SNS COLLEGE OF TECHNOLOGY

Coimbatore-35

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

COURSE NAME : 23ITT102_Programming in C and Data Structure

I YEAR/ IISEMESTER

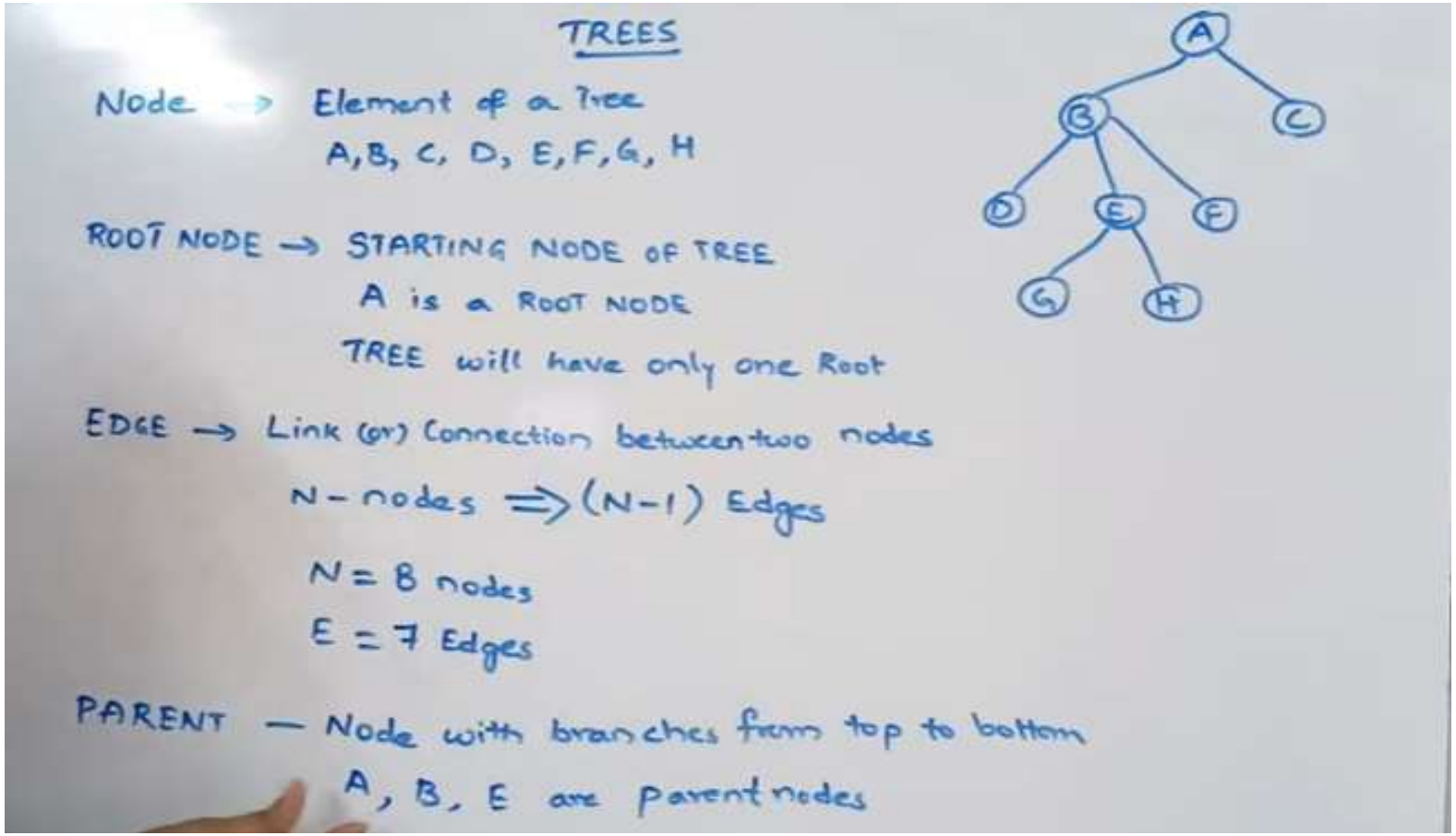
UNIT V

Topic: Tree ADT &*Binary Tree*

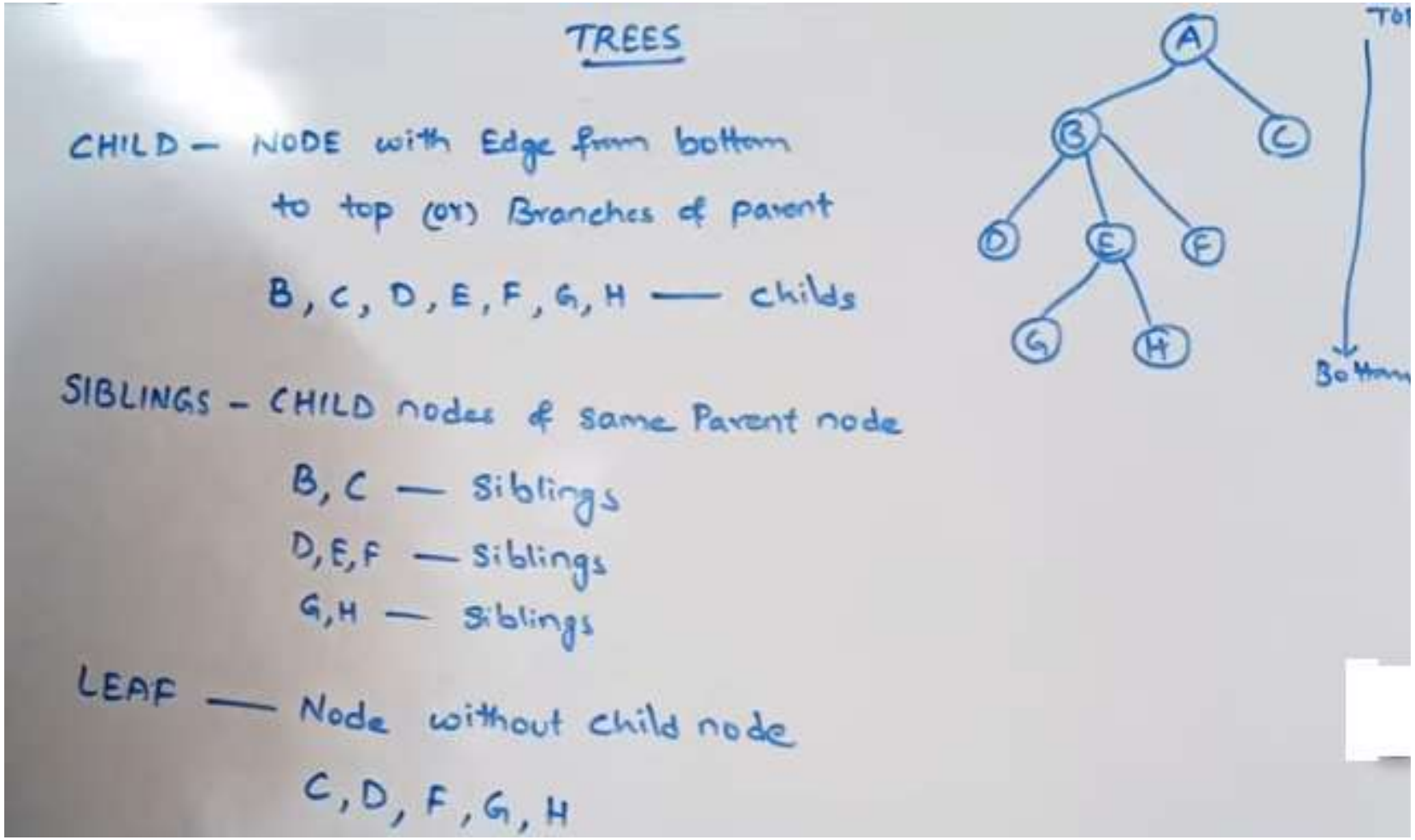
Tree Terminologies

A tree data structure is defined as a collection of objects or entities known as nodes that are linked together to represent or simulate hierarchy.

