Tree Traversal | Binary Tree Traversal

gatevidyalay.com/tree-traversal-binary-tree-traversal

29 July 2018

Binary Tree-

Before you go through this article, make sure that you gone through the previous article on **Binary Trees**.

We have discussed-

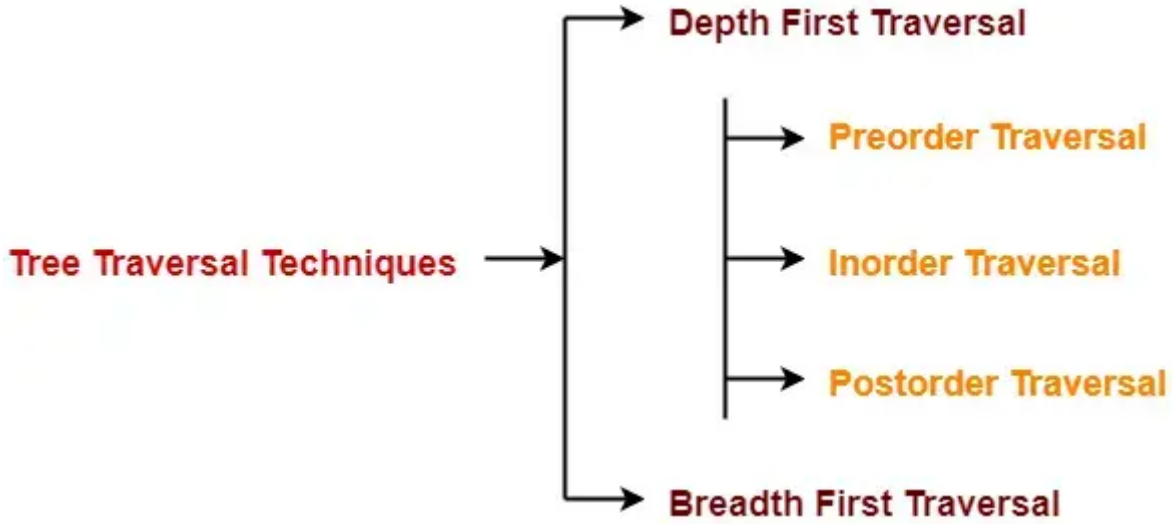
- Binary tree is a special tree data structure.
- In a binary tree, each node can have at most 2 children.

In this article, we will discuss about Binary Tree Traversal.

Tree Traversal-

> Tree Traversal refers to the process of visiting each node in a tree data structure exactly once.

