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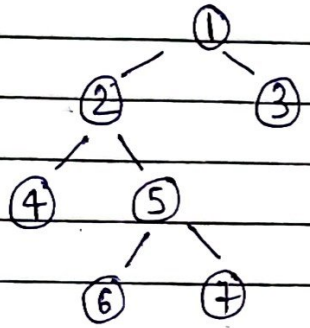
DS Important Question Solutions

1. Types of Binary Tree with eg.?

Ans There are 5 types of Binary Tree :-

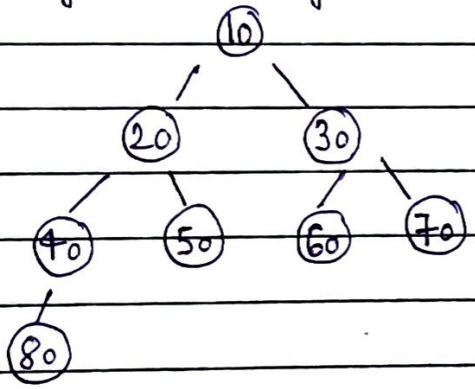
1. Proper / full / Strict Binary Tree :- A full Binary Tree is a special type of Binary Tree in which every parent node / Internal node has either two or no children.

eg:



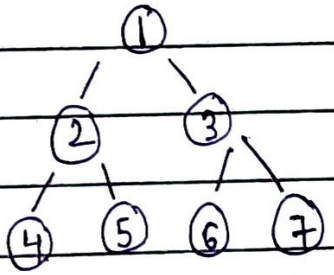
2. Complete Binary Tree :- It is a tree in which all the nodes are completely filled except the last level, all the nodes must Be as left as possible. In a this, the nodes should Be added from the left.

eg:



3. Perfect Binary Tree :- It is a perfect Binary Tree if all the internal nodes have 2 children and all the leaf nodes are at same level.

eg:



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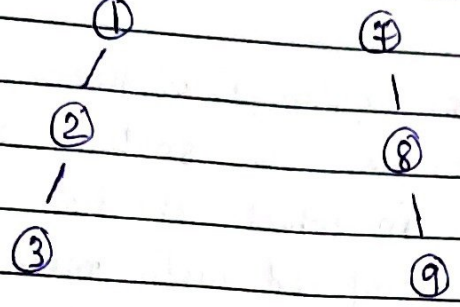
4. **Degenerate Binary Tree** :- It is a tree having single child either left or Right.

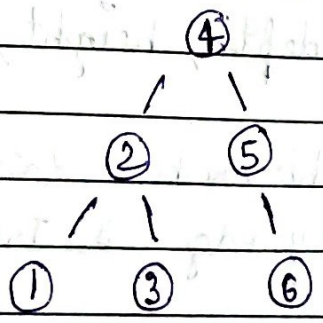
5. **Skewed Binary Tree** :- It is a Pathological or degenerate Tree in which tree is either dominated By left child node or Right nodes. There are two types of skewed Binary Tree left skewed tree and Right skewed tree.

eg:



6. **Balanced Binary Tree** :- It is a tree in which Both the left and Right Trees differ By atmost 1.

eg: AVL and Red Black Tree are Balanced Binary Tree.



2. Explain Searching? types of search in Brief.

Ans Searching is a process of finding some particular element in the list. If the element is present in the list, then the process is called Successful and The Process Returns the location of that element, otherwise Search is called Unsuccessful.

→ There are two types of searching :-

1. Linear Search.
2. Binary Search.

1. Linear Search :- It is the Simplest Search Algorithm and also called Sequential Search. In this, We Simply Traverse the list completely and Match each element of list with the item whose location is to Be found. If Match found then location of item is Returned otherwise Algorithm Return NULL. It is mostly used in Unordered list in which items are not Sorted.

2. Binary Search :- It works on Sorted lists Hence, In order to Search, It must ensure that list is sorted. It follows divide and Conquer Approach in which, the list is divided into two halves and item is compared with middle element. If the Match is found then, the location of Middle element is Returned otherwise, We Search into either of the halves depending upon the Result Produced Through the match.

3. What is Tree ? What is depth, height, descendent and Path of Tree ?

Ans :- 1. Tree :- A Tree is a non-linear hierarchical data structure that Consists of nodes connected By edges. In Tree, Topmost node is known as Root node.

2. depth :- The length of The Path from the Root to the node X. It is also defined as no. of edges B/w Root node and node X. The Root has 0 depth.

3. Height :- The longest Path from the node X to the leaf node.

4. descendent :- The immediate Successor of given node is known as a descendent of a node.

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5. Path of Tree :- Path Refers to the sequence of nodes along the edges of a Tree.