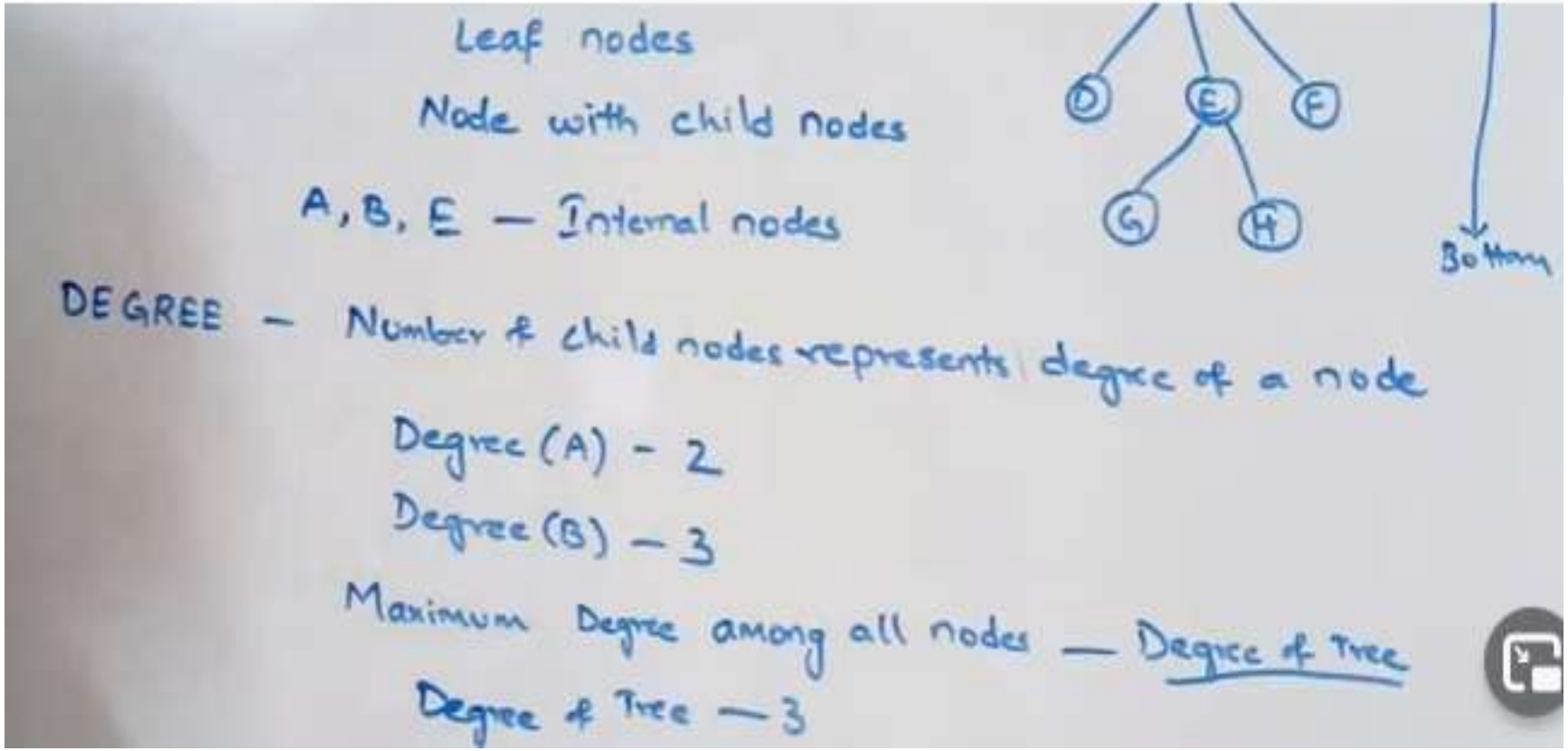
A tree data structure is a non-linear data structure because it does not store in a sequential manner. It is a hierarchical structure as elements in a Tree are arranged in multiple levels.



