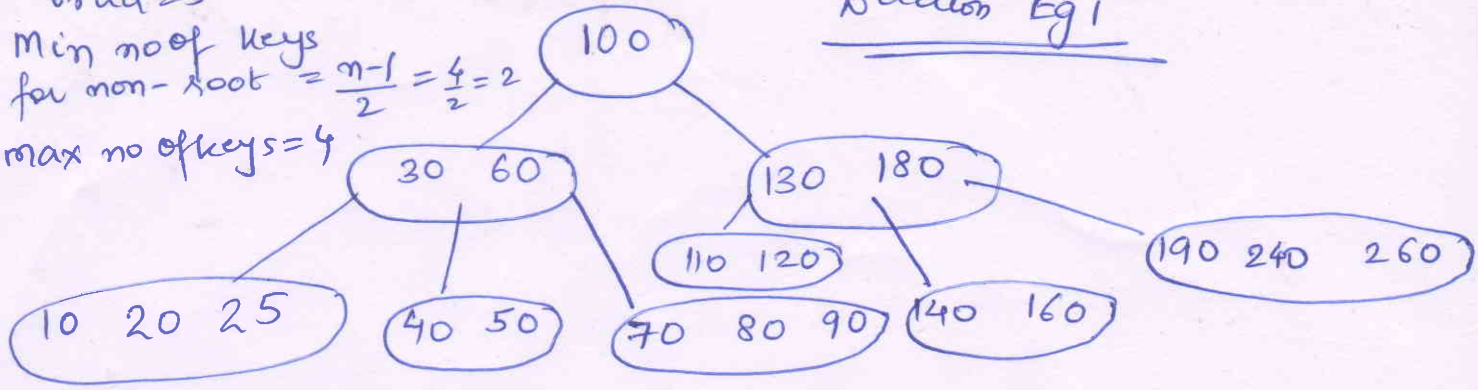
Deletion Eg 1

Order = 5

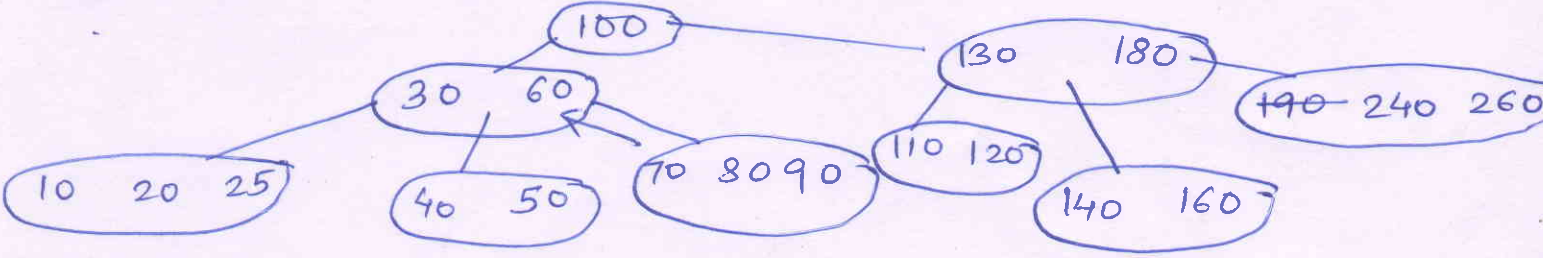
Min no of keys for non-root $= \frac{n-1}{2} = \frac{4}{2} = 2$

