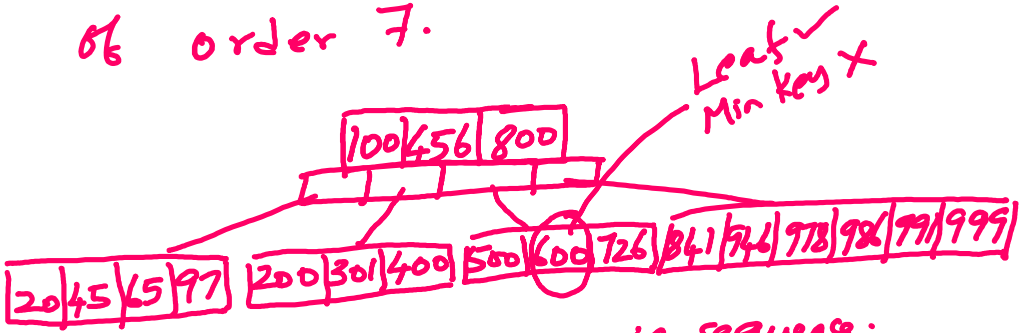
B tree deletion

01 October 2020 09:37

Example 1:

Consider the following B-Tree of order 7.



Leaf ✓
Min key ×

Delete 600, 800, 20 in sequence.

Delete 600:

order m = 7

Min Child $t = \lceil 7/2 \rceil = 4$

∴ Min keys = 3

Delete key 600.

Is a leaf node - Yes ✓

Min key available - No ×

Borrowing possible from Left Sibling } - No ×

Borrowing possible from Right Sibling } - Yes ✓

key - 800 ✓

Intervening Parent key-800
Smallest in Right Sibling -841 ✓

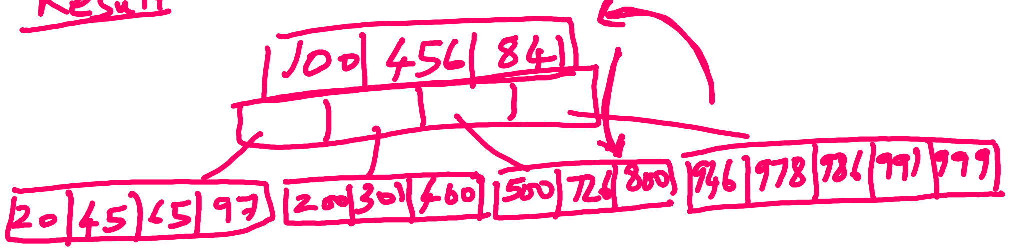
Move 841 to 800. ✓

Bring 800 down to the node in which the key is to be deleted.

Now delete 600.

Also Remove 841 in Right Sibling and adjust the Pointers.

Result



2) Delete 800

Leaf node - Yes ✓
Min key available - No ✗
Left Sibling borrowing - No ✗
Right Sibling borrowing - Yes ✓

Intervening Parent key-841
Smallest in Right Sibling -946

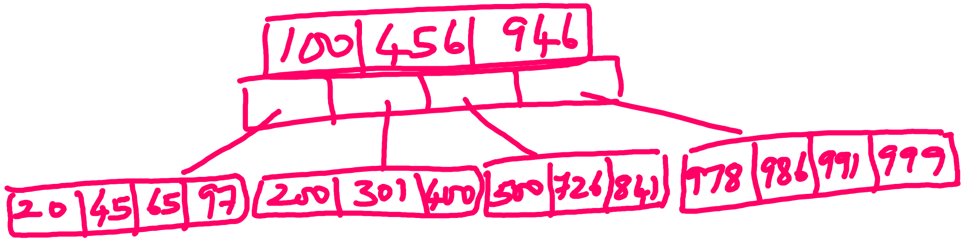
Move 946 to 841 & bring 841 down to node to be deleted.

Now delete 800.