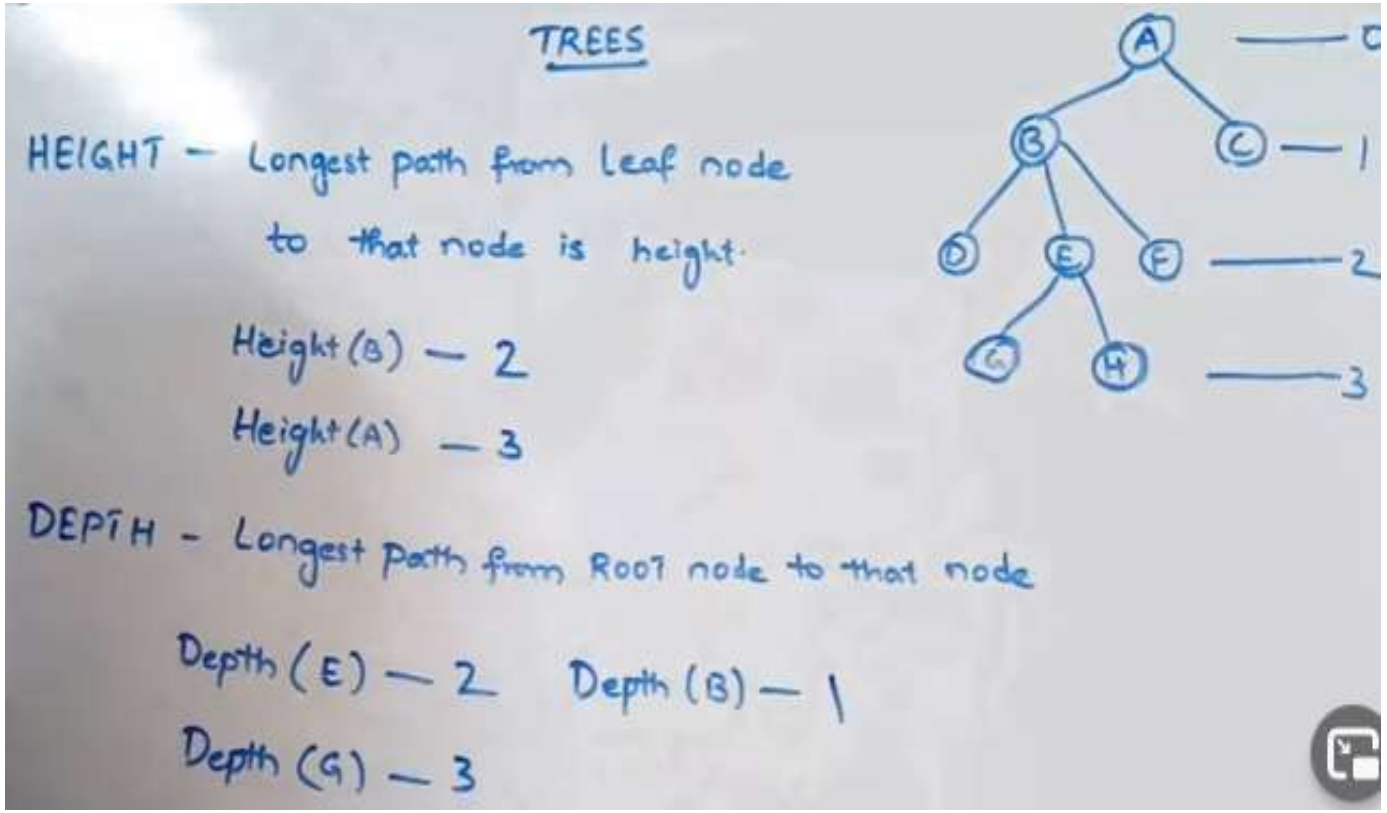
Tree Terminologies



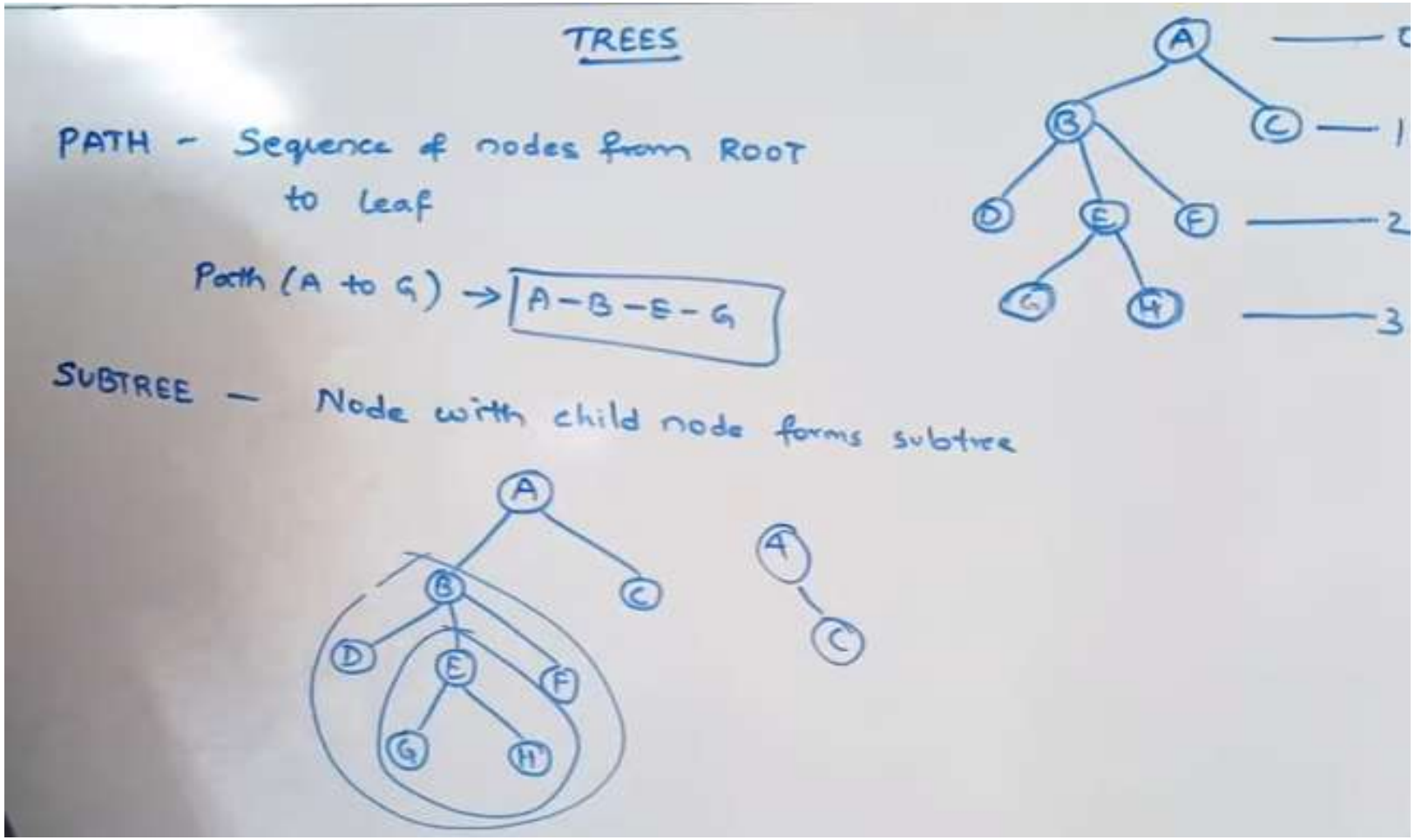
Tree Terminologies



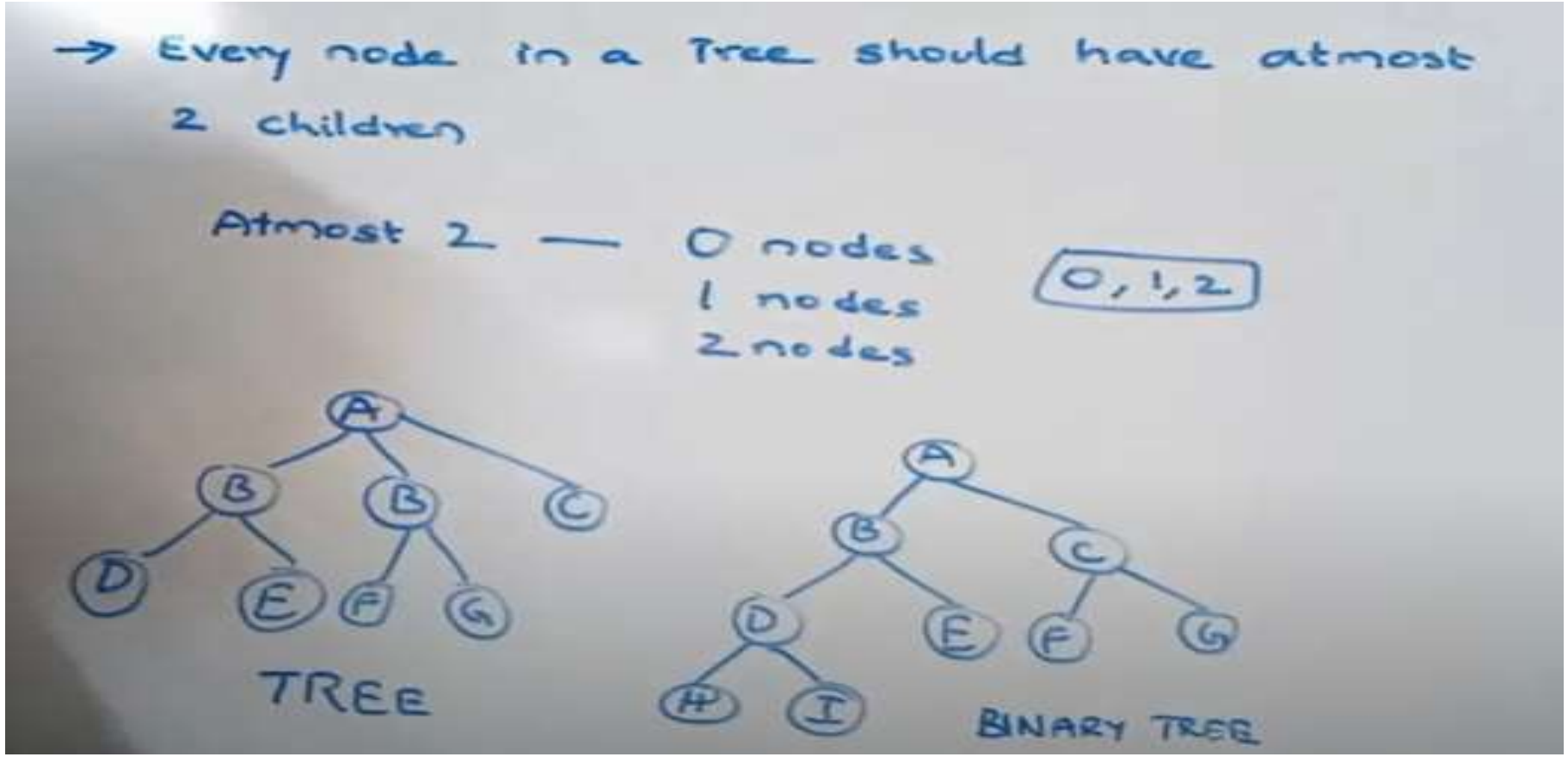
Tree Terminologies



Tree Terminologies



Binary Tree

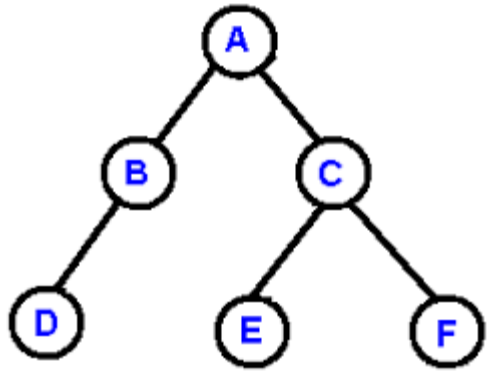

→ Every node in a Tree should have atmost 2 children
Atmost 2 — 0 nodes
1 nodes
2 nodes
0, 1, 2
A
B
B
C
D
E
F
G
TREE
A
B
C
D
E
F
G
H
I
BINARY TREE