Various tree traversal techniques are-



Depth First Traversal-

Following three traversal techniques fall under Depth First Traversal-

1. Preorder Traversal
2. Inorder Traversal
3. Postorder Traversal

1. Preorder Traversal-

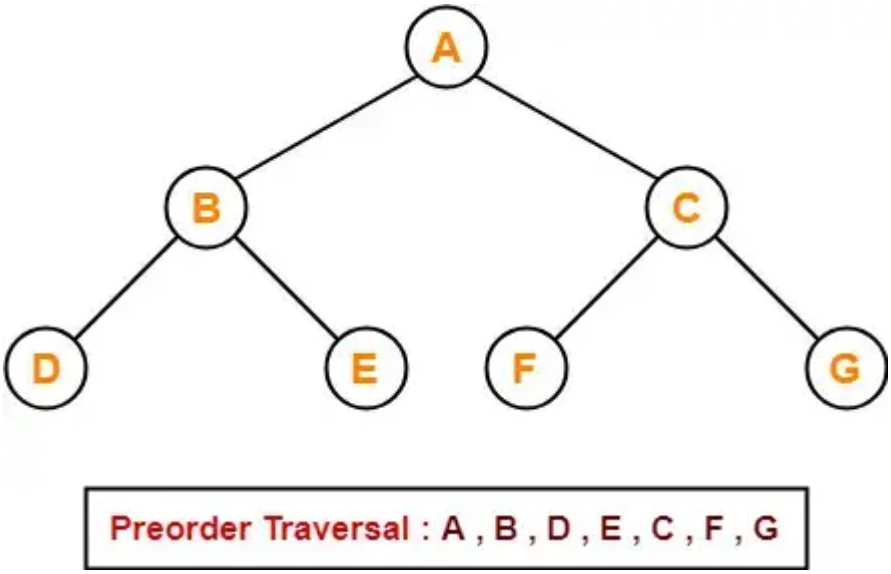
Algorithm-

1. Visit the root
2. Traverse the left sub tree i.e. call Preorder (left sub tree)
3. Traverse the right sub tree i.e. call Preorder (right sub tree)

Root → Left → Right

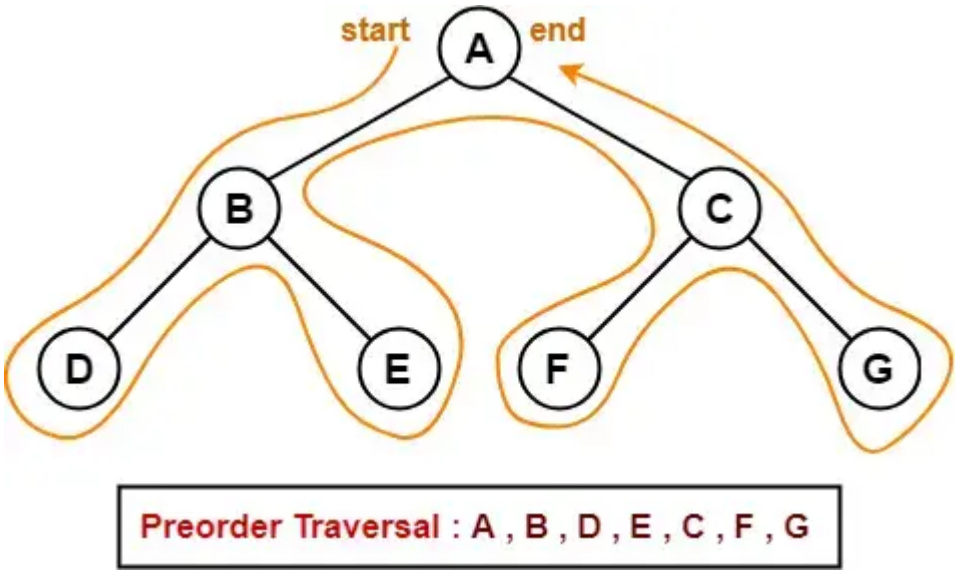
Example-

Consider the following example-



Preorder Traversal Shortcut

Traverse the entire tree starting from the root node keeping yourself to the left.



Applications-

- Preorder traversal is used to get prefix expression of an expression tree.
- Preorder traversal is used to create a copy of the tree.