4. What is Binary Search Tree? Explain with eg.?

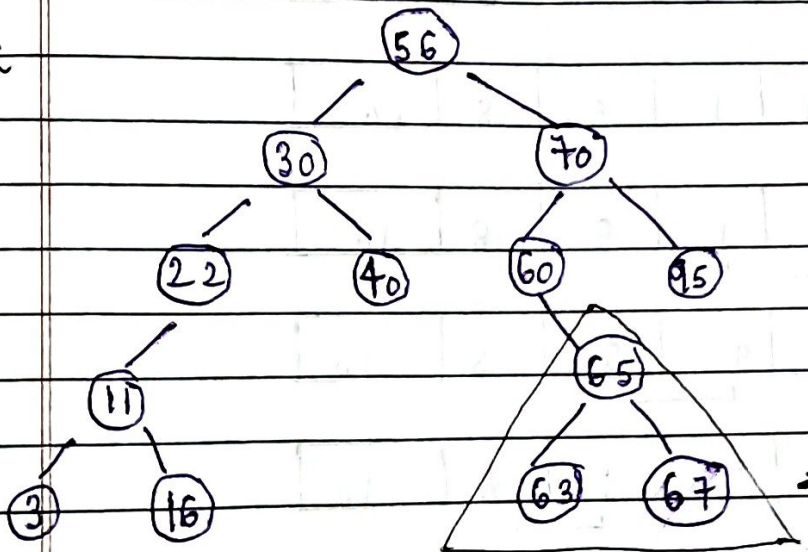
Ans Binary Search tree is more constricted extension of Binary Tree.

⇒ It follows Properties of Binary Tree.

⇒ It has a Unique Property that the Value of left child of given node should be less than or equal to parent value and the value of Right child should be greater than or equal to the parent Value.

⇒ Uses :- 1. Used to implement simple sorting Algo.
2. Can be Used as priority queues.

eg.



→ left Value ≤ node Value ≤ Right Value.

5. Sort the following with the help of Bubble sort. Show Result after each step.

7 10 2 9 1 5 8

⇒ Ans on next Page. → → →

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Pass·1

Step·1

7	10	2	9	1	5	8

Step·2

7	10	2	9	1	5	8

Step·3

7	2	10	9	1	5	8

Step·4

7	2	9	10	1	5	8

Step·5

7	2	9	1	10	5	8

Step·6

7	2	9	1	5	10	8

Step·7

7	2	9	1	5	8	10

→ largest Value.

Pass·2

Step·1

7	2	9	1	5	8	10

Step·2

2	7	9	1	5	8	10

Step·3

2	7	9	1	5	8	10

Step·4

2	7	1	9	5	8	10

Step·5

2	7	1	5	9	8	10

Step·6

2	7	1	5	8	9	10

Step·7

2	7	1	5	8	9	10

ass·3

Step·1

2	7	1	5	8	9	10

Step·2

2	7	1	5	8	9	10

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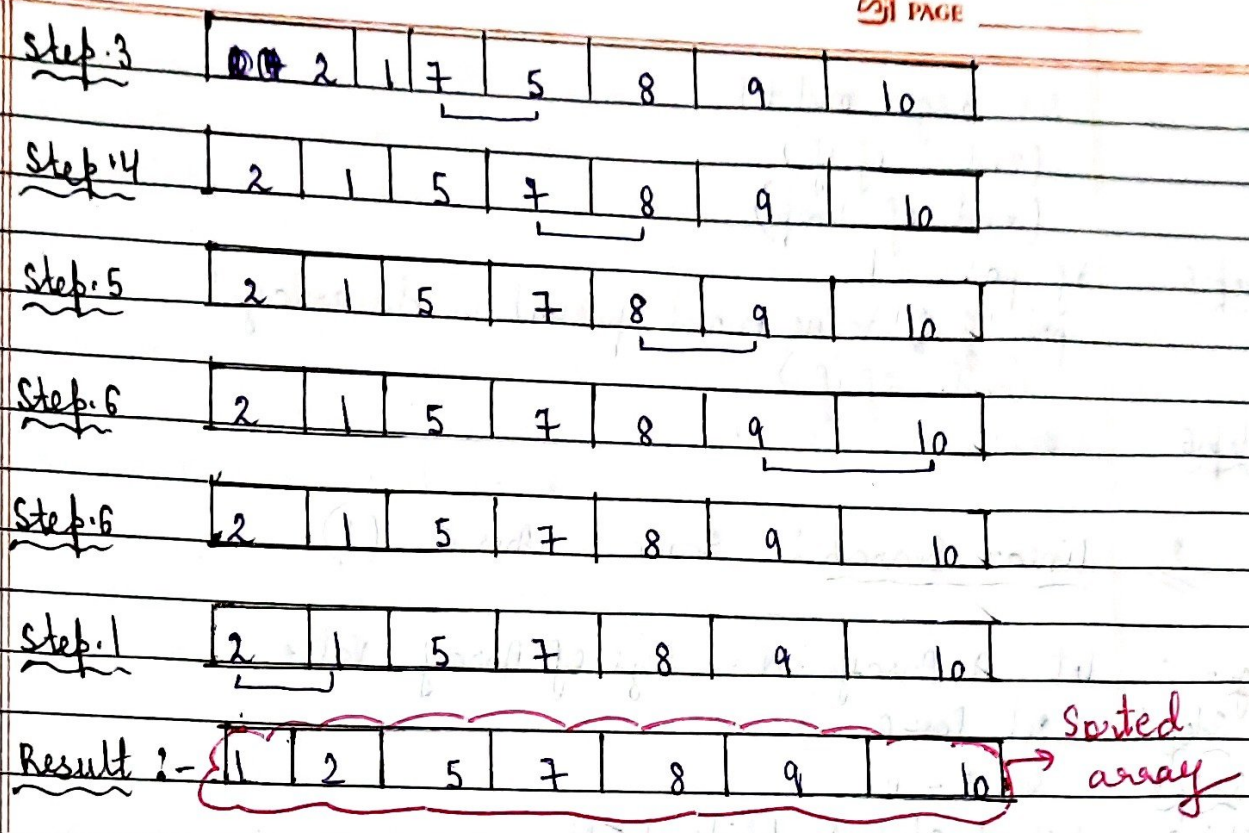


