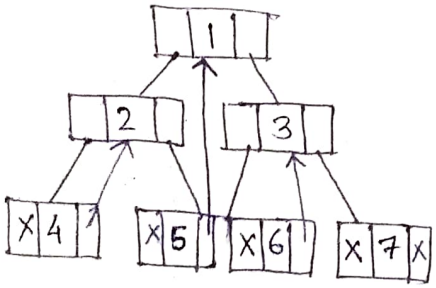
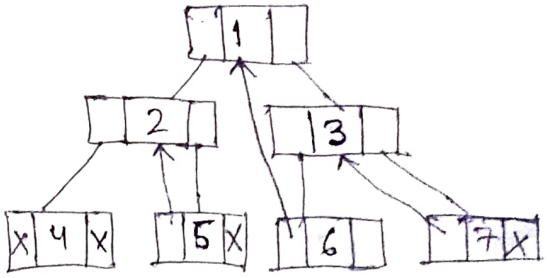
Data Structures :-

① Structure of node in threaded binary tree :-

ⓐ In one-way threading, a thread appears either in the right field or the left field of the node. A one-way threaded tree is also called a single threaded tree. If the thread appears in the left field, then the left field will be made to point to the inorder predecessor of the node. Such a tree is called a left-threaded tree. If the thread appears on the right field, then it will point to the inorder successor of the node. This is called a right-threaded tree.

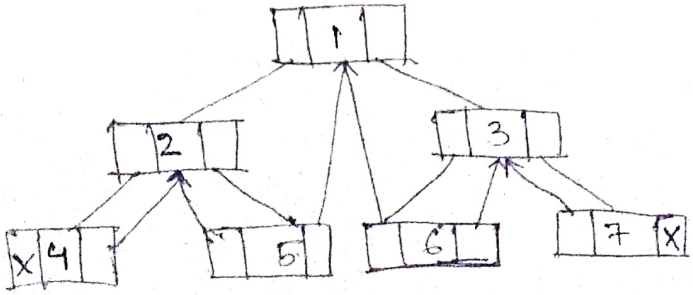


Linked representation of right-threaded B tree



Linked representation of left-threaded B tree

ⓑ In two-way threading, threads will appear in both the left and right field of the node. It is also called a double-threaded tree.



Linked representation of double-threaded B tree

Advantages

(1) We can avoid the recursive method of traversing a tree which uses stack & consumes a lot of memory.

(2) The node can keep record of its root.

(3) Threads make possible to back up higher levels and enables forward & backward traversal of nodes by inorder fashion.

(11) Comparing Quick & merge sort :-

Basis for Comparison	Quicksort	Merge sort
Partition of elements in the array	The splitting of array is in any ratio, not necessarily divided into half.	The splitting of array of elements is in any ratio, not necessarily divided into half.
Worst case complexity	$O(n^2)$	$O(n \log n)$
Works well on	Works well on smaller array	Operates fine on any size of array
Speed of execution	Works faster than other sorting algorithms for small data set like Selection sort etc.	It has consistent speed on any size of data.
Additional storage space requirement	Less (in-place)	More (not in place)
Efficiency	Inefficient for larger arrays	More efficient
Sorting method	Internal	External
Stability	Not stable	Stable
Preffered for	Arrays	Linked lists
Overall	good	poor

(12) Calculating minimum & maximum height from number of nodes -

If there are n nodes in binary tree, maximum height of the binary tree is n-1 and minimum height is floor ($\log_2 n$).

for eg.1: left skewed binary tree in Fig.1 with 5 nodes has height 5-1 = 4 & and binary tree in Fig.2 with 5 nodes has height- floor ($\log_2 5$) = 2.

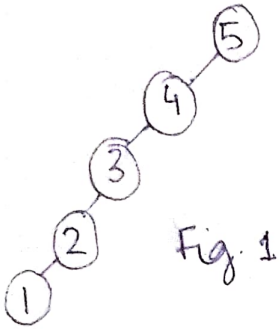


Fig. 1

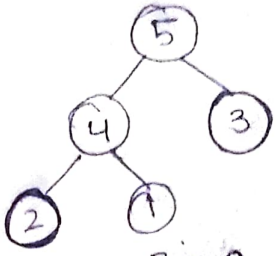


Fig. 2

Eg 2: height of left skewed tree having 8 nodes in Fig.3 is 8-1 =7. Height of tree having 8 nodes in Fig.4 is floor ($\log_2 8$) = 3.

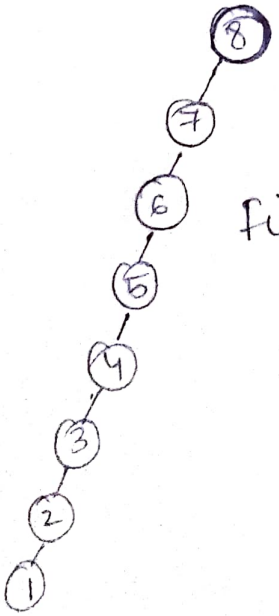


Fig. 3

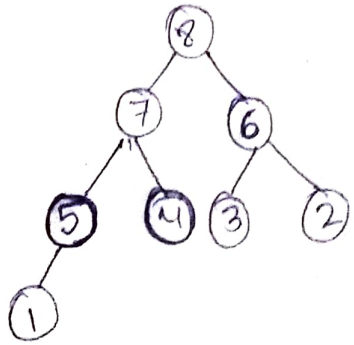


Fig. 4