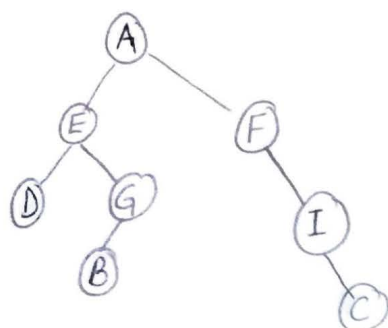


Sonam Yangtso

Cpts 233

Homework # 2

1.



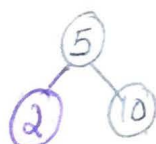
② Insert 5

⑤

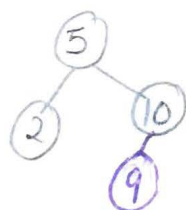
Insert 10 ($10 > 5$), so insert at right



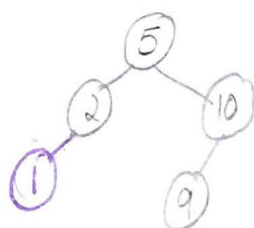
Insert 2 ($2 < 5$, move to the left



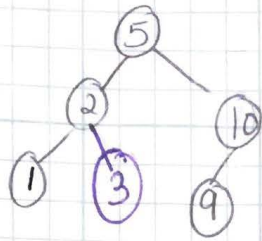
Insert 9 ($9 > 5$, move to the right of 5, $9 < 10$, move left of 10



Insert 1 ($1 < 5$) move to the left of 5, $1 < 2$, move left of 2

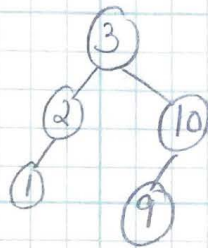


Insert 3 ($3 < 5$, move left of 5, $3 > 2$, move right of 2)



Remove 5 from the left subtree. If node to be delete has 2 children, we replace the node with the largest element of the left subtree and recursively delete that node.

We are removing 5, the largest element in the left subtree is 3. So replace 5 with 3.



③ Question

Insert 10



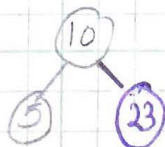
Insert 5

($5 < 10$, move 5 to the left of 10)



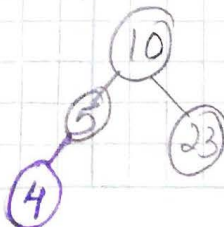
Insert 23

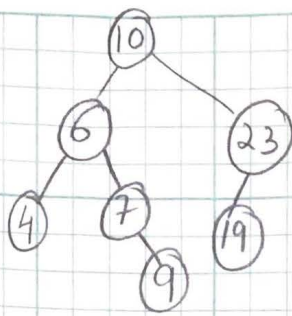
($23 > 10$, move to the right of 10)



Insert 4

($4 < 10$, move to the left of 10, $4 < 5$ move to the left of 5)





4 Question

A] The height of the tree 4

B] The depth of node 90 is 3

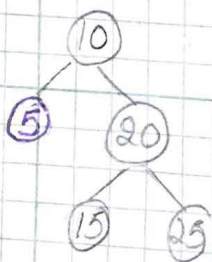
C] The height of node 90 is 1

D] pre-order: 100, 50, 3, 1, 20, 80, 52, 90, 83, 99, 150, 125, 152

In-order 01, 03, 20, 50, 52, 80, 83, 90, 99, 100, 125, 150, 152

post-order 01, 20, 03, 52, 83, 99, 90, 80, 50, 125, 152, 150, 100

5) Remove 5 from the Given AVL tree



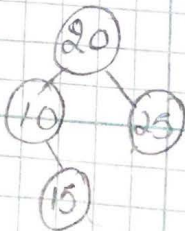
Remove 5

⇒



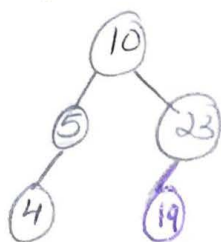
This is RR imbalance

Therefore we do left rotation

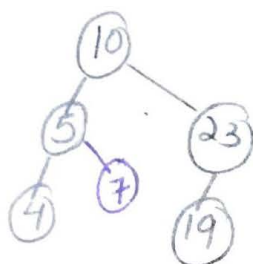


(2)