max no of keys = 4



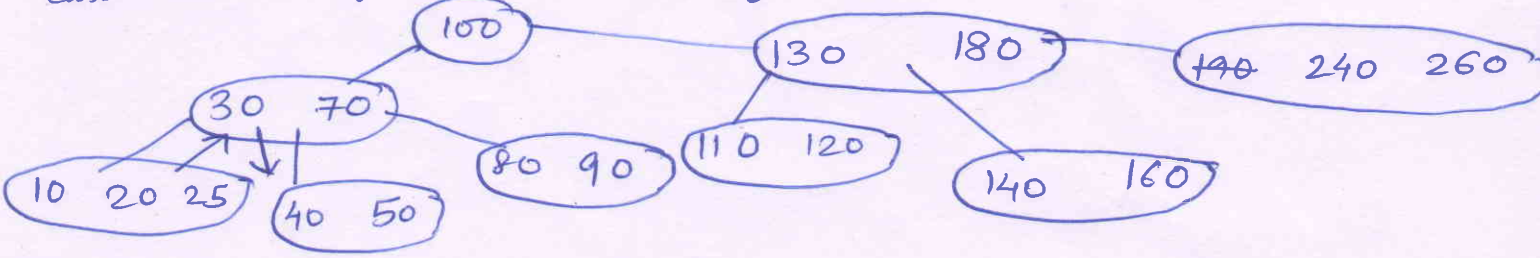
Delete 190 →

Case – Leaf Node, > min no of keys, Just delete it.