Binary Tree

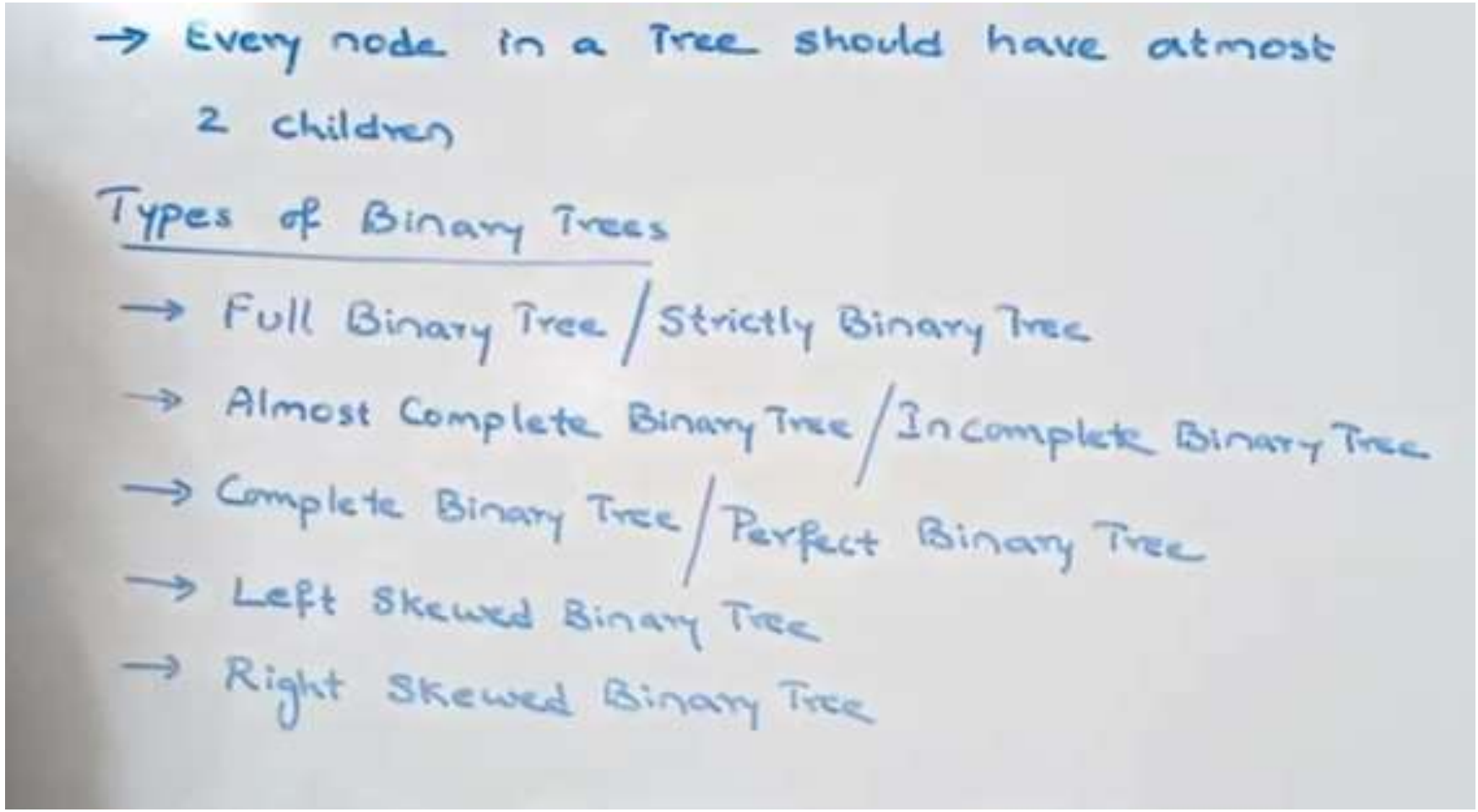
- Tree in which no node can have more than two children

Node declaration

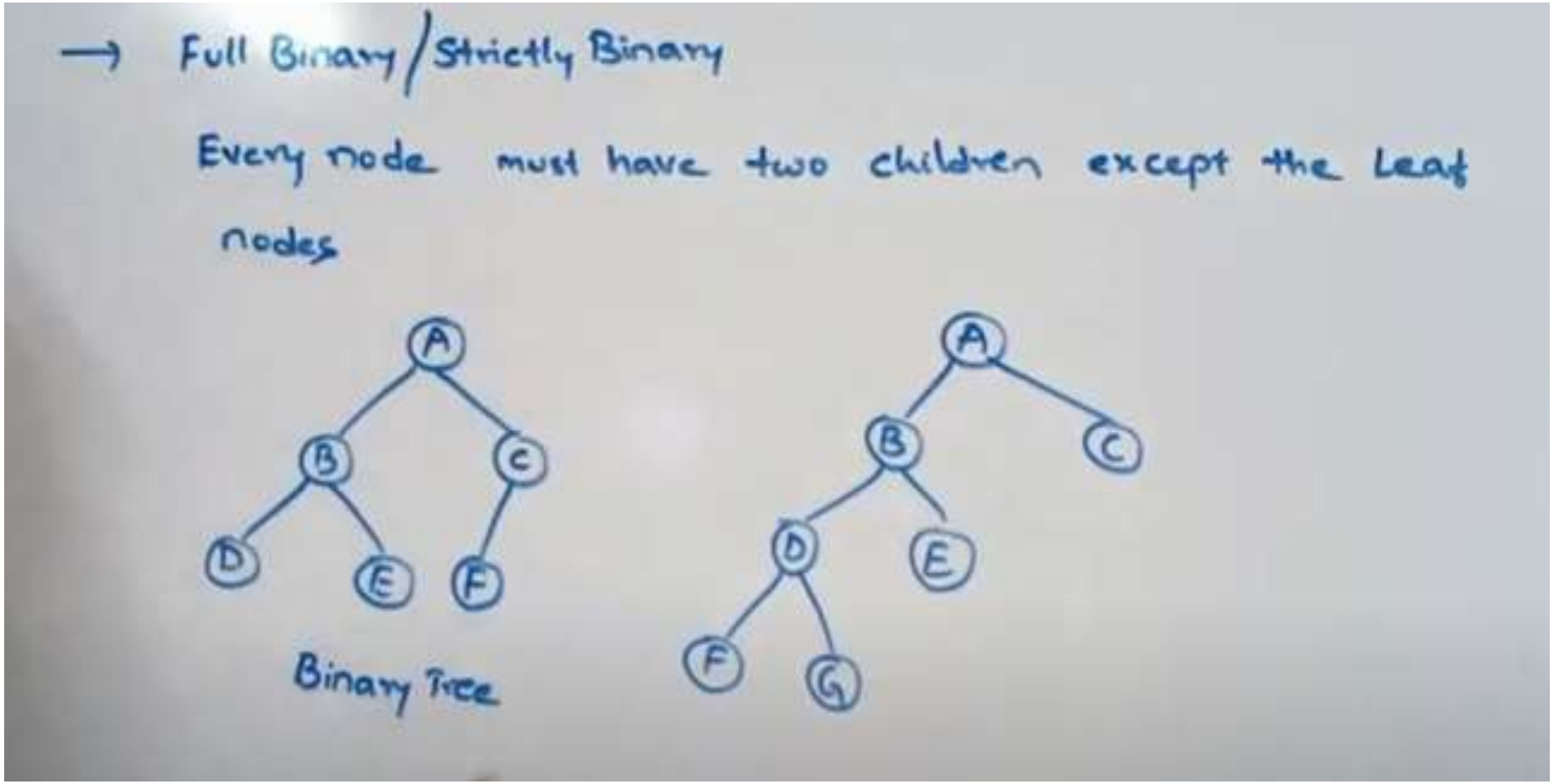
```
Struct TreeNode
{
Int Element;
Struct TreeNode *Left;
Struct TreeNode *Right;
}
```



