Problem 7: [7 marks]

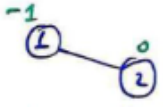
Insert the following numbers one by one in sequence into an initially empty AVL tree: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10. After each insertion, show the initial tree obtained after insertion. If the tree becomes unbalanced, clearly mark the imbalanced node(s) and show the steps of balancing and the tree obtained after balancing. Then continue with inserting the next number in sequence and show all the intermediate steps as before.

Note:- I will be indicating balance factor (i.e. [height of left subtree − height of right subtree]) by green on each node.

Insert 1:-

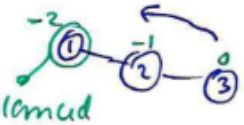
(Balanced)

Insert 2:-



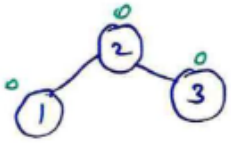
(Balanced)

Insert 3:-



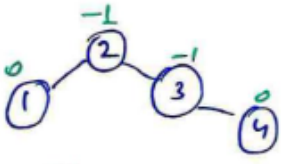
Imbalanced

rotation =) make 2 as root



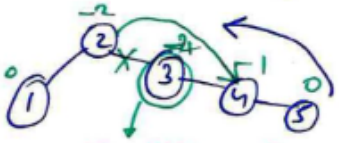
(Balanced by)

Insert 4:-



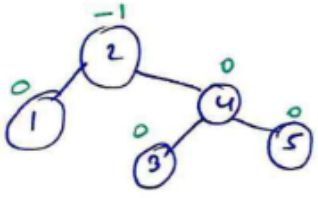
(Balanced)

Insert 5:-



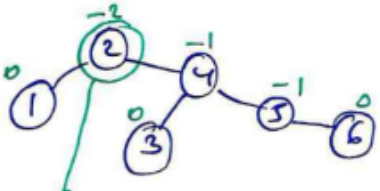
Imbalanced =) perform rotation

=>

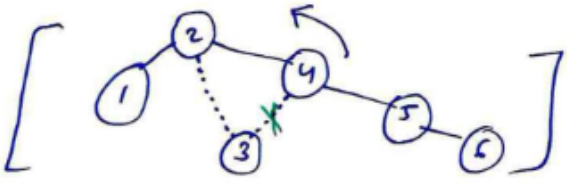


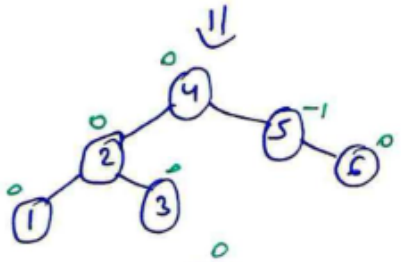
(Balanced)

Insert 6:-



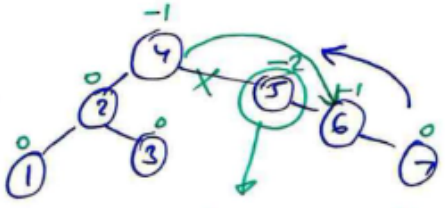
Imbalanced, perform rotation :-





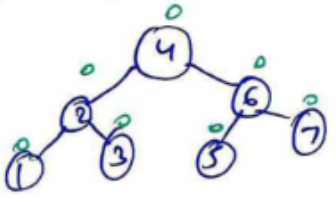
(Balanced)

Insert 7:-



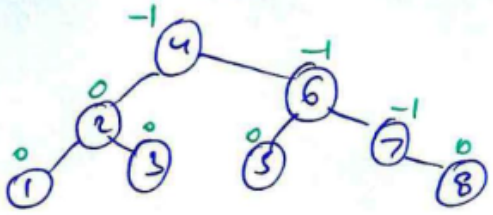
Imbalanced, perform rotation

=>



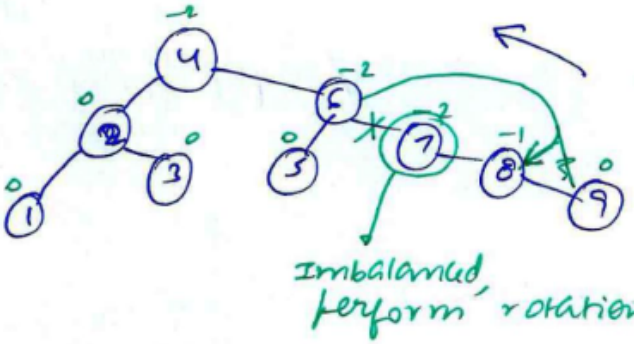
(Balanced)

Insert 8:-



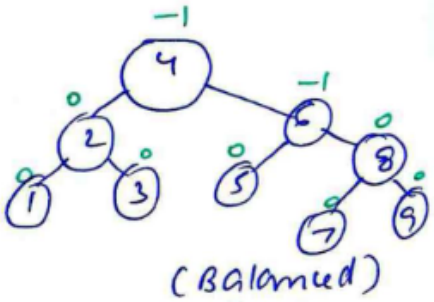
(Balanced)

Insert 9:-



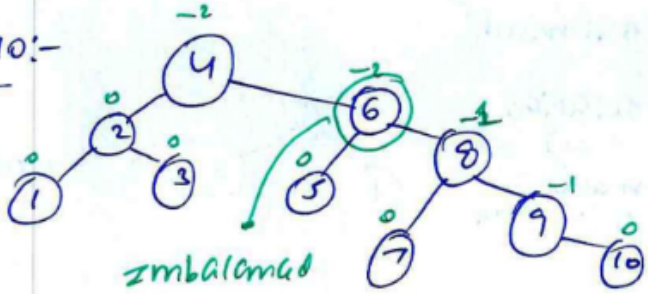
Imbalanced, perform rotation

=)

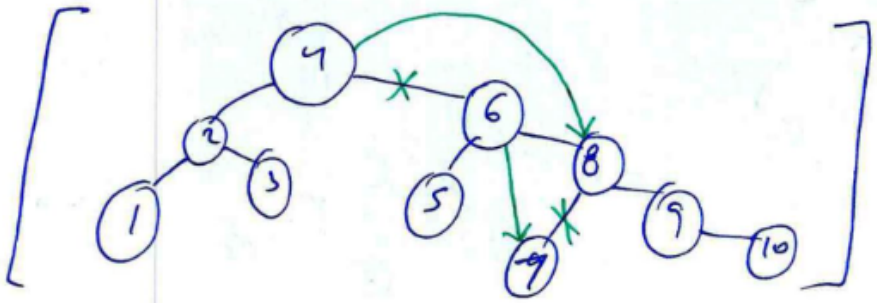


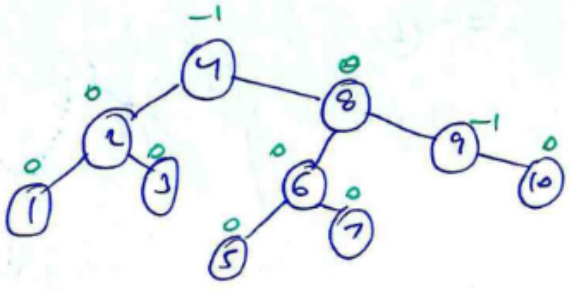
(Balanced)

Insert 10:-



Imbalanced





(Balanced)

Final