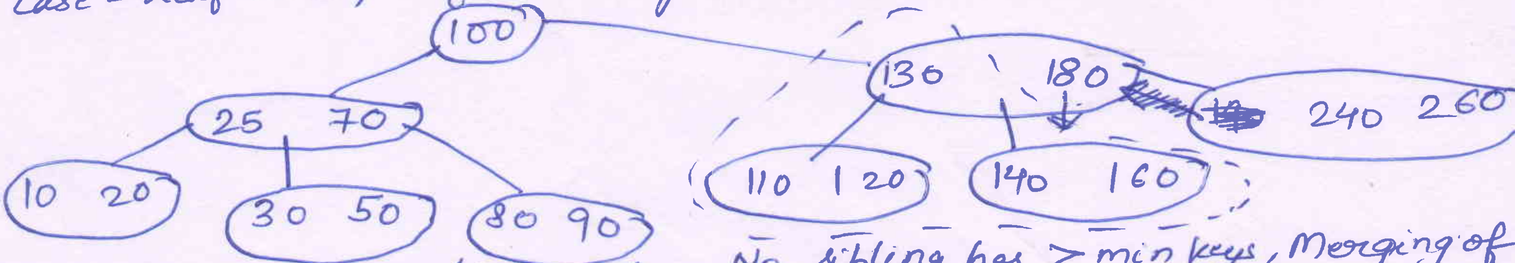
Delete 60 →

Case – Non-Leaf Node, Replace by successor



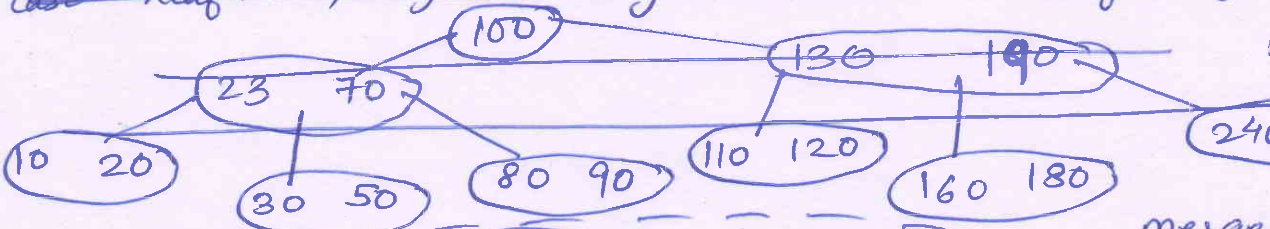
Delete 40 →

Case – Leaf Node, Left sibling has > min no of keys

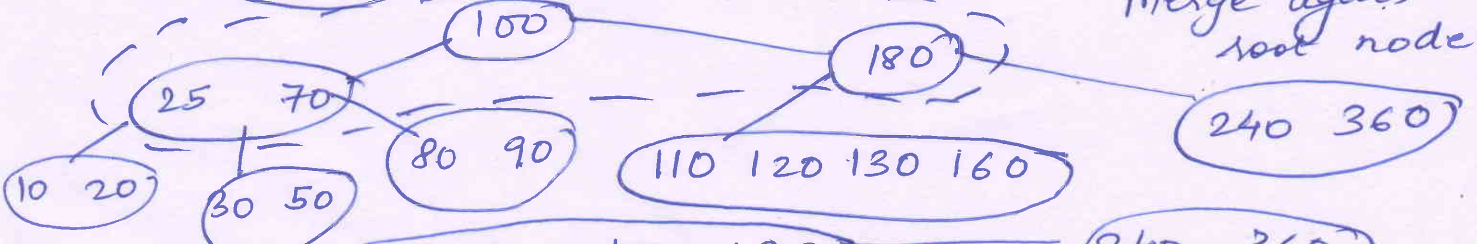


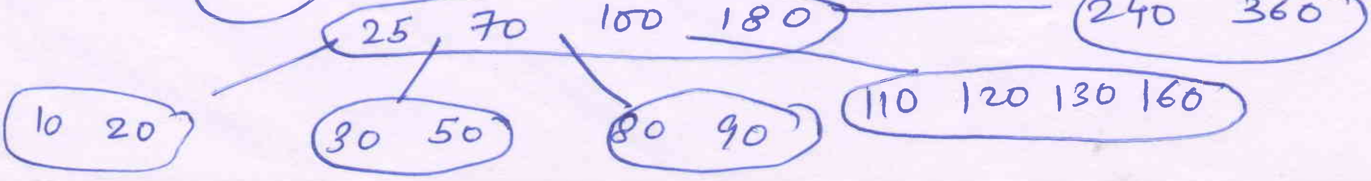
Delete 140 → Case – Leaf Node – No sibling has > min keys, Merging of leaves & median key from parent