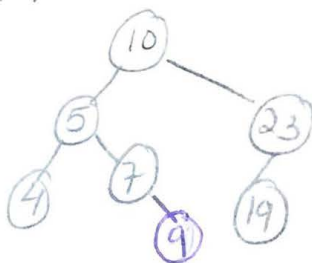
Insert 19 $19 > 10$, move to the right of 10, $19 < 23$, move to the left of 23)



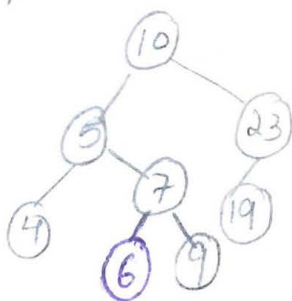
Insert 7 ($7 < 10$, move left of 10, $7 > 5$ move to the right of 5)



Insert 9 ($9 < 10$, move left of 10, $9 > 5$ move right of 5, $9 > 7$ move right of 7)



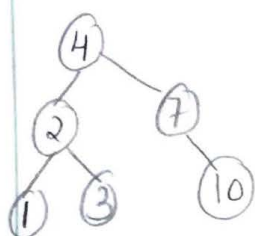
Insert 6 ($6 < 10$, move left of 10, $6 > 5$ move right of 5, $6 < 7$ move left of 7)



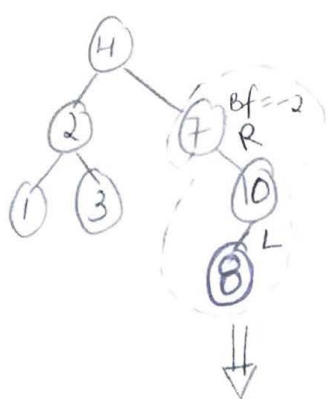
Remove 5 from right subtree of the node.

Since 5 has 2 children, we replace the node with the smallest element from the right subtree which is 6 in this case.

⑥ Insert the value 8 into AVL Tree

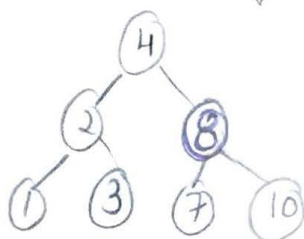


⇒



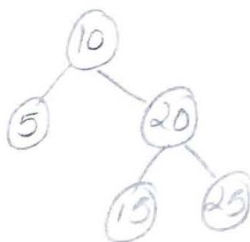
This is RL imbalance

⇓

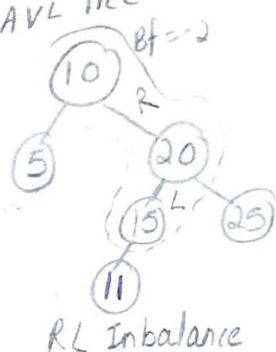


⑦ Question

Insert the value 11 into the AVL Tree

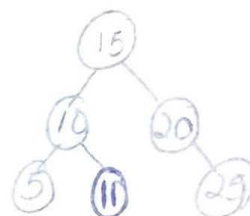


⇒



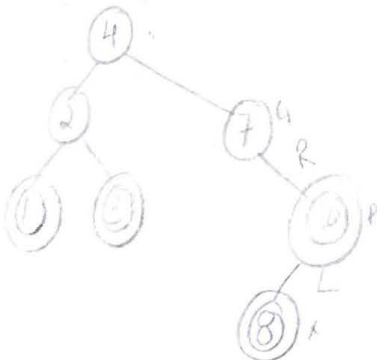
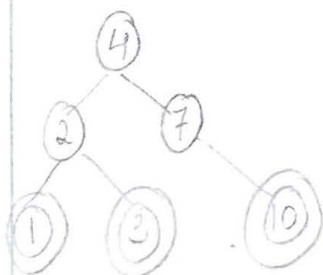
RL Imbalance