Also Remove 946 in Right Sibling

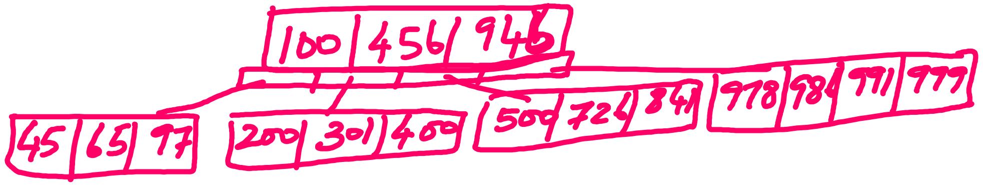
Also Remove
& adjust Pointers.

Result:



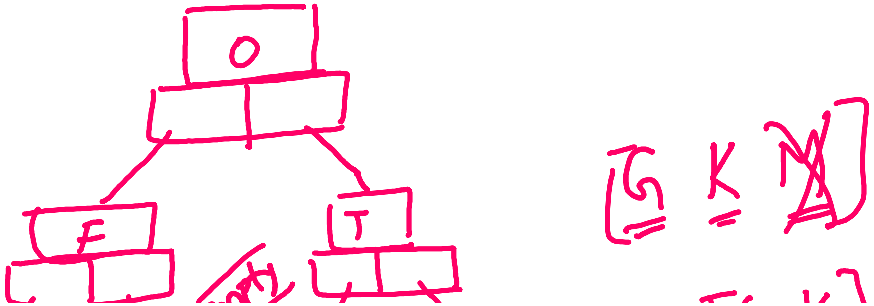
3) Delete 20:

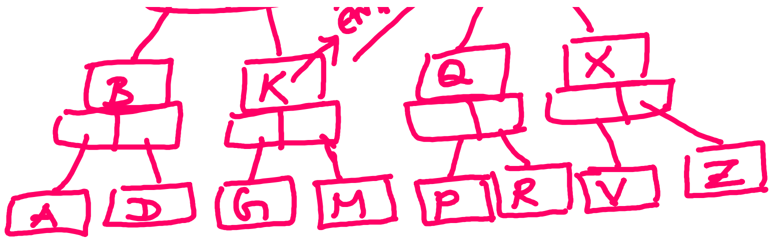
Leaf node - Yes ✓
Min key available - Yes ✓
Simply delete 20 & adjust Pointers



Example 2:

Given B-Tree of order 3.





[G K)

Delete M.

Step 1:

Leaf node – Yes ✓

Min Key available – No ×

Left Sibling borrowing – No ×

Right Sibling borrowing – No ×

Now Combine/Merge

Left sibling

Intervening Parent key

Node in which deletion takes place

$\boxed{G}$ K $\boxed{m}$

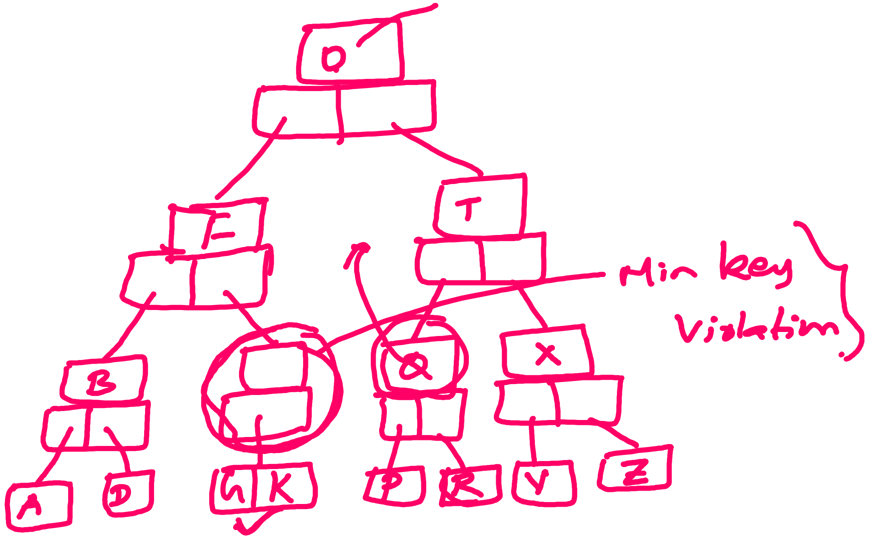
⟹ [G K M]

Now delete 'M'

⟹ [G K] ✓

Now delete intervening Parent key in Parent node.