~~Case – Leaf Node, Right sibling has > min no of keys~~

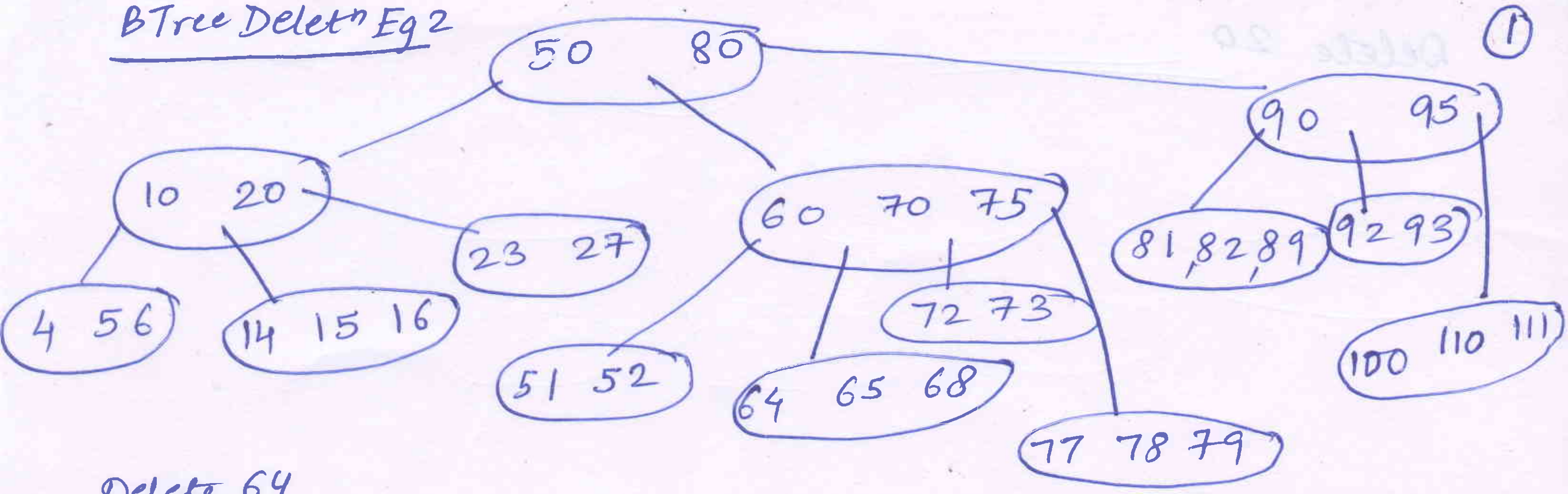


merge again with root node

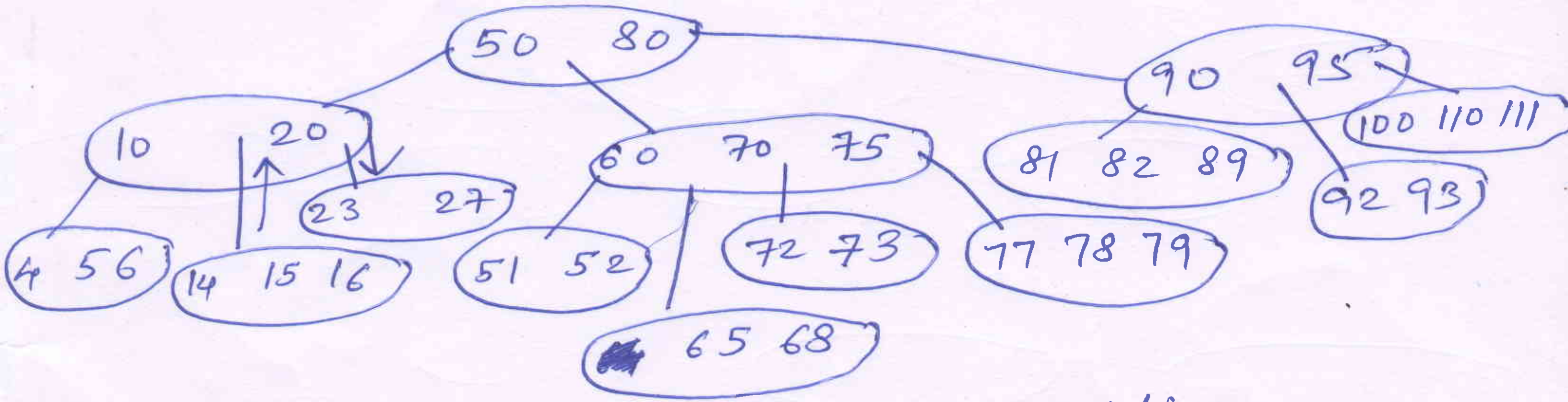




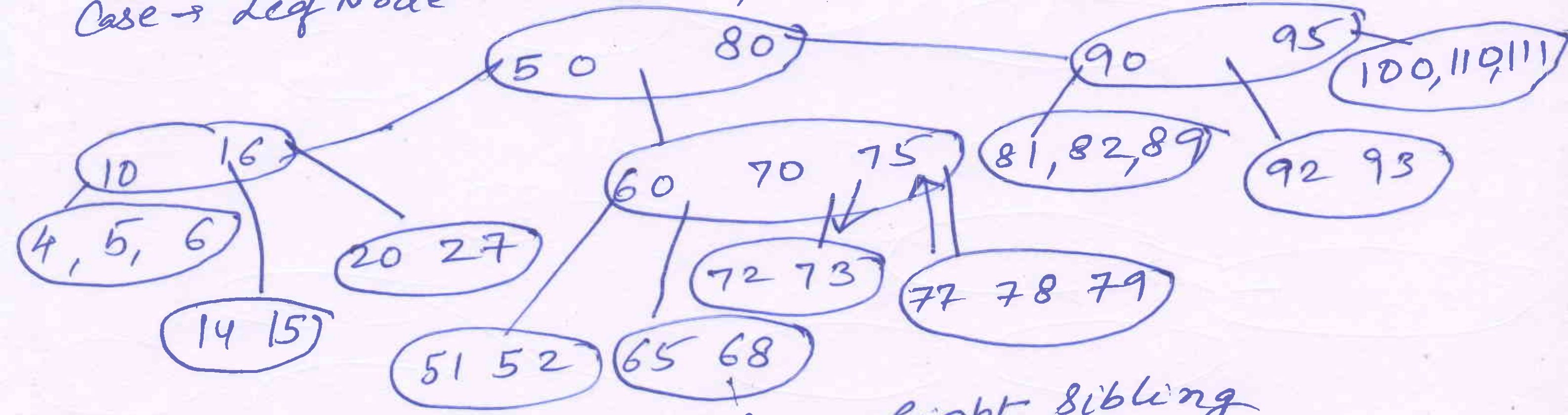