6. What is Binary Search and linear Search? Explain its Working with the help of eg. & Algorithm?

Ans. Binary Search :- Same as Ans. 2 (2).

Algo: Let A Be the array and We have to Search Val, LB = lower Bound, Index of 1st element; Ub = Upper bound, Index of last element.

Step.1 Set Beg = lower_bound.
end = upper_bound, pos = -1.

Step.2 Repeat step 3 and 4 while Beg <= End.

Step.3 Set mid = (Beg + end)/2.

Step.4 If A(mid) = Val.
Set pos = mid + 1
print Pos
go to step 6
else if A(mid) > Val
set end = mid - 1
elseif A(mid) < Val

Set Beg = mid + 1
(end of if)
(end of loop)

Step-5 if pos = -1
print§" Value is not present in the array"
(end of if)

Step-6 exit.

2. Linear Search :- Same as Ans-2 (1).

Algo- Let A = Array, N = Size of Array, Val.

Step-1 Set Pos = 0

Step-2 set I = 0

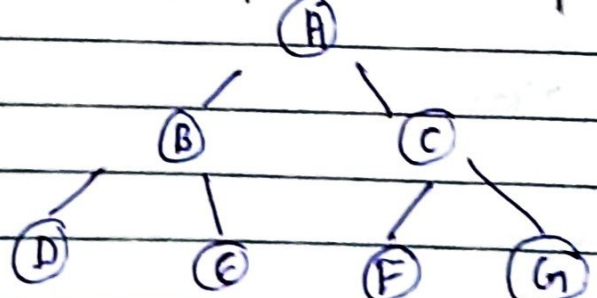
Step-3 Repeat step 4 while I < N

Step-4 if A(i) = Val
Set pos = I + 1
print Pos
go to step-6
(end of if)
Set I = I + 1
(end of loop)

Step-5 if Pos = 0
print "Value is not present in the array"
(end of if)

Step-6 exit.

7. give Inorder, postorder and preorder of the Tree.



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Ans 1. Inorder :- D B E A F C G.
2. Postorder :- D E B F G C A
3. Preorder :- A B D E C F G.

8. What is Sorting ? Name different sorting Algorithm.
Ans Sorting is a process of Arranging the elements of an array so that they can be placed either in ascending or descending order.

→ There are Sorting Algorithm :-
1. Bubble sort
2. Insertion Sort.
3. Selection Sort.
4. Quick Sort.
5. Merge Sort.
6. Heap Sort.

9. Applications of Tree ?
Ans 1. Storing Naturally hierarchical data :- Trees are used to store the data in the heirarchical structure.

2. Organize data :- It is Used to organise data for efficient Insertion, deletion and Searching.

3. Trie :- It is a special kind of Tree that is Used to store the dictionary. It is a fast & efficient Way for dynamic spell checking.

4. Heap :- It is also a tree data structure implemented Using arrays It is implement priority queues.

5. B-Tree and B+ Tree :- They are the tree data structures used to implement Indexing in databases.

6. Routing tables :- The Tree data structure is also used to store the data in Routing tables in Routers.

10. Properties of Tree ?

Ans 1. Recursive data structure :- A Tree is also known as Recursive data structure. A Tree can be defined as Recursively Because the distinguished node in a Tree data structure is known as Root node. Recursion Means to Reduce Something in Self-Similar Manner.

2. No. of edges :- If There are n nodes, then there would n-1 edges. each arrow in the structure Represents the link or path. Each node, except Root node will have atleast one incoming link known as edge. There would Be one link for Parent-child Relationship.

3. Depth of node X :- Same as Ans. 3 (2)

4. Height of node X :- Same as Ans. 3 (3).

11. Traversal in data structure and types of Traversal (DFS & BFS).

Ans The Process of Visiting the nodes of is known as Tree Traversal. It is divided into 2 Categories :-

1. DFS :- It stands for depth First search Algorithm. It starts with Root node and first visits all nodes of one Branch as deep as Possible of the choosen node and Before backtracking, it visits all other Branches in a

similar fashion.

There are Three types of This :-

1. Inorder Traversal
2. preorder Traversal
3. Postorder. Traversal.

2. BFS :- Breadth first search Algorithm. It also starts from the Root node and visits all nodes of current depth Before Moving to the next depth in a Tree.