19/01/2021

1. The different between Linear and non-Linear data structures is :

No	key	Linear Data Structures	non-Linear Data Structures
1.	Data Element Arragement	in Linear data Structures data elements are sequentially and each elements travessable in single run.	data elements are hierarchically connected and Present at various levels.
2.	Levels	all elements are Present at Single level.	data elements are present at multiple levels.
3.	Implementation Complexity	Linear are easier to Implementation	non-linear are difficult to understand and Implementati-on
4.	Traversal	Linear data Structures can be Transversed completely in Single run	not easy to traverse and need multiple runs to be traved completely.
5	memory Utilization	Linear data Structures are not very memory Friendly and are not Utilization memory efficiently.	non-linear ds uses memory very efficiently.
6.	Time Complexity	Time Complexity in Linear DS are increase with increase in Size	Time Complexity non linear DS often remain with increase in size

2. Describes the following terminology in a tree :
   - Base root : the First node of the tree.
   - Key : The value inside the Node.
   - Edge : The link between two node.
   - Siblings : a Node that has a same level in tree.
   - Parents : a Node that has an edge to child node
   - child : a Node that has a parents Node
   - leaf : a Node that does n't have child node in the tree.

3. Explain the Following Types of binary Trees : Full, Complete and perfect
   - Full binary Tree : a binary tree tha has either zero children or two children.
   - Complete Binary Tree : a binary tree Where all the tree level are filled entirely with nodes, except the lowes level of the Tree.
   - Perfect Binary Tree : a binary tree where all internal nodes have strictly two children and every node in same level in the Tree.
   - Balanced Binary Tree : we can identify a balanced binary tree if the Height of the left & right Subtree Vary by atmost one.
   - Degenerate Binary Tree : a binary tree where every node has only a single child and similar to a Linked list.

4. What makes a tree Balanced :
   * if the Height of the left and right Subtree Vary by atmost one.

5. The four properties OF binary Tree :

- Property one : The maximum number of nodes on level x is 2^x where $x \geq 0$
- —/— Two : The maximum number of nodes possible in binary tree of height x is $2^x - 1$
- —/— Three : The maximum number of nodes in binary tree of height x is x
- —/— Four : for any non-empty binary tree, if n is the number of nodes and e is the number of edges. then $n = e + 1$

6. Explain the intuition of Implementation Binary Tree using Array!
   - Root is index 0
   - left child is $2x + 1$
   - Right child is $2x + 2$
   - Parent is $(p - 1) / 2$

   $x = (p - 1) / 2$
   x = Parent's Index
   p = Right Index

7. Explain the differences between in order successor and In order predecessor!
   - Predecessor (the nodes lies behind of given node) o
   - Successor (the nodes lies ahead of given node).

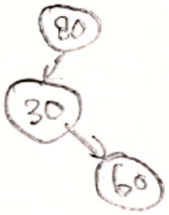
8. Draw the following binary Tree step by step (14 step)
   - Insert : 80, 30, 60, 50, 75

1.


BF = 0

2.

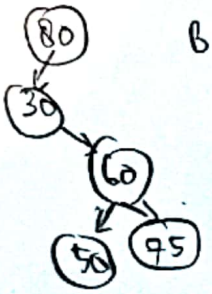

BF = 1

3.


BF = 2

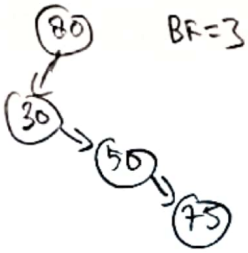
4


BF = 3

5).


BF = 4

- Delete : 60, 30, 75

6).


BF = 3

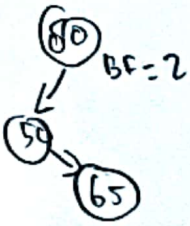
7).


BF = 2

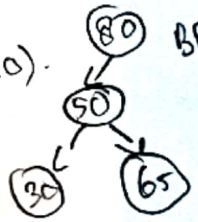
8).


BF = 1

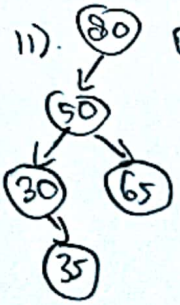
- Insert : 65, 30, 35

9).


BF = 2

10).


BF = 2

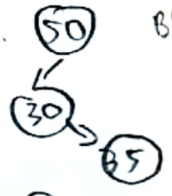
11).


BF = 3

- Delete : 80, 65, 35

12).


BF = 2

13).


BF = 2

14).


BF = 1