BTree Deletn Eg 2



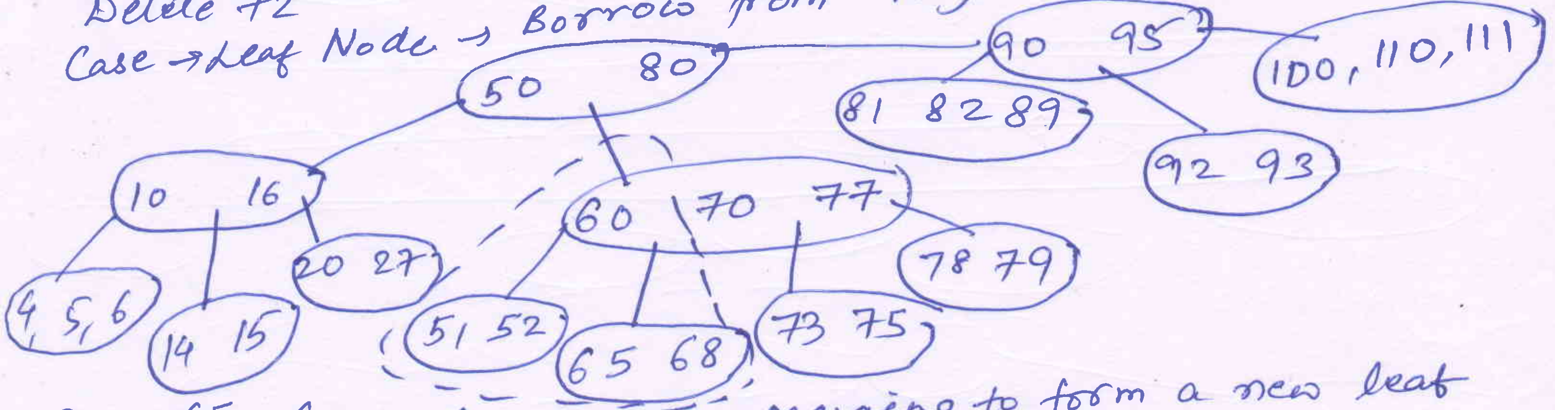
Delete 64
Case-Leaf Node > Min no of keys, Just delete it



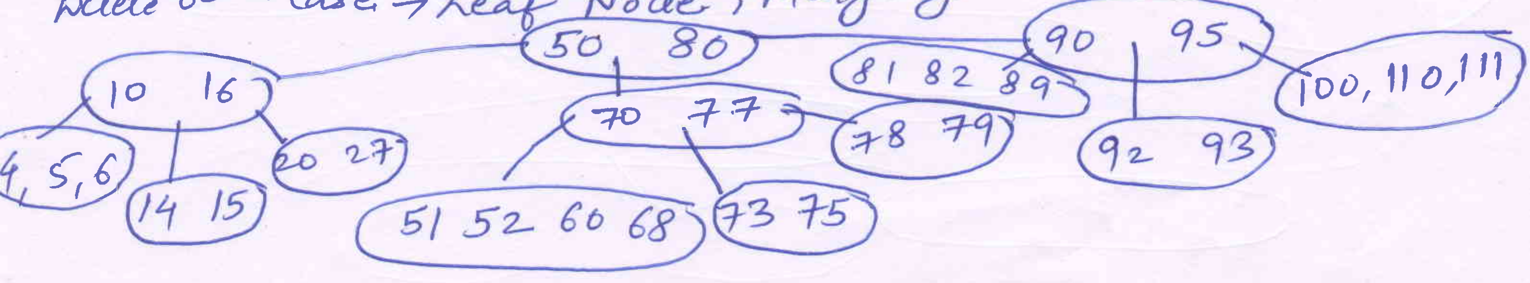
Delete 23
Case → Leaf Node – Borrow from Left Sibling