⇒

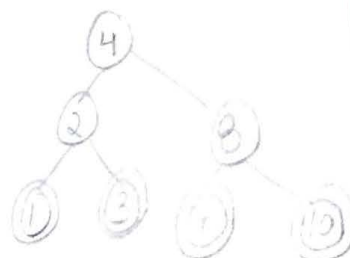


⑧ Question

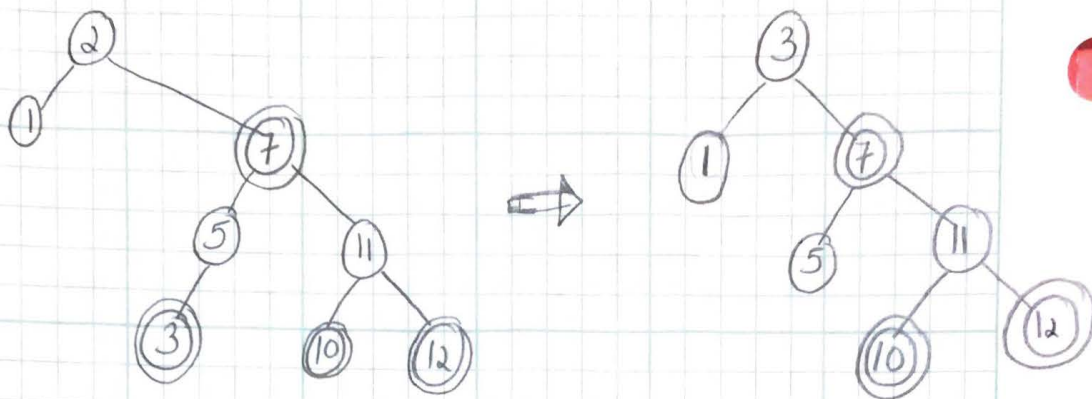
Insert value 8 into the Red-Black Tree



⇒

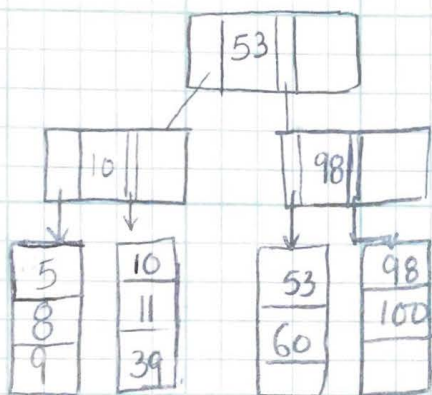


9) Delete the value 2 from Red-Black Tree

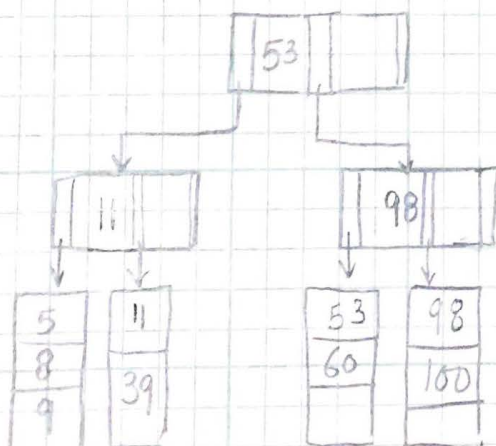


10)

A) Insert 60 into the B+ tree



B) Deleting 10 from the B+ tree



ii)

A) The size of the internal Node (M) is 3 because the given B tree has 3 nodes.

B) Size of B-tree leaf node (L) is 6

C) Since each B tree node have 5 pointers...
therefore, $5^m < n \leq 5^{m+1}$, height m

d) If we insert 30,000 Customer records
 $= 5^6 < 30,000 \leq 5^7$
Therefore height is 6

e) If we insert 2,500,000 Customer
 $= 5^9 < 2,500,000 \leq 5^{10}$
Therefore height is 9

Note: Took help from my fellow classmate and tutors.