2. Inorder Traversal-

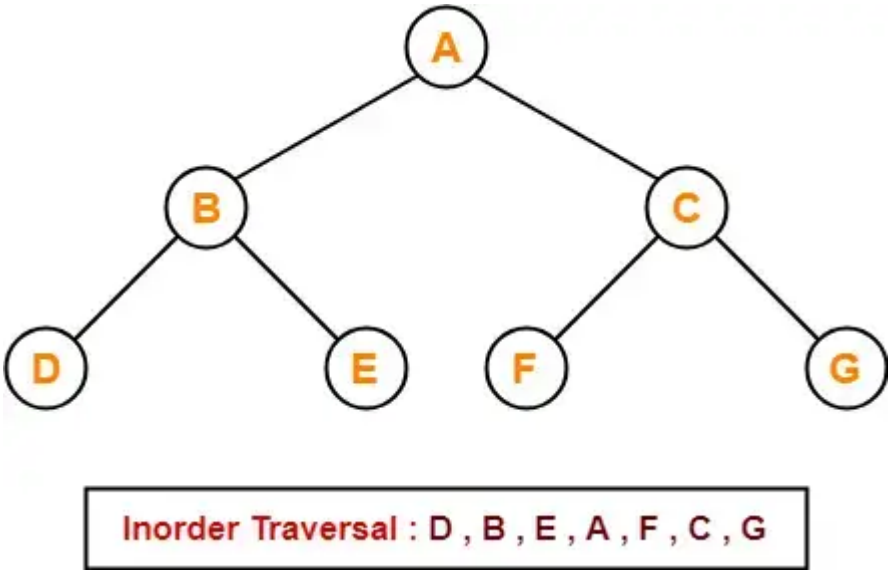
Algorithm-

1. Traverse the left sub tree i.e. call Inorder (left sub tree)
2. Visit the root
3. Traverse the right sub tree i.e. call Inorder (right sub tree)

Left → Root → Right

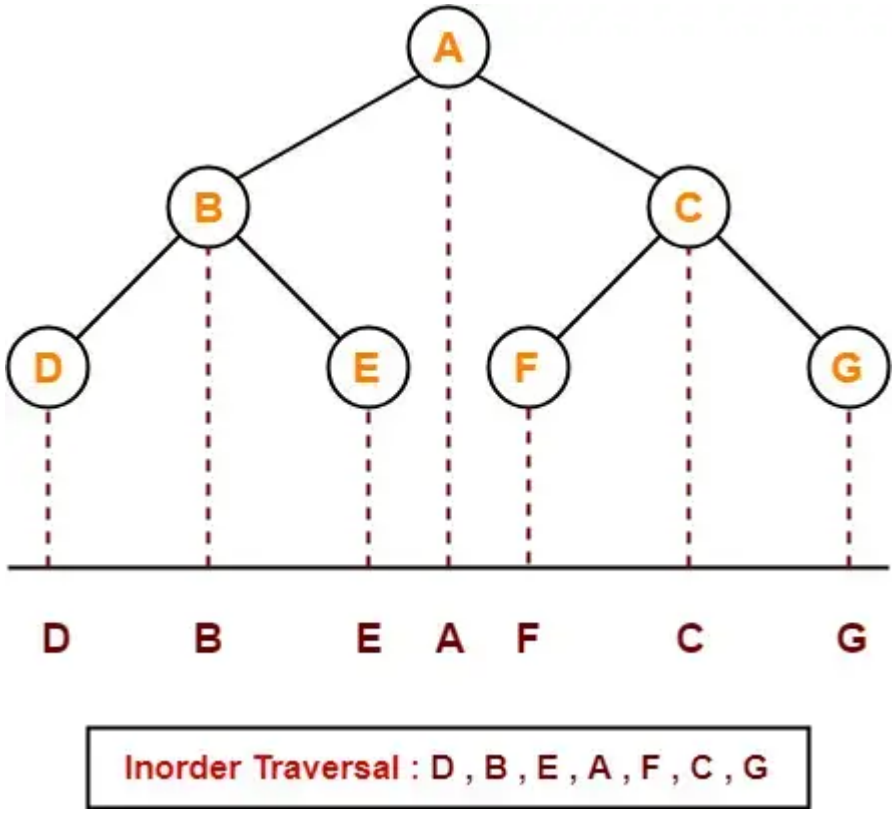
Example-

Consider the following example-



Inorder Traversal Shortcut

Keep a plane mirror horizontally at the bottom of the tree and take the projection of all the nodes.



Application-

Inorder traversal is used to get infix expression of an expression tree.

