



# Aishwarya College

JODHPUR | PALI

BCA II YEAR

1. Course: BCA
2. Class :- BCA II Year
3. Subject: Data Structures & Algorithms(English)
4. Unit :- Third
5. Faculty: Naveen Joshi



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## Contents:-

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2	Binary tree
3	Linear and linked representation of binary tree
4	Tree traversal
5	Inorder, Preorder
6	post order traversal
7	Example of Tree Traversal





## Tree Data Structure

Tree Data Structure :-

A tree is hierarchical data structure and it is used to store the data in parent-child relationship. A tree is implemented for providing security to store data in random order. A tree is designed by two components one is called the node of the tree and other is called the edge or path to the next node in a tree.

There are following types of node in a tree first root node, leaf nodes and third intermediate nodes, these all nodes can be defined by two types of measurement.

1. Indegree :-

It is the count of total incoming edge to a particular node in a tree.

2. Outdegree :-

Outdegree refers to number of outgoing edge from a particular node in a tree.

A root node is a special node having indegree count to zero[0] and the leaf node are those node where outdegree count is zero[0]

Intermediate node having indegree



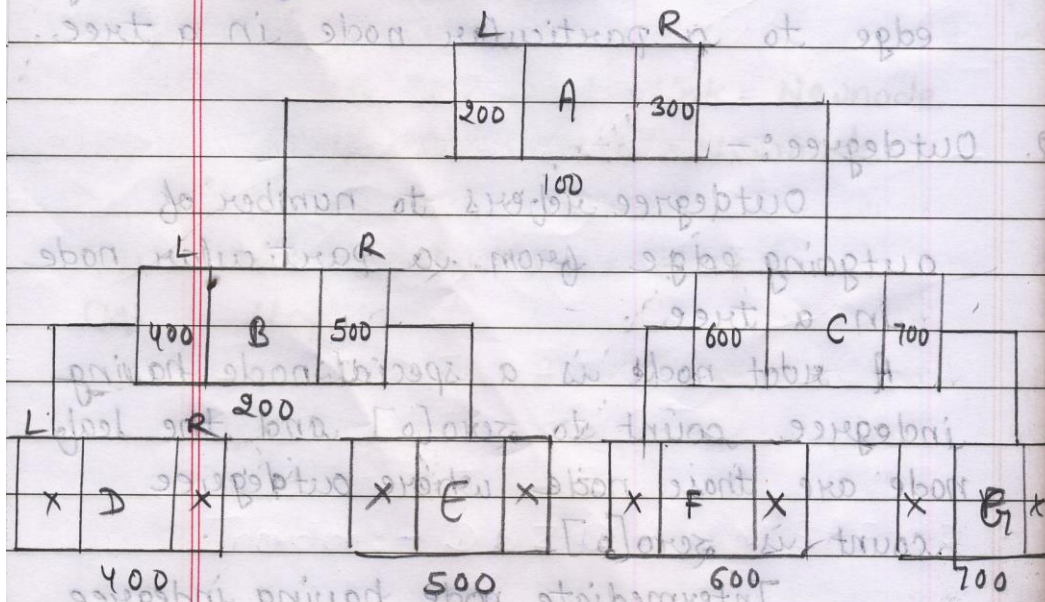


and outdegree count is non zero.

A Binary tree is a category of tree data structure in which the outdegree of a particular node can be 0, 1 and 2.

Linked list Representation of Binary tree:-

When representing a Binary tree in the computer's memory then a node of tree is represented by a node of doubly linked list, which contains three parts, one is used to store user data and other two pointers are used to store the address of left sub and Right sub tree.

