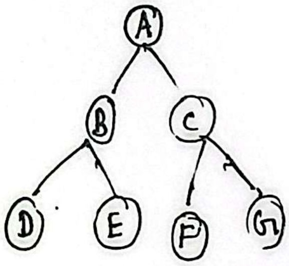
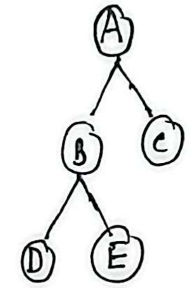
Heap

Binary tree:- A binary tree is a tree data structure where each node have at most two children.

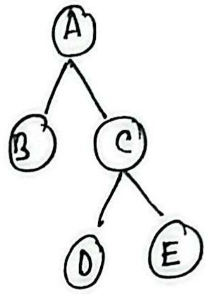
(i) Left child (ii) Right child.



T→	A,	B,	C,	D,	E,	F	G
	1	2	3	4	5	6	7



T→	A	B	C	D	E
	1	2	3	4	5



T→	A	B	C	-	-	D	E
	1	2	3	4	5	6	7

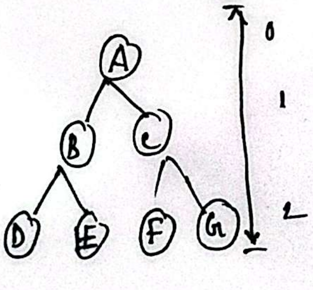
if a node is at index → i

its left child is at → $2*i$

its right child is at → $2*i+1$

its parent is at → $\left\lfloor \frac{i}{2} \right\rfloor$ → floor

Full Binary Tree



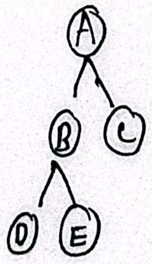
if $h = n$

∴ number of nodes $= 2^{h+1} - 1$

Binary tree with maximum number of node is called full binary tree.

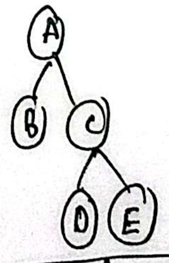
Complete binary tree.

There is no empty elements or gap in between two nodes.



A	B	C	D	E

Complete



A	B	C	-	-	D	E

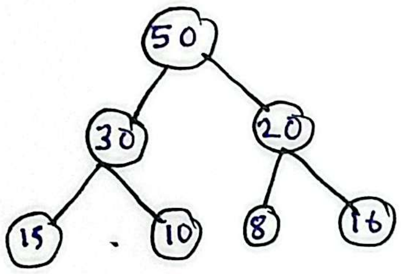
Not complete

Heap

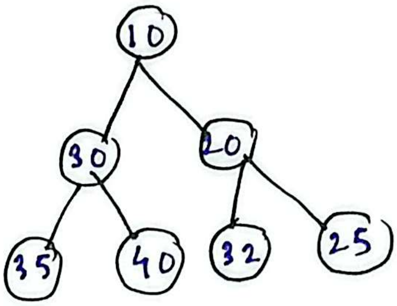
For heap it has to be complete binary tree.

Max Heap

Max Heap



Min Heap



<u>In certinon</u> (T.C. → O(logn) ⇒ O(1) → O(logn) → Direction is leaf to root

Because Height of a complete binary tree is O(log n)

Deletion → Direction is root to leaf

T.C → O(log n)

⊛ when we delet from max heap we delete the largest element.