3. Postorder Traversal-

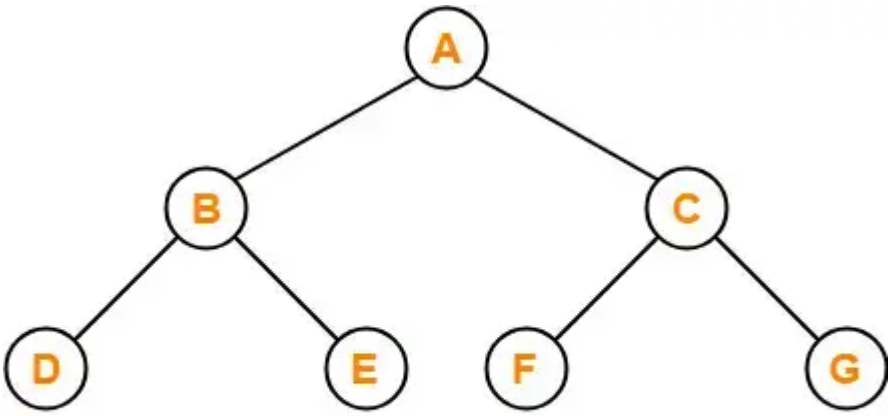
Algorithm-

1. Traverse the left sub tree i.e. call Postorder (left sub tree)
2. Traverse the right sub tree i.e. call Postorder (right sub tree)
3. Visit the root

Left → Right → Root

Example-

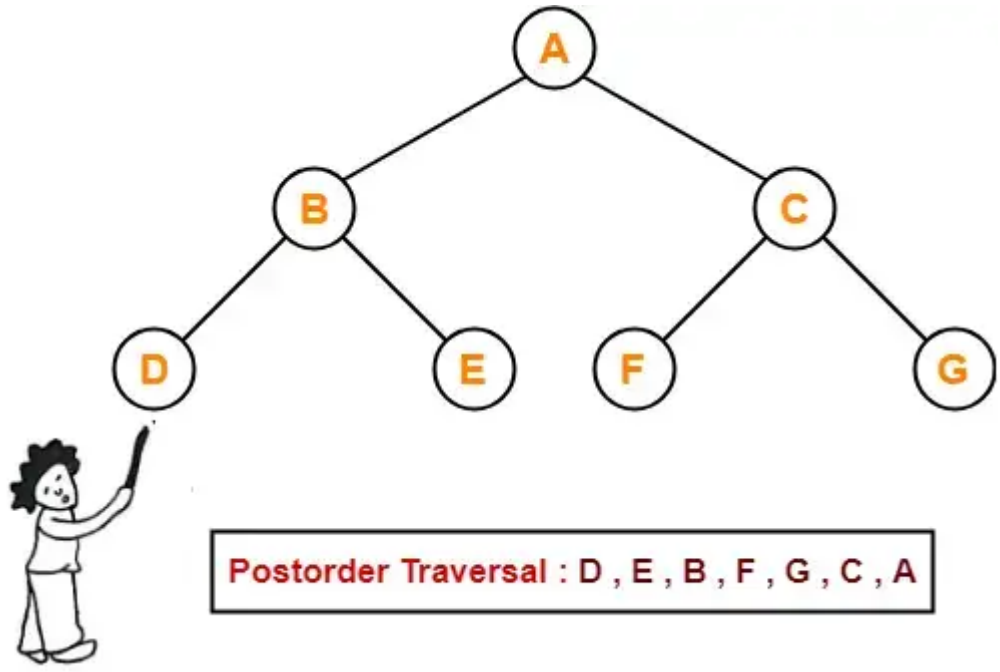
Consider the following example-



Postorder Traversal : D , E , B , F , G , C , A

Postorder Traversal Shortcut

Pluck all the leftmost leaf nodes one by one.