Delete 72
Case → Leaf Node → Borrow from Right Sibling

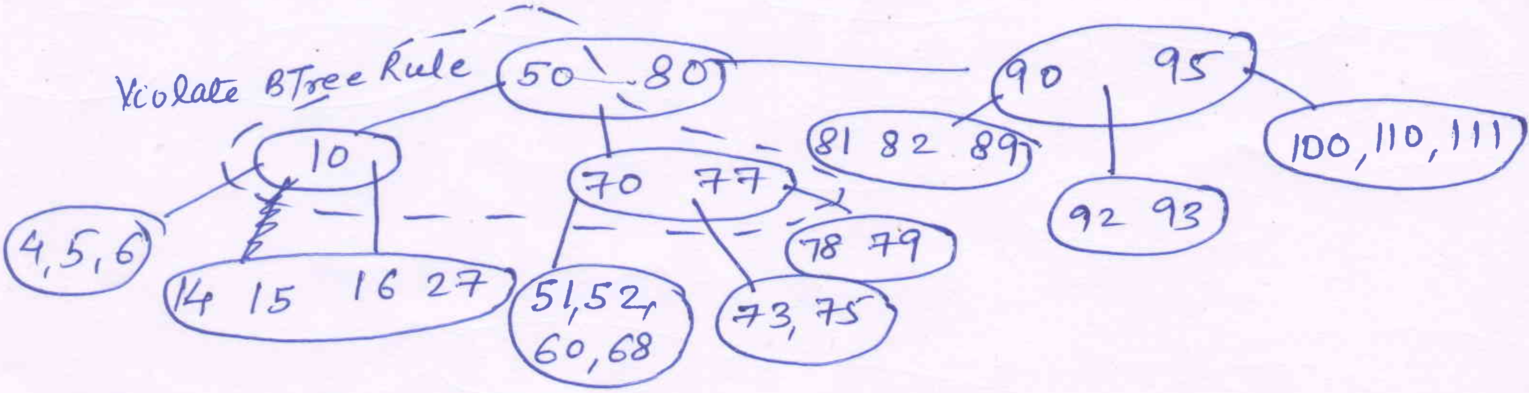


Delete 65 → Case → Leaf Node, Merging to form a new leaf

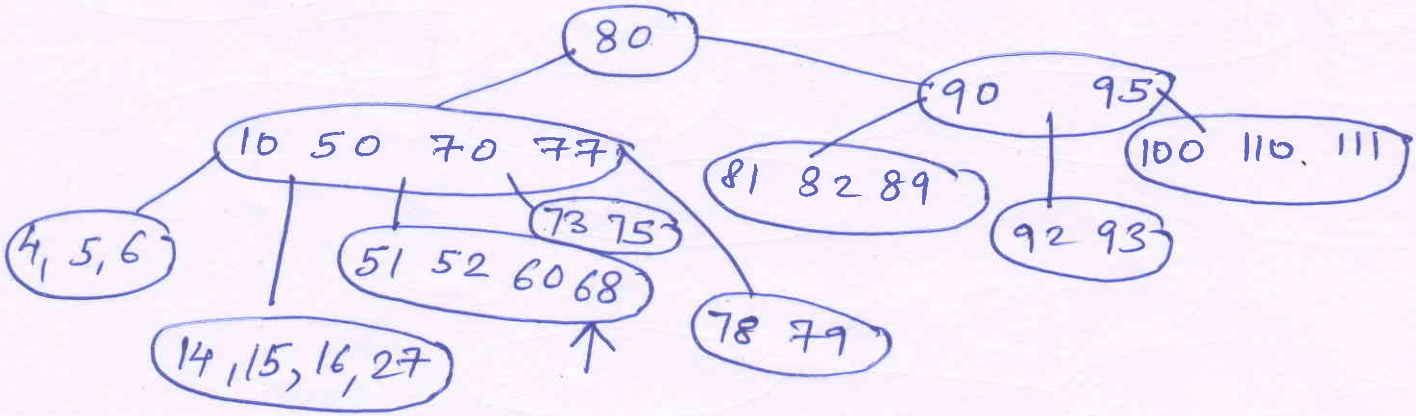


Delete 20 No Right sibling

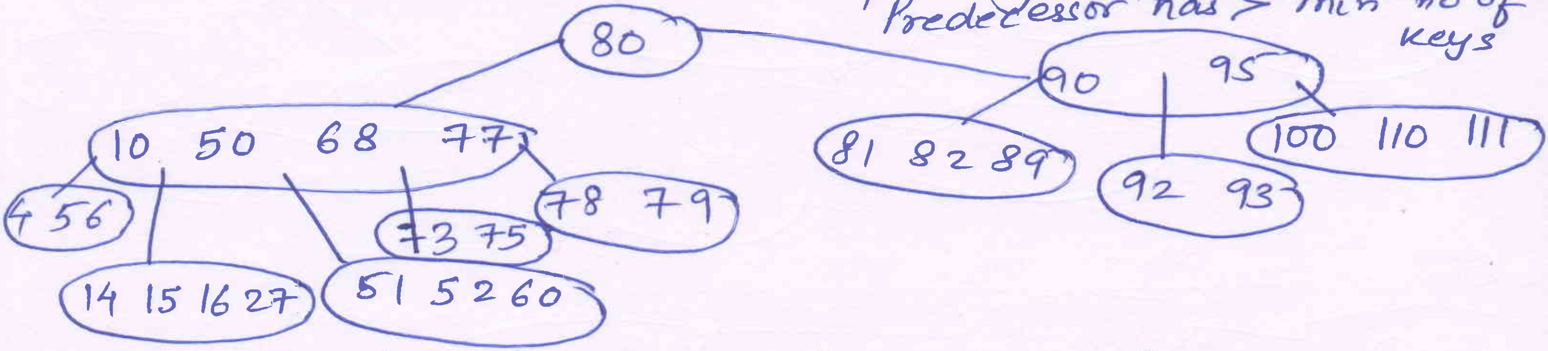
