversal we move to its left subtree B. B is also traversed in-order. The process goes on until all the nodes are visited. The output of inorder traversal of this tree will be –

$$D \rightarrow B \rightarrow E \rightarrow A \rightarrow F \rightarrow C \rightarrow G$$
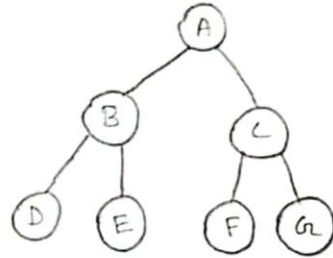
Algorithm:

until all nodes are traversed.

Step 1 : Recursively traverse left subtree.

Step 2 : Visit root node.

Step 3 : Recursively traverse right subtree.

Pre-order Traversal:

In this traversal method the root node is visited first, then the left subtree and finally the right subtree.

we start from A, and following Pre-order traversal we first visit A itself and then move to its left subtree B. B is also traversed Pre-order. The Process goes on untill all the nodes are visited. The output of Pre-order traversal of this tree will be —

$$A \rightarrow B \rightarrow D \rightarrow E \rightarrow C \rightarrow F \rightarrow G$$

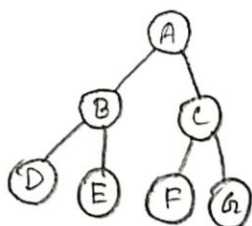Algorithm:
        until all nodes are traversed

step 1: Visit root node.

step 2: Recursively traverse left subtree

step 3: Recursively traverse right subtree.

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<u>Post-Order Traversal</u> : In this traversal method the root node is visited last hence the name. First we traverse the left subtree then the right subtree and finally the root node.

we start from A, and following Post-order traversa we first visit the left subtree B. B is also traversed Post-order. The Process goes on until all the nodes are visited. The Output of Post-Order traversal of this tree will be —

$$D \to E \to B \to F \to G \to C \to A$$

<u>Algorithm</u> : until all nodes are traversed

Step 1 : Recursively traverse left subtree
Step 2 : Recursively traverse right subtree
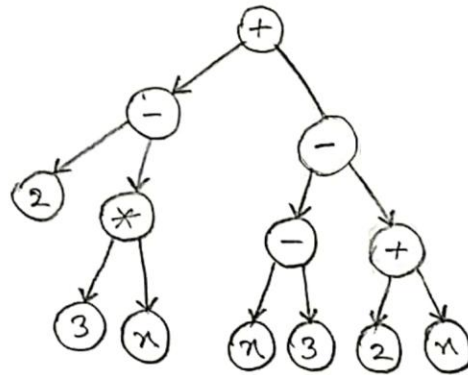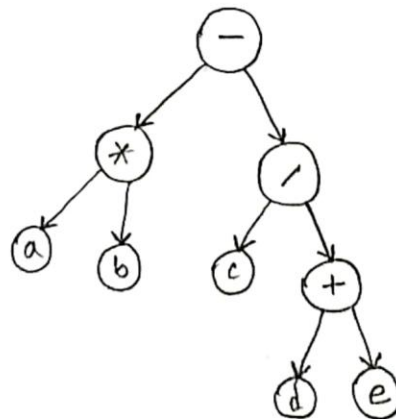Step 3 : Visit root node.

Question: 02 Draw the rooted tree for the algebraic expression of the following.
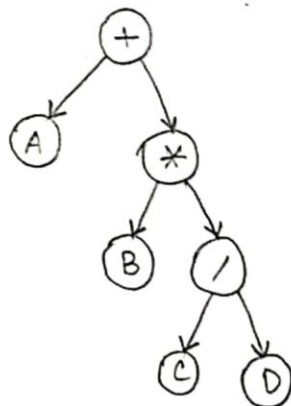
Solution:

(i) $(2 - (3 \times x)) + ((x-3) - (2+x))$

(ii) $ab - (c / (d+e))$.
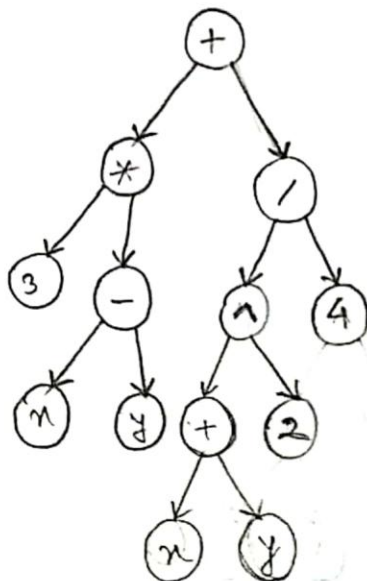
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(iii)   A + (B * (C/D))

```
          (+)
         /   \
       (A)   (*)
            /   \
          (B)   (/)
               /   \
             (C)   (D)
```

(iv) $3(x-y) + \dfrac{(x+y)^2}{4}$

```
              (+)
            /     \
          (*)      (/)
         /   \     /   \
       (3)  (-)  (^)   (4)
           /  \  /  \
         (x) (y)(+) (2)
                /  \
              (x)  (y)
```
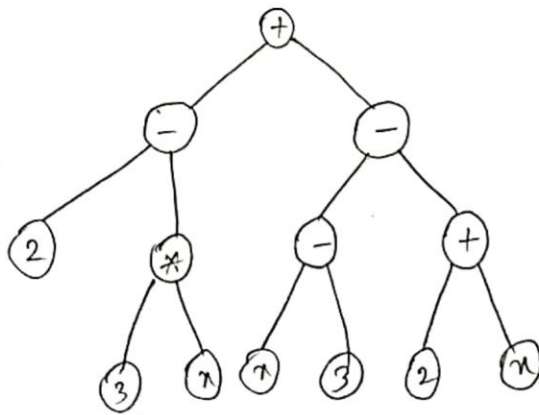
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Question : 03 Draw the rooted tree for the above

algebraic expression Also

    a. Find the infix form

    b. Find the Prefix form

    c Find the Postfix form

<u>Solution:</u>
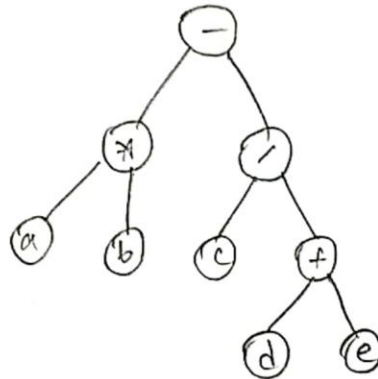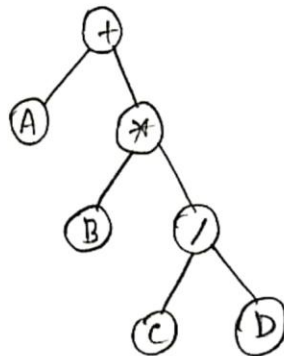
  Expression 1

(i) $(2-(3 \times x))+((x-3)-(2+x))$

a. Infin: $(2-(3*x))+((x-3)-(2+x))$

b. Prefix: ~~abf~~ $+--2*3x--x3+2x$

c. Postfin: $23x*-x3-2x+-+$

Ex Presision (2i)
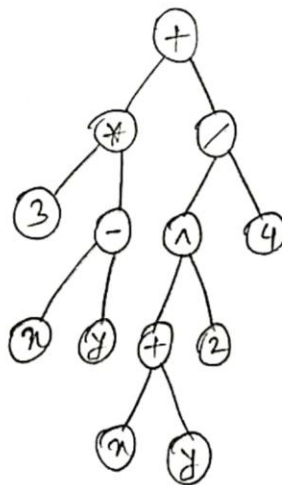
(ii) $ab - (c * (d+e))$

a. Infin: $ab - (c/(d+e))$

b. Prefin: $-ab/c + de$

c. Postfin: $abcde + /-$

(iii) $A + (B * (C/D))$

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a. Infix : $A + (B * (C/D))$

b. Prefix : $+ A * B / C D$

c. Postfix : $A B C D / * +$

(iv) $3(x-y) + \dfrac{(x+y)^2}{4}$

$= 3(x-y) + (x+y)^2 / 4$

a. Infix : $3(x-y) + ((x+y)^2 / 4)$

b. Prefix : $+ 3 - x y / \wedge + x y 2 4$

c. Postfix : $3 x y - x y + 2 \wedge 4 / +$

THE END