The result is



The deletion in Parent cause Min key violation.

Also borrowing not possible

Merge left sibling B,

Intervening Parent element F

Node in which deletion to be done } K

(ie) B F K

delete K.

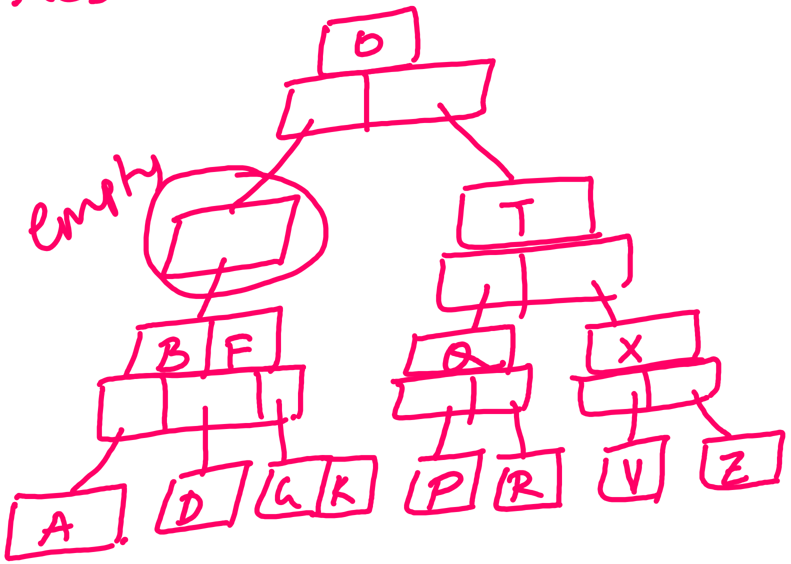
Result is B F

Parent

. height is reduced by 1

Now delete intervening key in Parent node.

Result is



The deletion in Parent, Cause min key violation. Also, left or Right borrowing not possible

Merge node to be deleted F

Intervening Parent O

Righ Sibling T

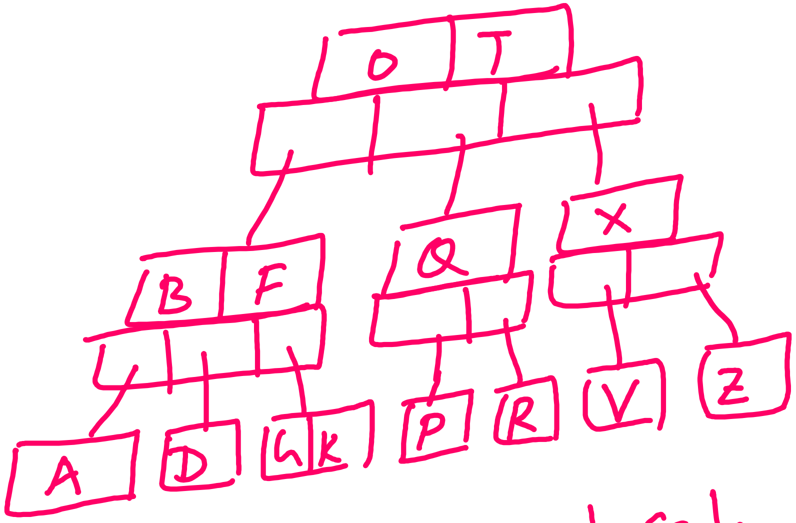
∴ [F O T]

Delete F.

Result is $\boxed{O \mid T}$

Now delete 'O' in parent node. Result is empty root node. Since we can't propagate further, we create new root node as $\boxed{O \mid T}$.

The result is



Here Height is reduced.