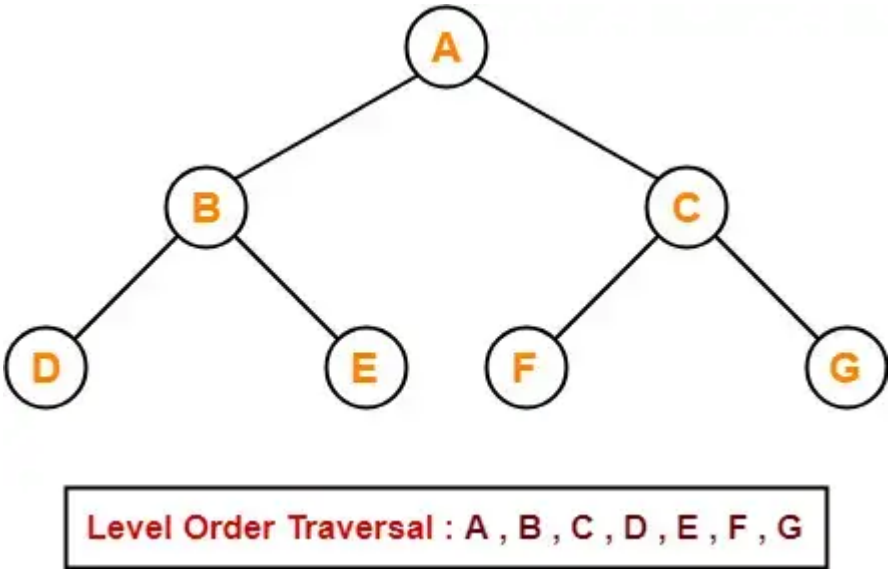
Applications-

- Postorder traversal is used to get postfix expression of an expression tree.
- Postorder traversal is used to delete the tree.
- This is because it deletes the children first and then it deletes the parent.

Breadth First Traversal-

- Breadth First Traversal of a tree prints all the nodes of a tree level by level.
- Breadth First Traversal is also called as **Level Order Traversal**.

Example-



Application-

Level order traversal is used to print the data in the same order as stored in the array representation of a complete binary tree.