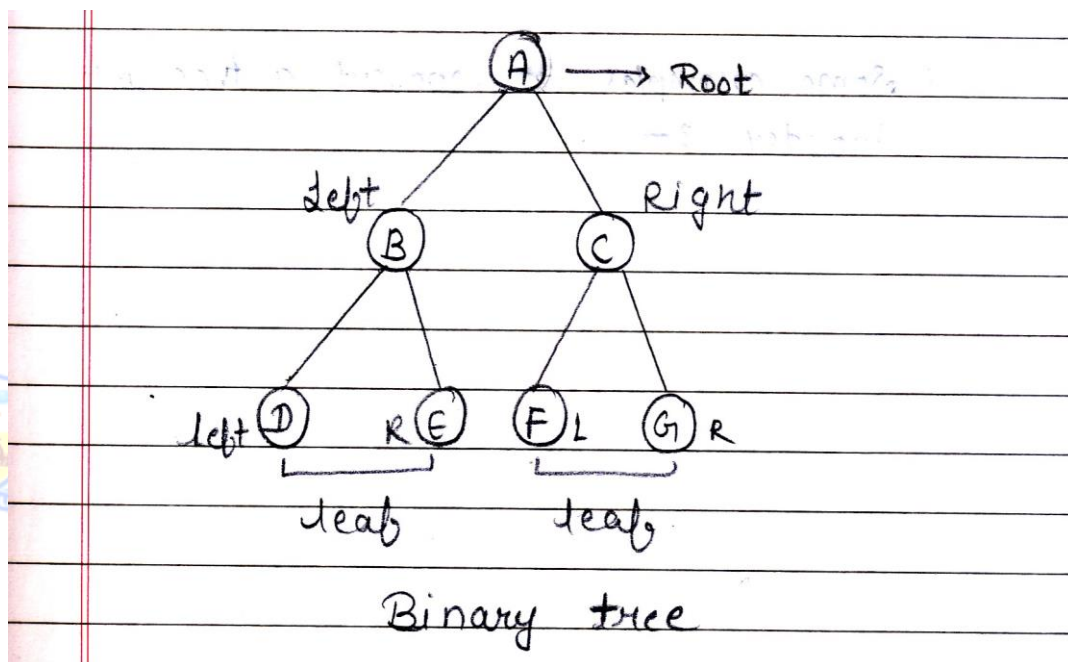




## Tree Representation

### Array Representation of a Binary Tree

The array representation stores the tree data by scanning elements using level order fashion. So it stores nodes level by level. If some element is missing, it left blank spaces for it. The representation of the above tree is like below –



1      2      3      4      5      6      7

A	B	C	D	E	F	G
---	---	---	---	---	---	---

### **Array Representation of a Binary Tree**

The index 1 is holding the root, it has two children 5 and 16, they are placed at location 2 and 3. Some children are missing, so their place is left as blank. In this representation we can easily get the position of two children of one node by using this formula –