Case - Leaf Node, left sibling has min no of keys so merge with median key from parent & form new leaf



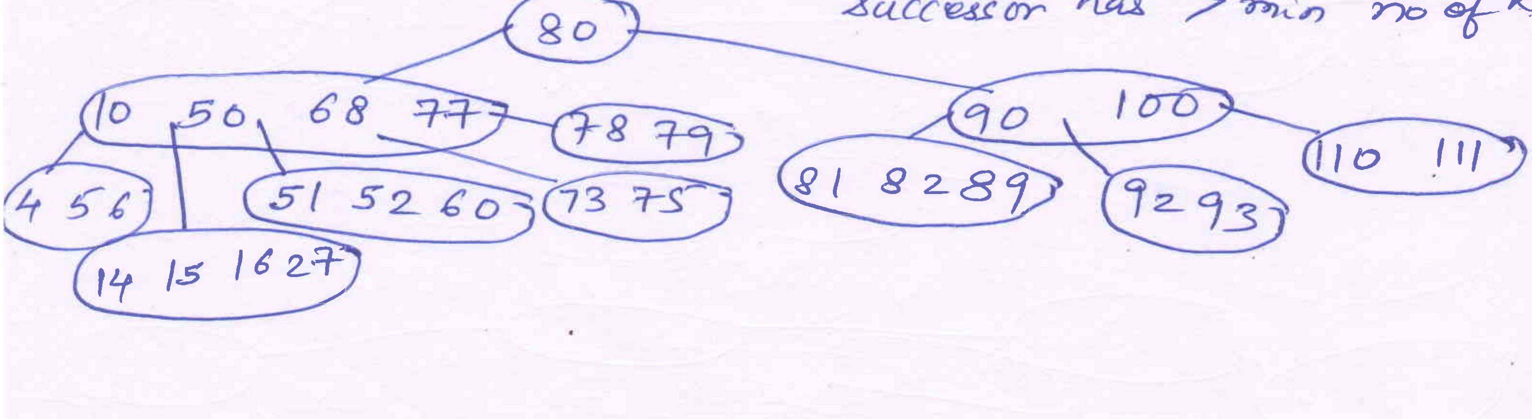
Merging the siblings & median key at Level 1



Delete 70 - Non-Leaf Node, Replace by Predecessor as Predecessor has > min no of keys