To gain better understanding about Tree Traversal,

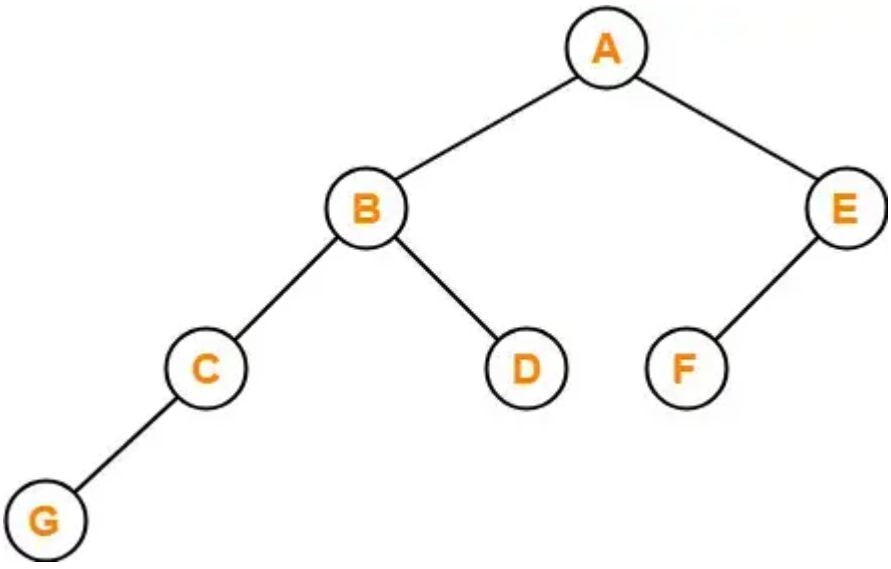
Watch this Video Lecture

Also Read- Binary Tree Properties

PRACTICE PROBLEMS BASED ON TREE TRAVERSAL-

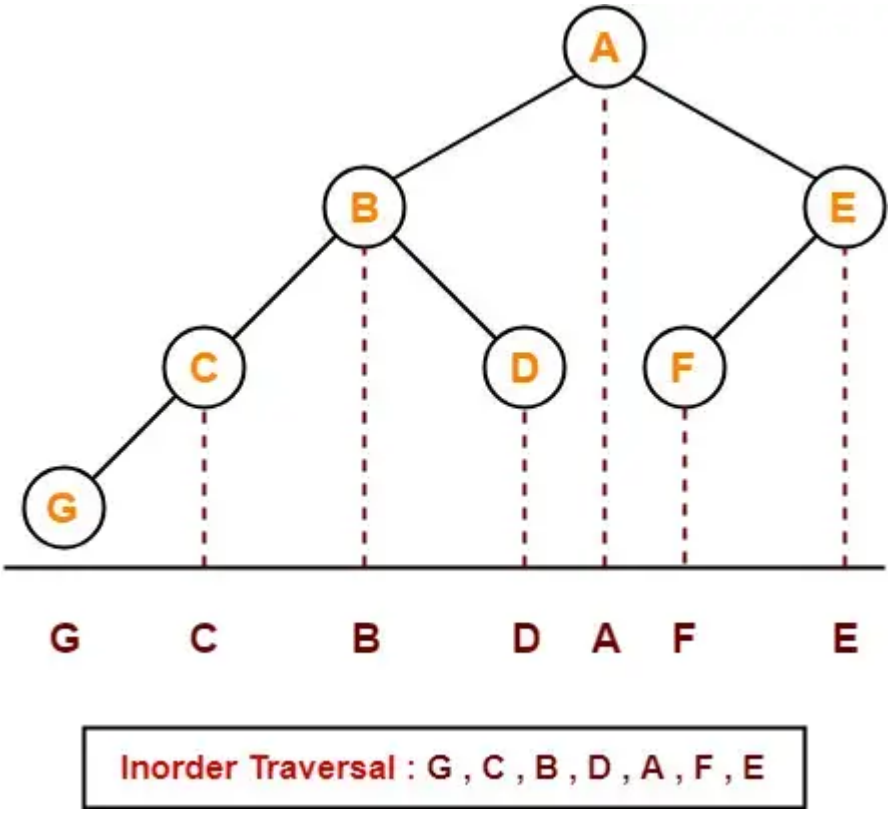
Problem-01:

If the binary tree in figure is traversed in inorder, then the order in which the nodes will be visited is ____?



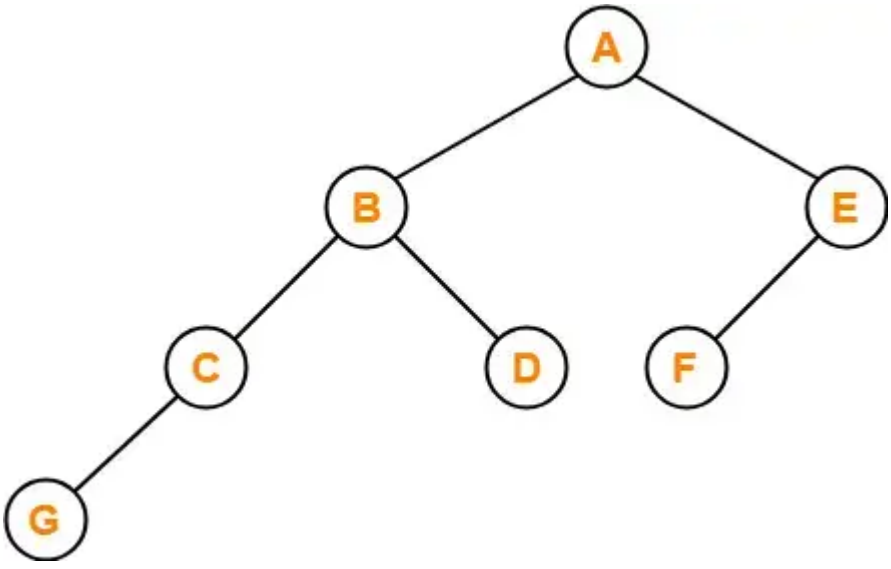
Solution-

The inorder traversal will be performed as-



Problem-02:

Which of the following sequences denotes the postorder traversal sequence of the tree shown in figure?