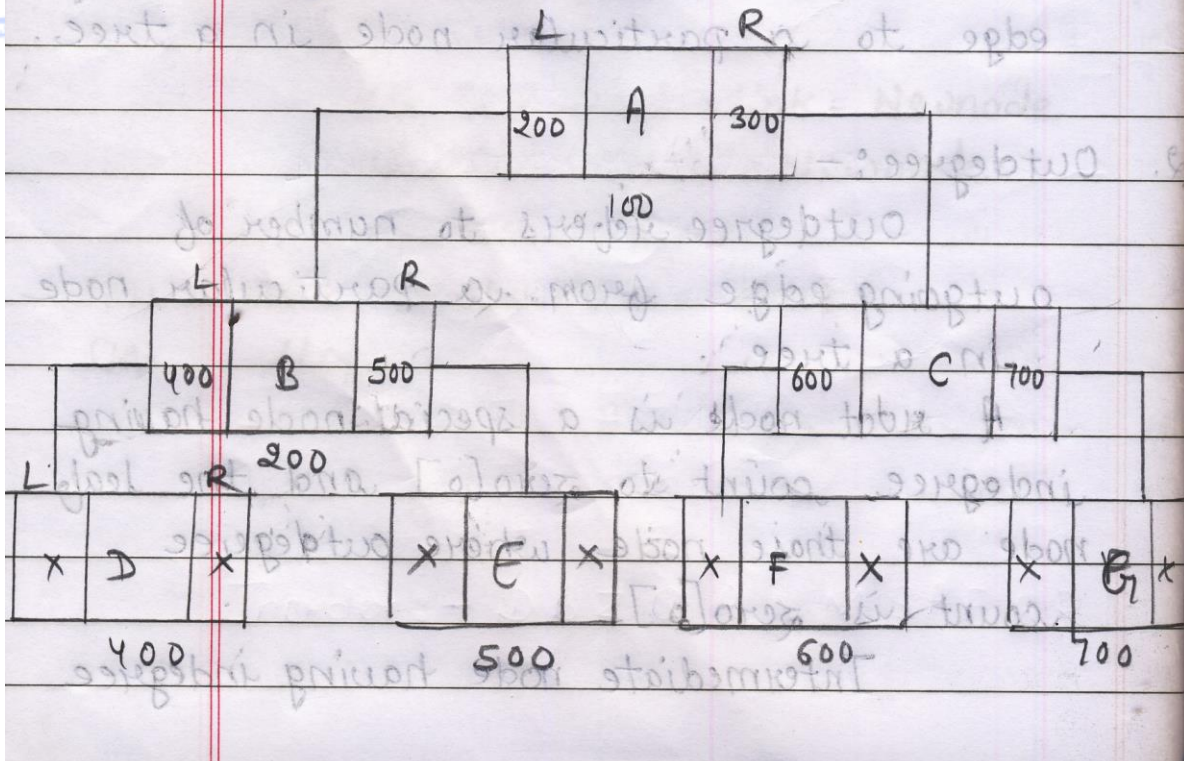
$$\text{child1} = 2 * \text{parent} \quad \text{child2} = 2 * \text{parent} + 1$$





## Linked List Representation of Binary Tree

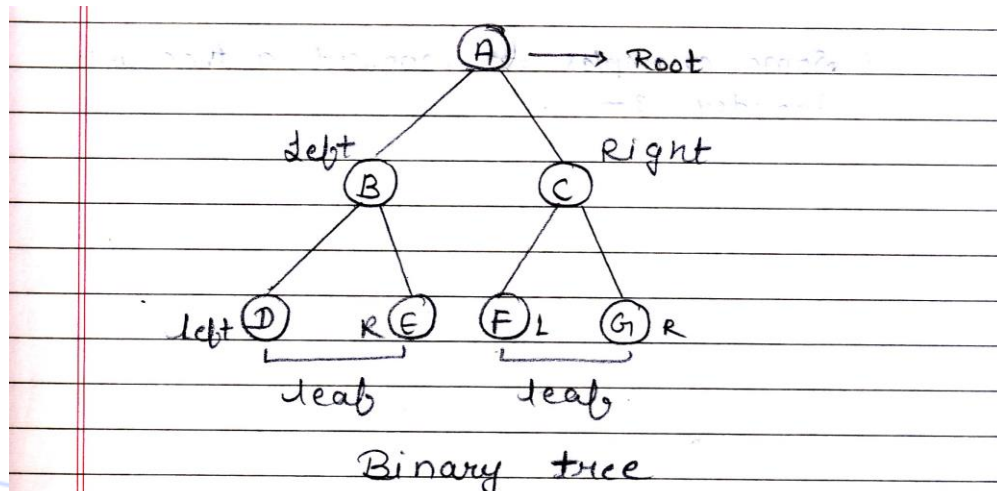
Linked list Representation of Binary tree:-  
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## Tree Traversal

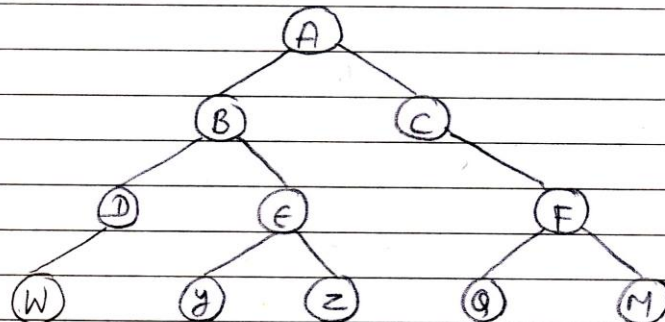
Traversal is a process to visit all the nodes of a tree and may print their values too. Because, all nodes are connected via edges (links) we always start from the root (head) node. That is, we cannot randomly access a node in a tree. There are three ways which we use to traverse tree:-