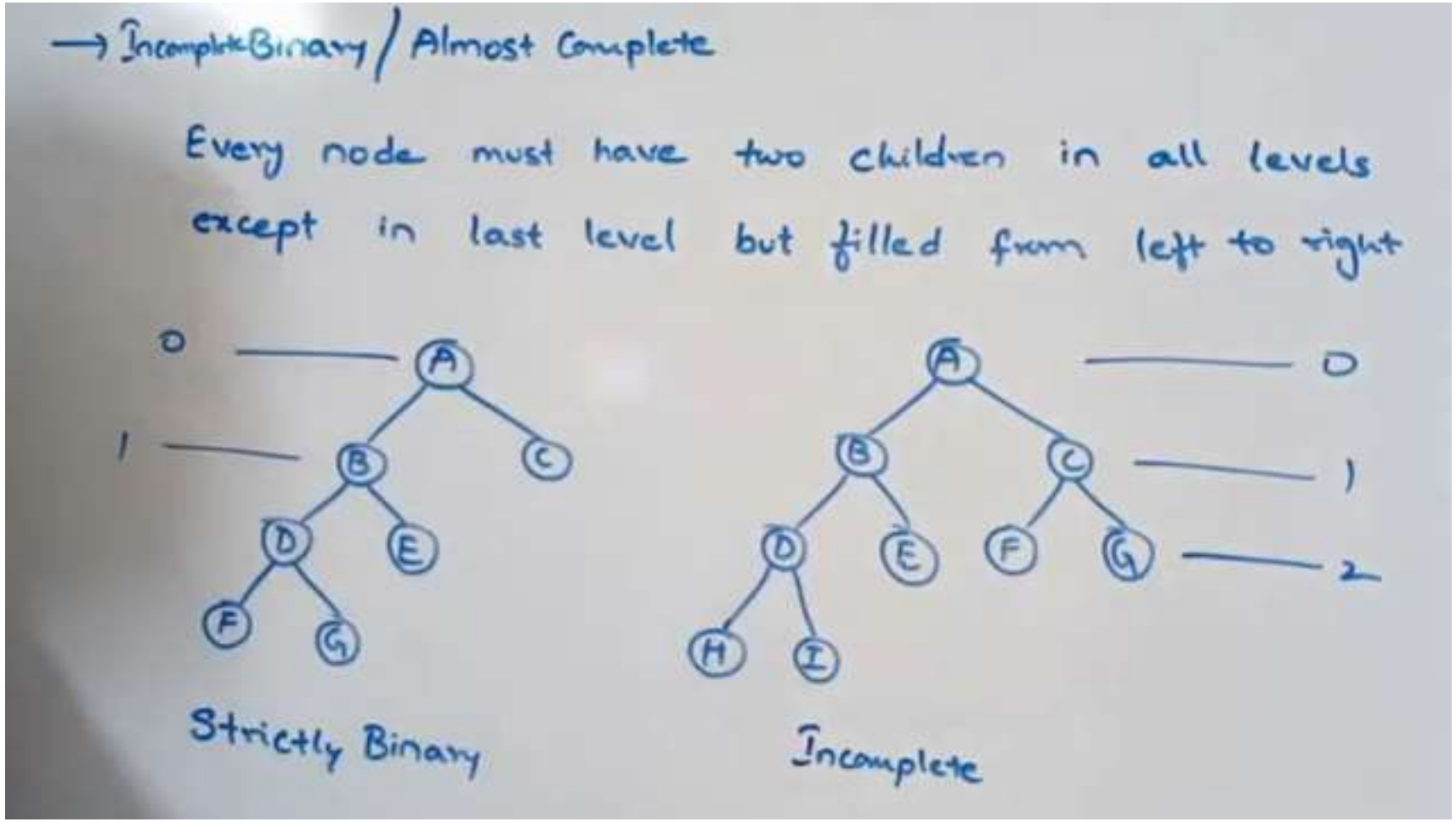
Binary Tree


→ Every node in a Tree should have atmost 2 children
Types of Binary Trees
→ Full Binary Tree / Strictly Binary Tree
→ Almost Complete Binary Tree / Incomplete Binary Tree
→ Complete Binary Tree / Perfect Binary Tree
→ Left Skewed Binary Tree
→ Right Skewed Binary Tree