Delete 95 - Non-Leaf Node, Replace by Successor as successor has > min no of Key



Delete 77

Case Non-leaf Node

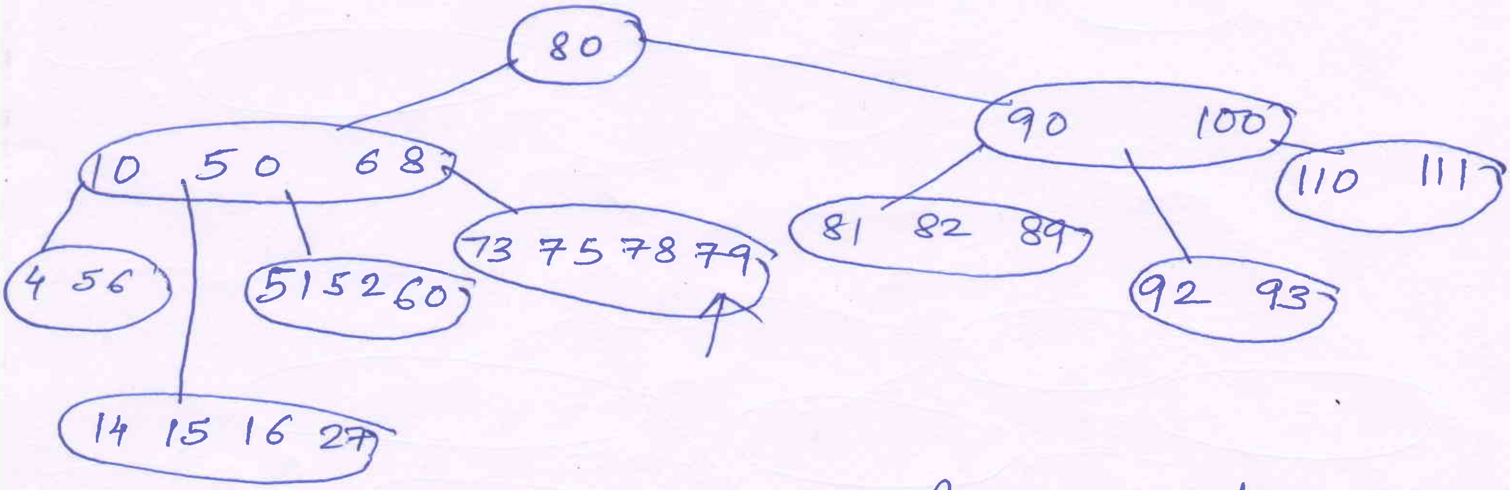
↳ Successor does not have > min no of keys

Predecessor does not have > min no of keys.

merge the Successor leaf node + Predecessor leaf node

+ median key from Parent

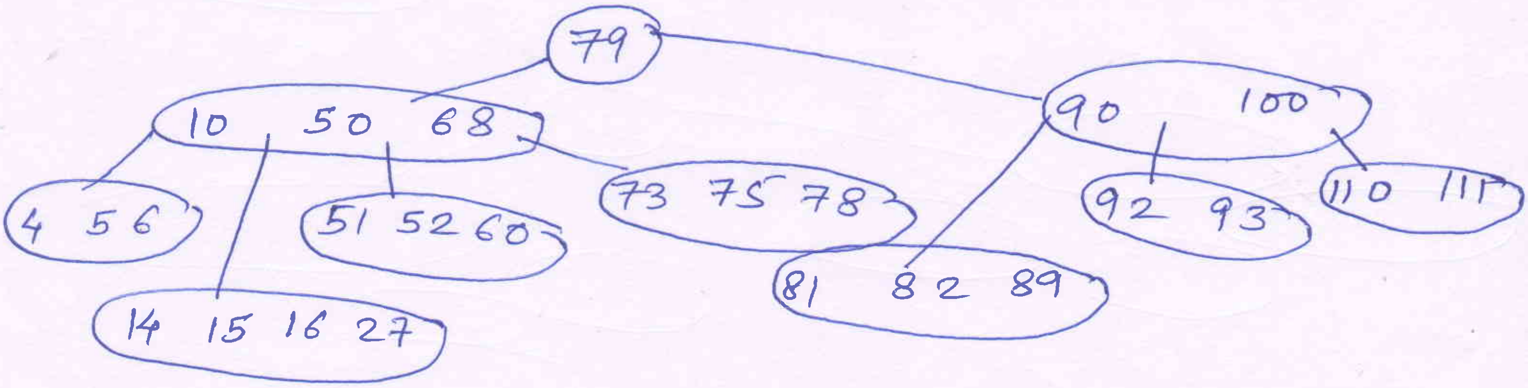
to form a new leaf.



Delete 80

Case — Non-Leaf Node → Inorder Predecessor has > min no of keys

so Replace with Inorder Predecessor


79
10 50 68
90 100
4 5 6
51 52 60
73 75 78
92 93
110 111
81 82 89
14 15 16 27