Tree traversal :-

Tree traversal can be performed by three orders :-

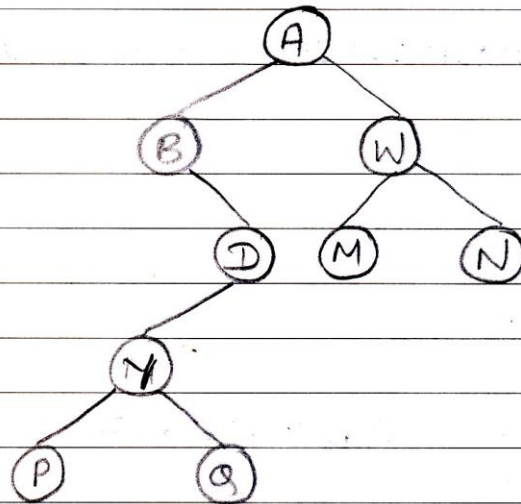
1. Inorder  $\Rightarrow$  Left - Root - Right
2. Preorder  $\Rightarrow$  Root - Left - Right
3. Postorder  $\Rightarrow$  Left - Right - Root.



Inorder :- W D B Y E Z A C Q F M

Preorder :- A B D W E Y Z C F Q M

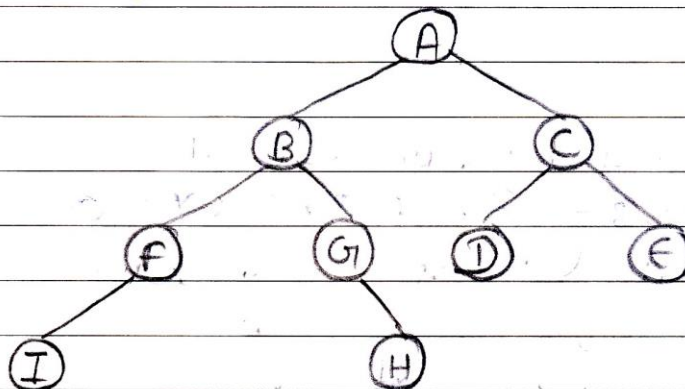




Inorder :- B P Y Q D B A M W N

Preorder :- A B D Y P Q W M N

Postorder :- P Q Y D B M N W A



Inorder :- I F B G H A D C E

Preorder :- A B F I G H C D E

Postorder :- I F H G B D E C A





## Questions

### Part A (2 X 20)

1. What do you mean by Data Structures?
2. What is Tree?
3. What is ADT?
4. What is Circular Tree?
5. What is binary tree?
6. What is complete Binary Tree?
7. Define Linked List representation of Tree?
8. What is Forest?

9. What is Threaded B Tree?

10. What is Forest?

11. Define In order traversal?

12. Define pre order in tree.

13. What are types of tree?

14. What is use of D Linked List in Tree?

15. Define primary data structures?

16. Define post order traversal.

17. What is Array representation of B Tree?

18. Define multi dimension Array.

19. What is leaf node?

20. Define root node.



## Part- B (7 X 5)

1. What do you mean by data structures? Explain B Tree with example.
2. Explain tree data structure with in order traversal algorithm.
3. Write algorithm to create a BS Tree.
4. Explain conversion of Infix to Postfix expression with example.
5. Write algorithm for post order traversal.

## Part- C (10 X 3)

1. What do you mean by linked list? How it is used in tree?
2. Explain Threaded Binary tree.
3. Explain the process of creating Binary Tree using Preorder & in order traversal with example.