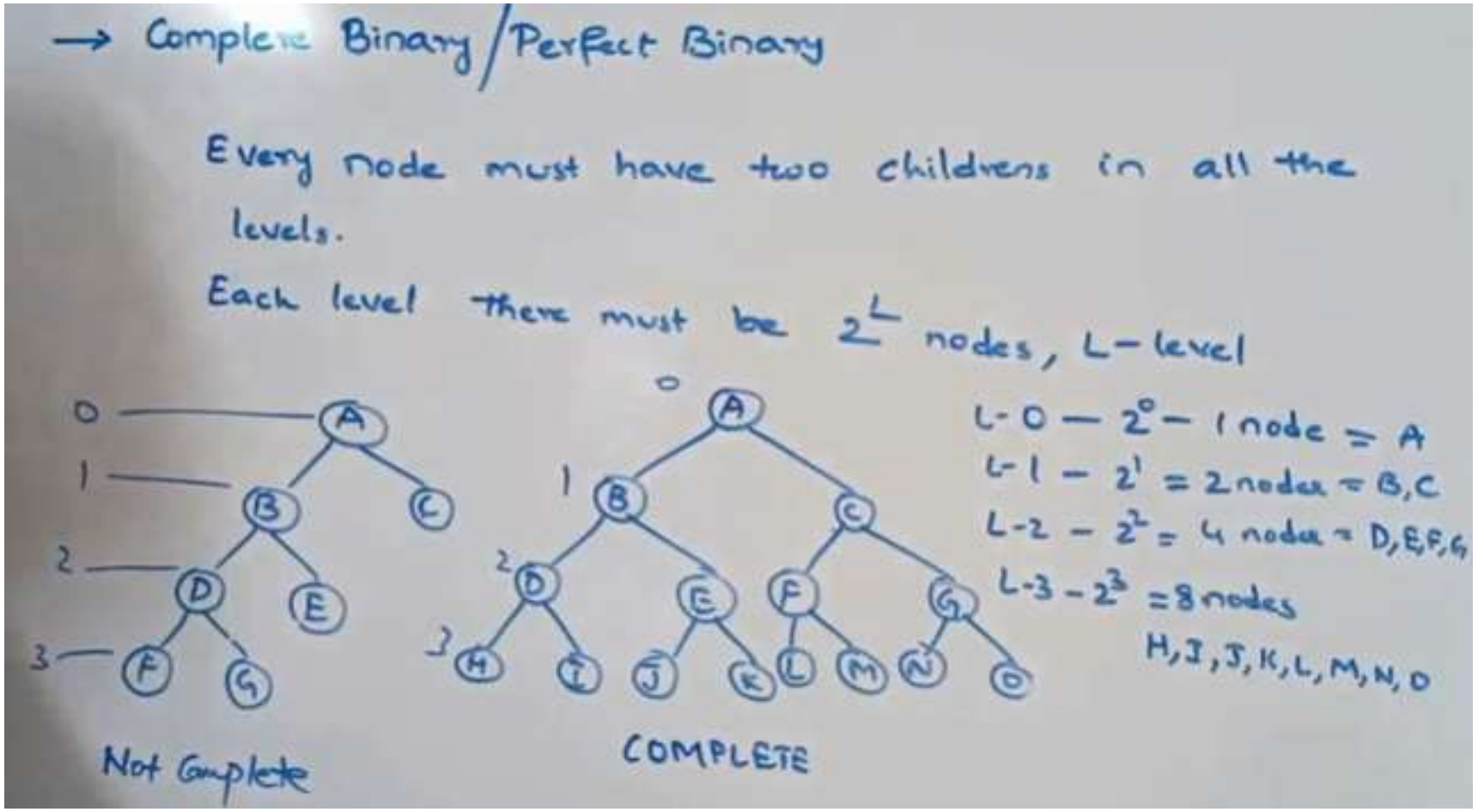
Types of Binary Tree



Types of Binary Tree



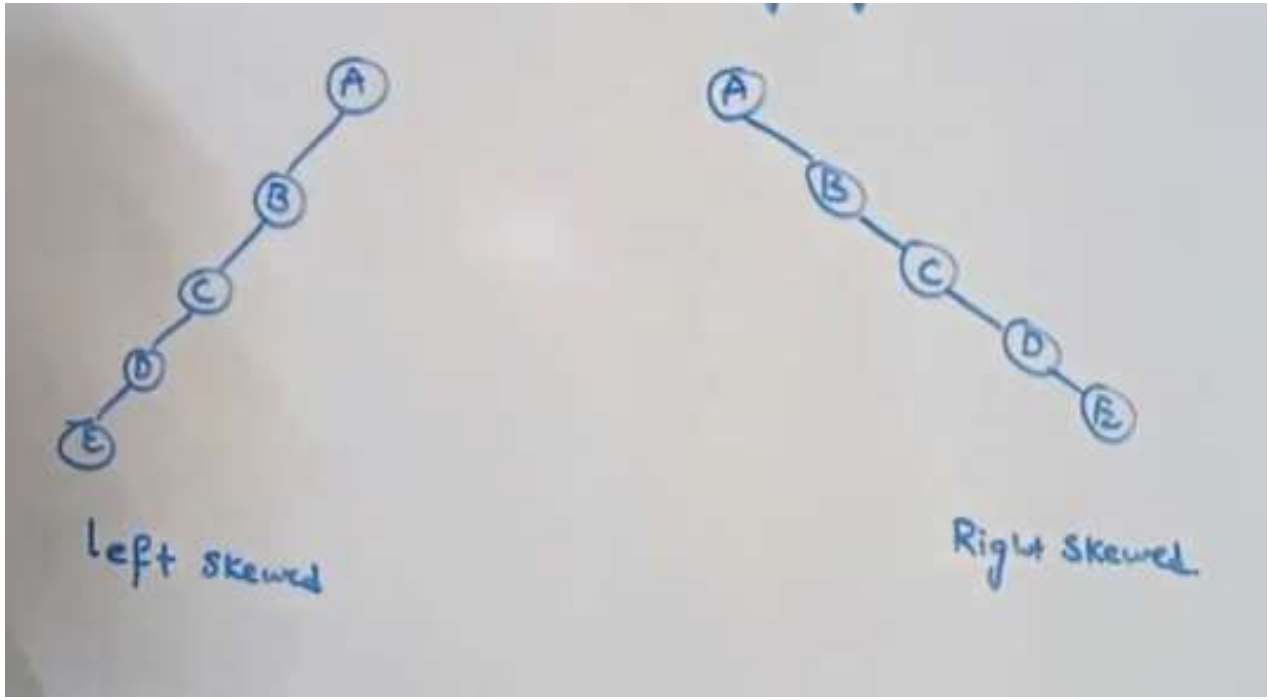
Types of Binary Tree



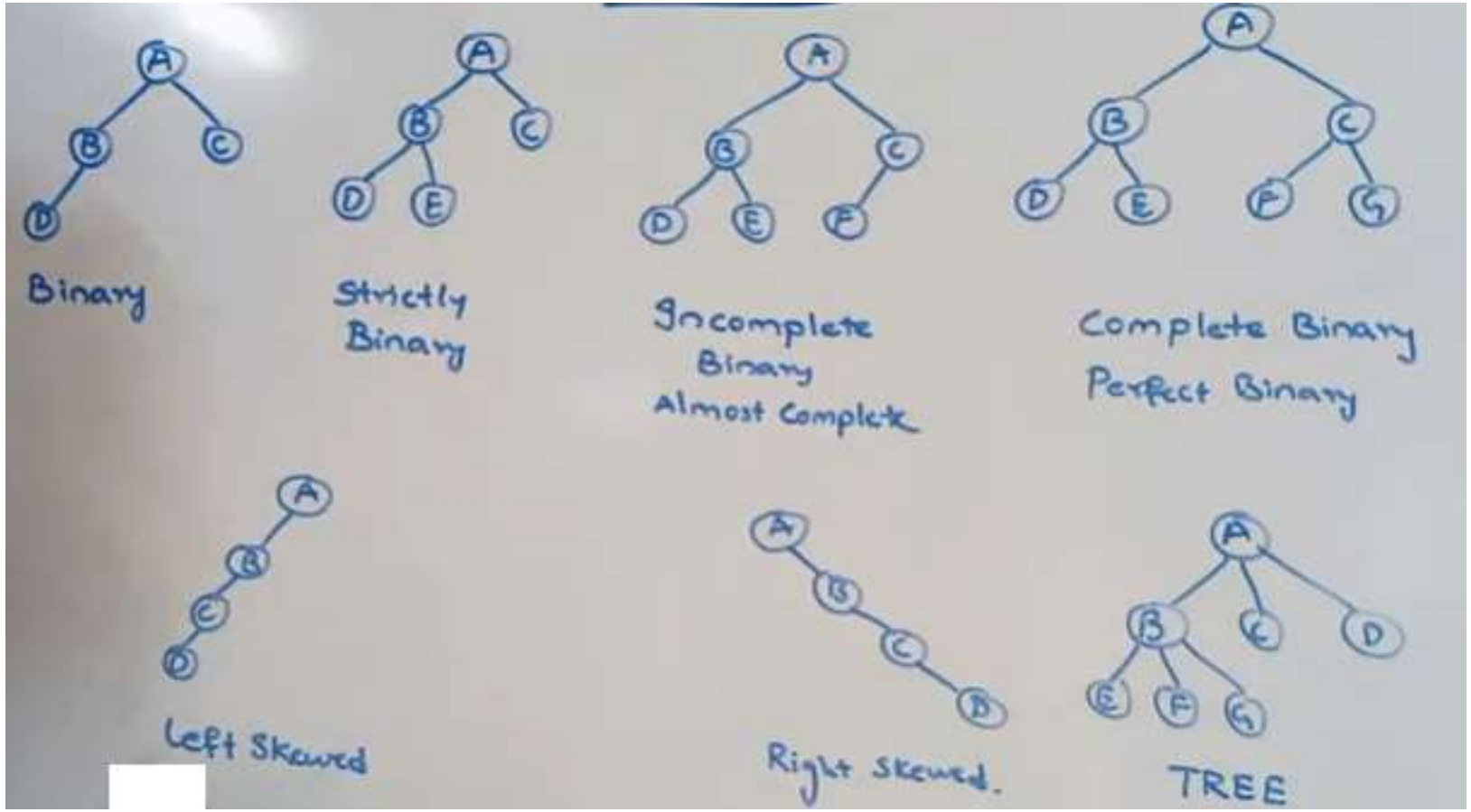
Types of Binary Tree

Left Skewed Tree: Every node should have only left Children

Right Skewed Tree : Every node should have only Right Children

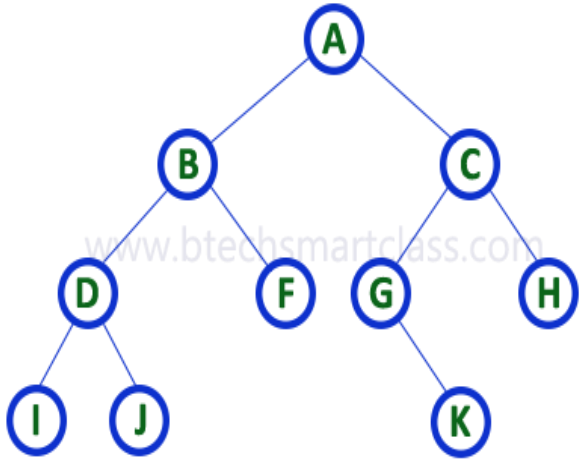


Types of Binary Tree



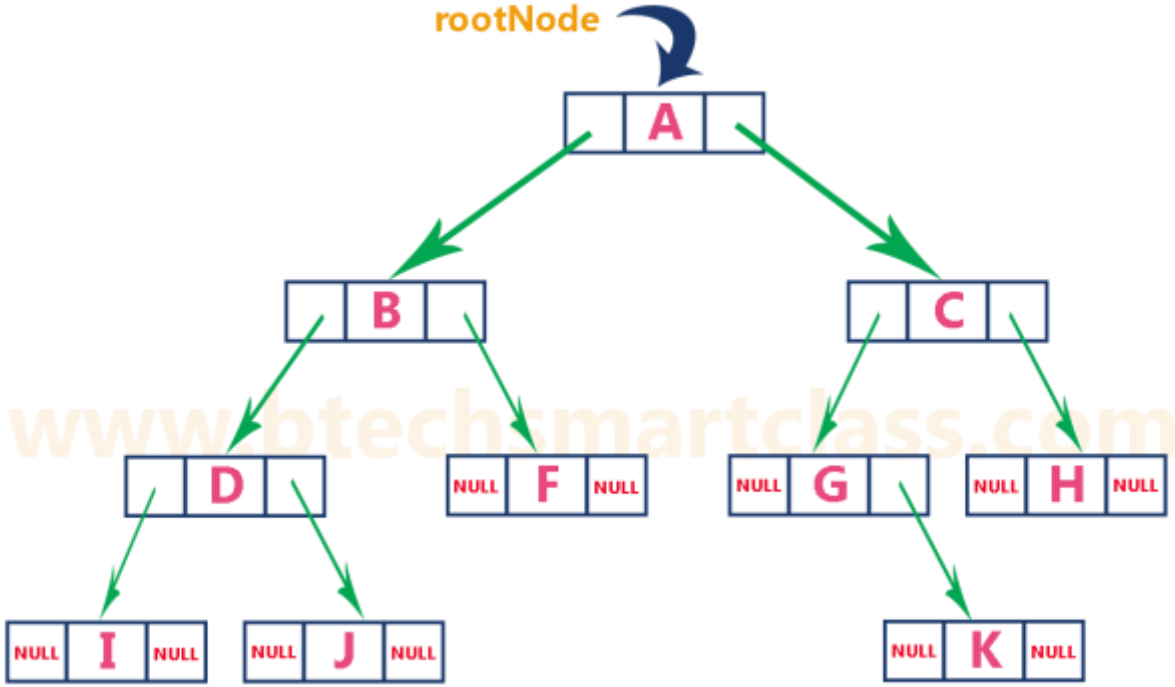
Representation of Binary Tree -Linear Representation