1. FEGCBDBA
2. GCBDAFE
3. GCDBFEA
4. FDEGCBA

Solution-

Perform the postorder traversal by plucking all the leftmost leaf nodes one by one.

Then,

Postorder Traversal : G , C , D , B , F , E , A

Thus, Option (C) is correct.

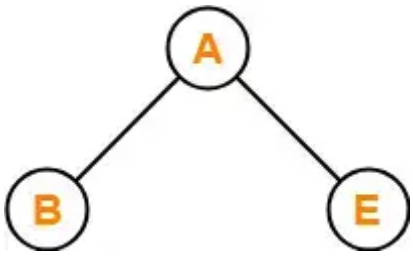
Problem-03:

Let LASTPOST, LASTIN, LASTPRE denote the last vertex visited in a postorder, inorder and preorder traversal respectively of a complete binary tree. Which of the following is always true?

1. LASTIN = LASTPOST
2. LASTIN = LASTPRE
3. LASTPRE = LASTPOST
4. None of these

Solution-

Consider the following complete binary tree-



Preorder Traversal : B , A , E

Inorder Traversal : B , A , E

Postorder Traversal : B , E , A

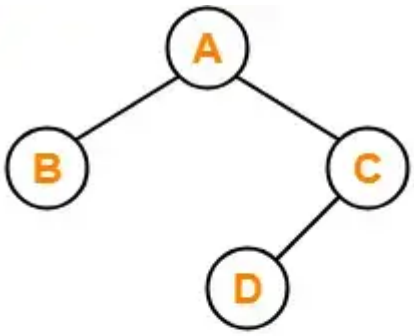
Clearly, LASTIN = LASTPRE.

Thus, Option (B) is correct.

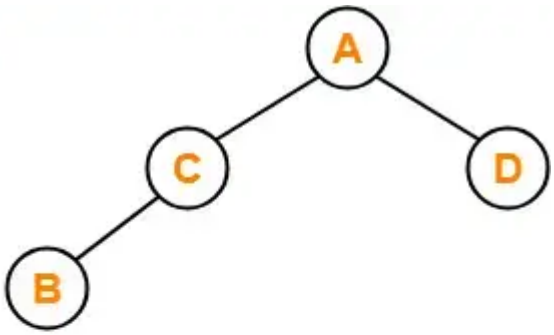
Problem-04:

Which of the following binary trees has its inorder and preorder traversals as BCAD and ABCD respectively-

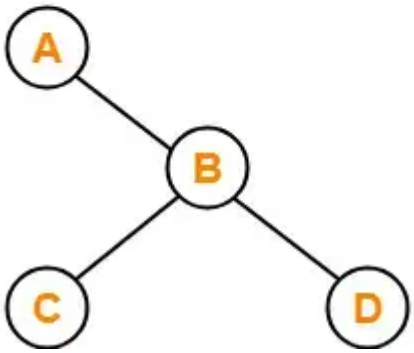
A)



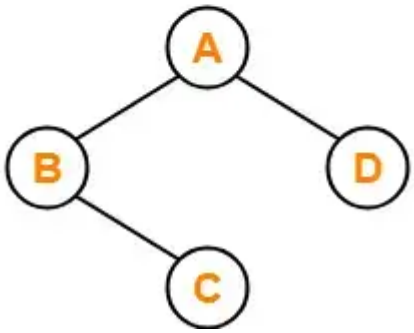
B)



C)



D)



Solution-

Option (D) is correct.

To watch video solutions and practice more problems,

Watch this Video Lecture

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