- For any element in position i, the left child is in position 2i,the right child is in position 2i+1 and the parent is in position (i/2)



A	B	C	D	F	G	H	I	J	-	-	-	K	-	-	-	-	-	-	-	-

Linked List Representation



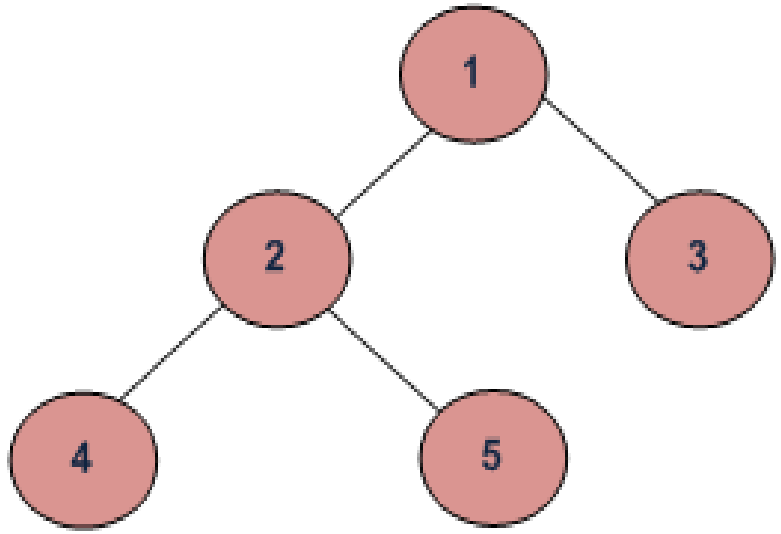
Tree Traversals

- Visiting each node only once
- Three types of tree traversals

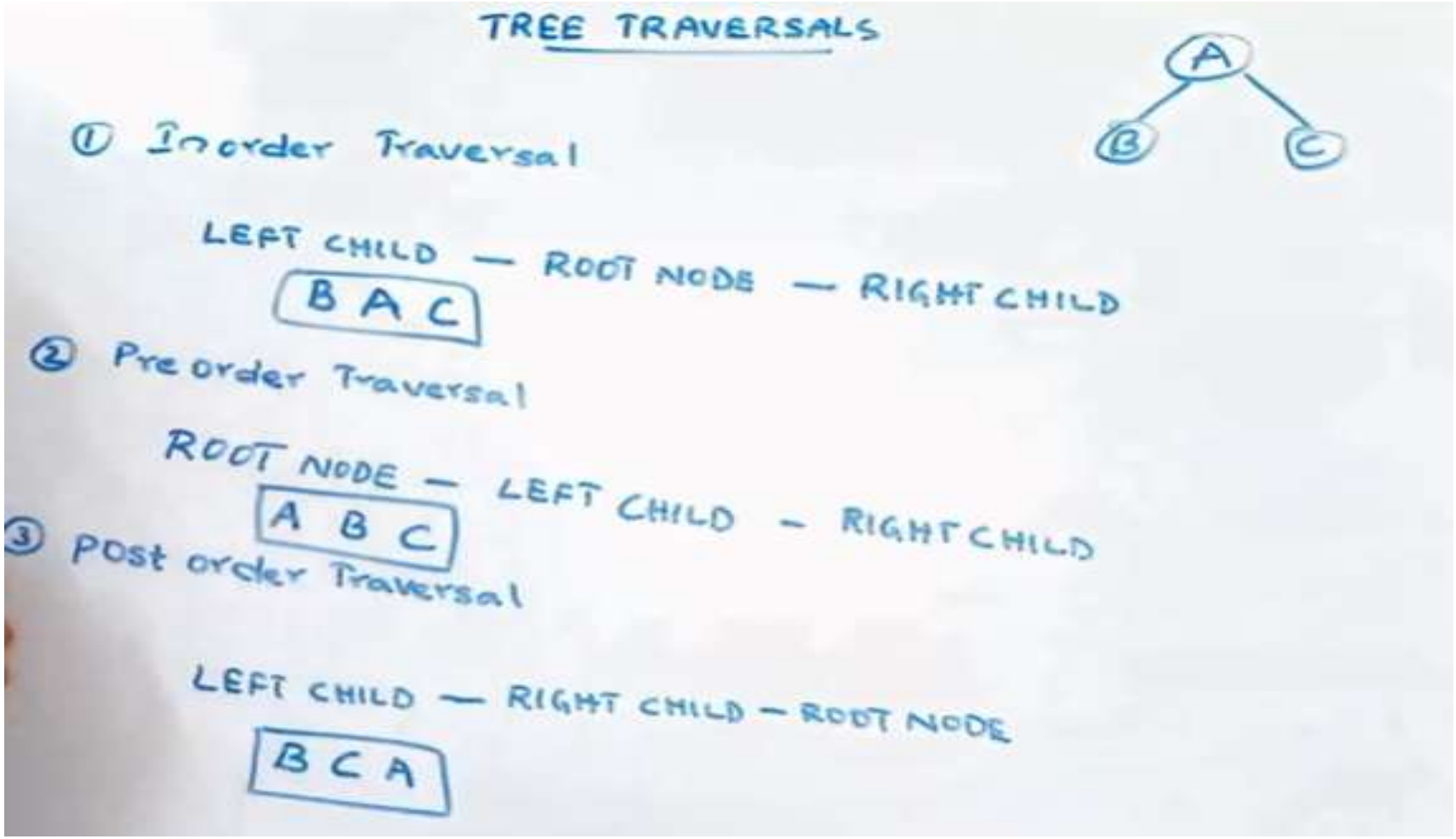
➢Inorder Traversal

➢Preorder Traversal

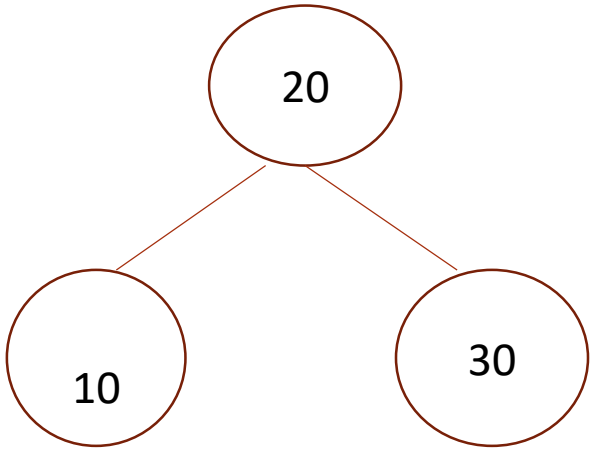
➢Postorder Traversal



Tree Traversals



Examples



- Inorder 10 20 30
- Preorder 20 10 30
- Postorder 10 30 20

Inorder Traversal

Traverse the left subtree in inorder

Visit the root

Traverse the right subtree in inorder

Routine

```
Void Inorder(Tree T)
{
If(T!=NULL)
{
Inorder(T->left);
printElement((T->Element);
Inorder(T->right);
}
}
```

Preorder Traversals

Visit the root

Traverse the left subtree in preorder

Traverse the right subtree in preorder

```
Void Preorder(Tree T)
{
If(T!=NULL)
{
printElement((T->Element);
Preorder(T->left);
Preorder(T->right);
}
}
```

Post order Traversals

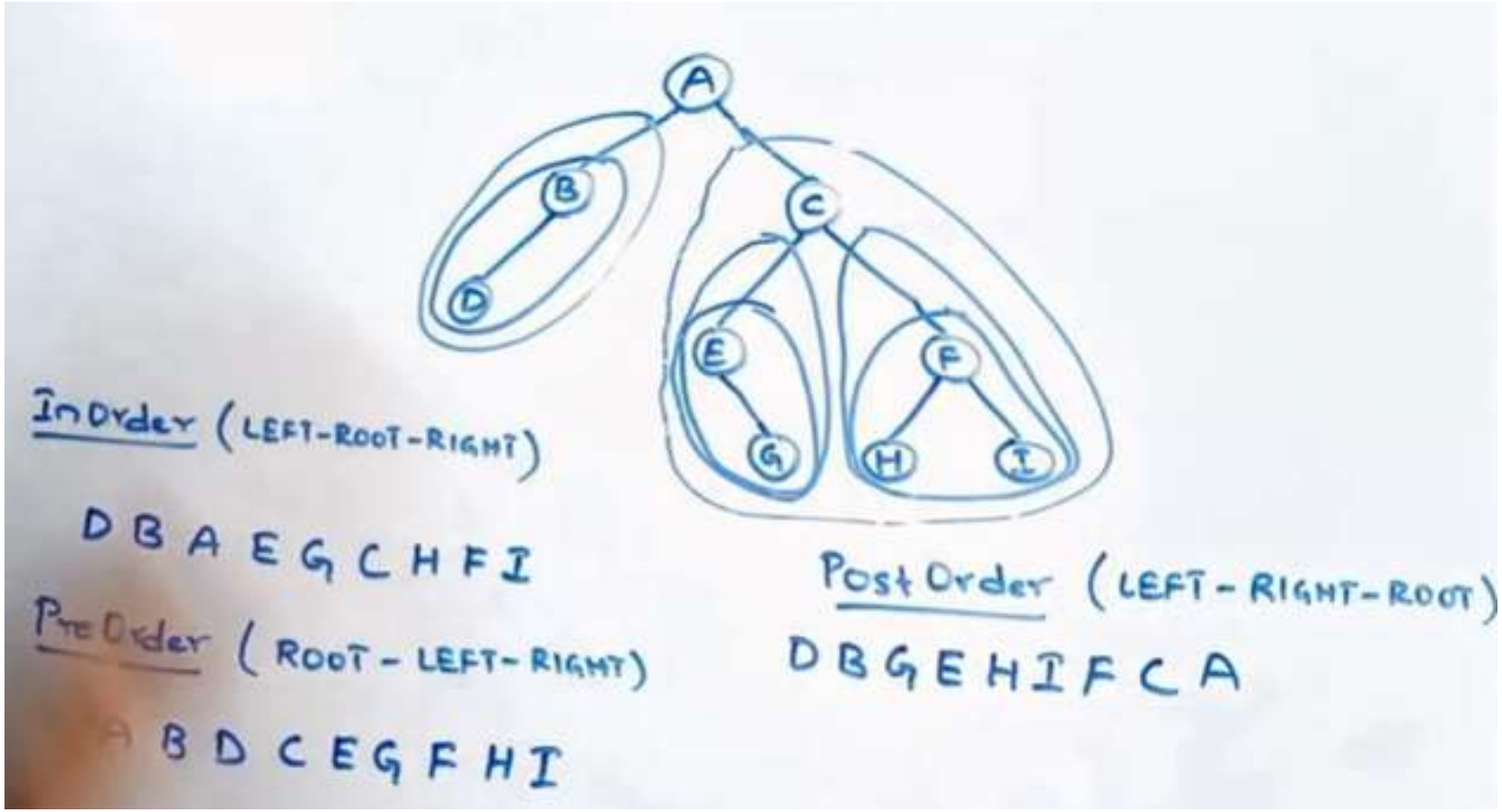
Traverse the left subtree in preorder

Traverse the right subtree in preorder

Visit the root

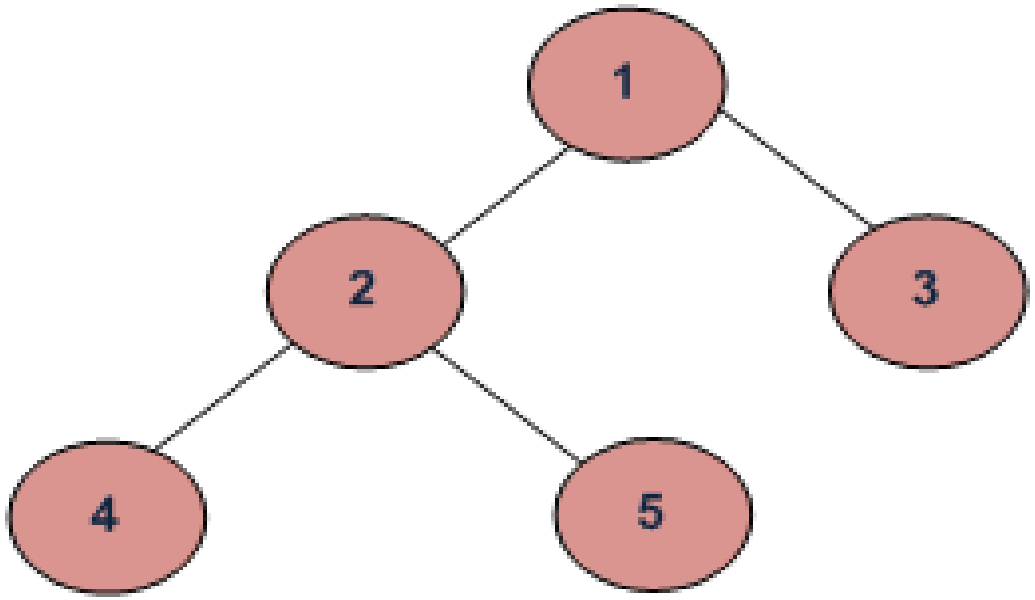
```
Void Postorder(Tree T)
{
If(T!=NULL)
{
Postorder(T->left);
Postorder(T->right);
printElement((T->Element);
}
}
```

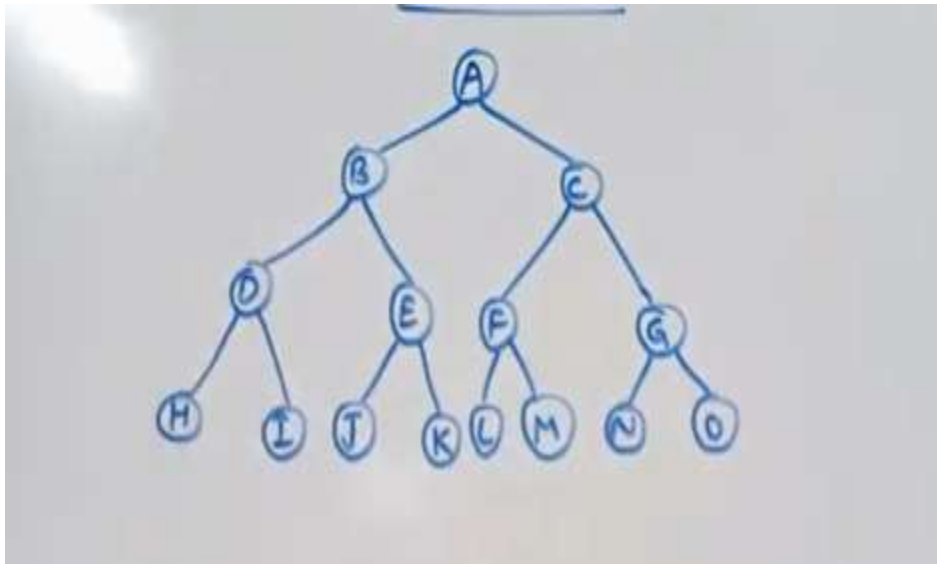
Assessment


A
B
C
D
E
F
G
H
I
InOrder (LEFT-ROOT-RIGHT)
D B A E G C H F I
PreOrder (ROOT - LEFT- RIGHT)
A B D C E G F H I
Post Order (LEFT - RIGHT- ROOT)
D B G E H I F C A

Assessment

Find out the Tree Traversals for the following Tree





References

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2. A. V. Aho, J. E. Hopcroft and J. D. Ullman, “Data Structures and Algorithms”, Pearson Education, 2nd Edition, 2007
3. Ashok Kamthane, " Data Structures Using C ", Pearson Education, 2nd Edition, 2012.
4. Sahni Horowitz, “Fundamentals of Data Structures in C”Universities Press; Second edition 2008

Thank You