* Data Structures and Algorithms (DSA) - Assignment Number - 4

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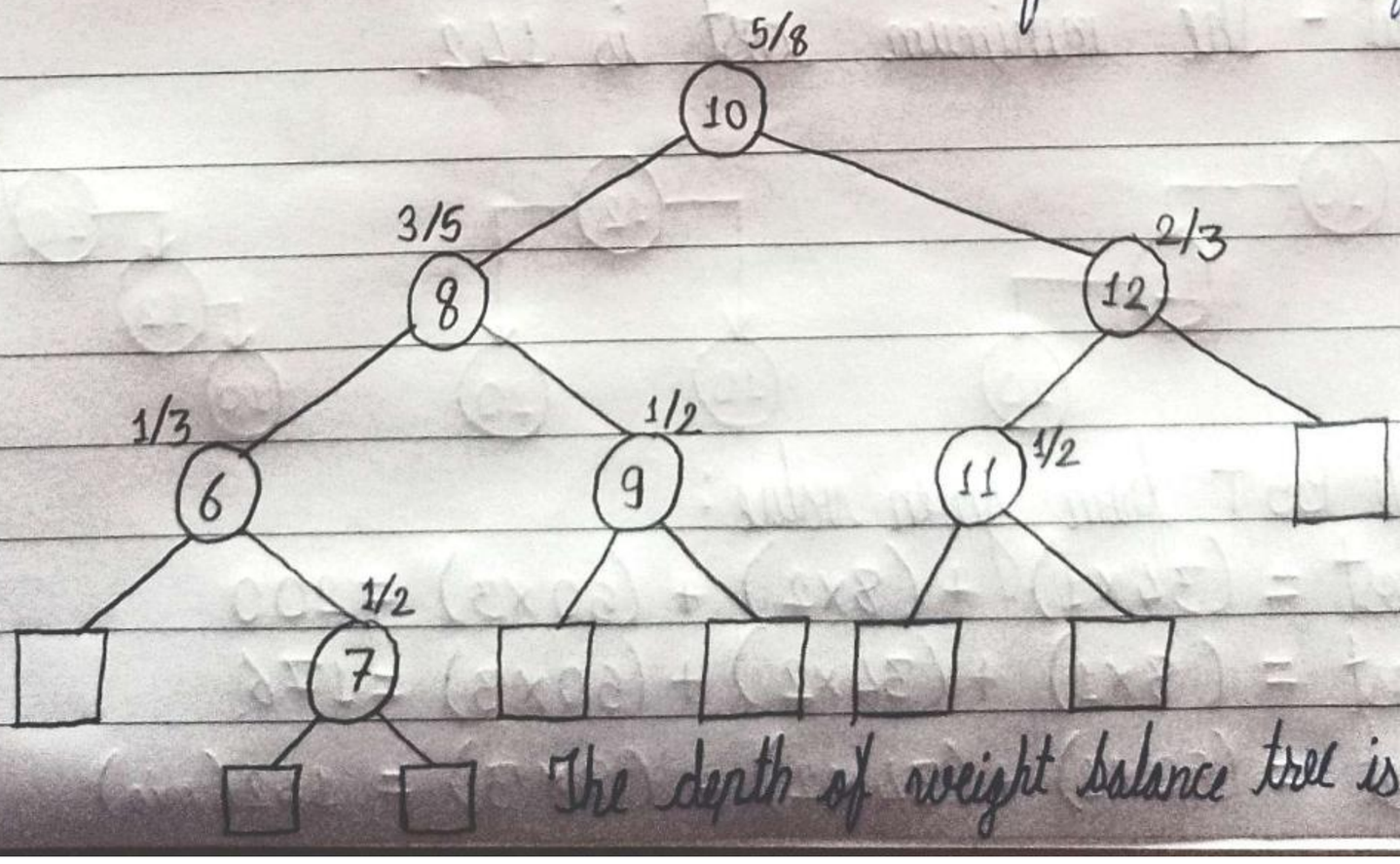
Q-1. Define weight balanced tree and optimal binary search tree with example

→ 1) The weight balance tree is a binary search tree, whose balance is based on the size of the subtrees, in each node.

2) It is a binary tree in which the number of nodes in the left subtree is atleast half and at most twice the number of nodes in right subtree.

3) Balance factor at each node = $\frac{\text{no. of ext node in left subtree}}{\text{Total no. of ext. node of tree}}$

4) Example:



The depth of weight balance tree is O(log n).

Optimal Binary Search Tree (OBST):

1) The element having more probability of appearance should be placed nearer to the root of a binary search tree and the element that appear for atleast no. of time i.e. the element with lesser probability should be placed away from roots.

2) The BST created with such kind of arrangement is called OBST.

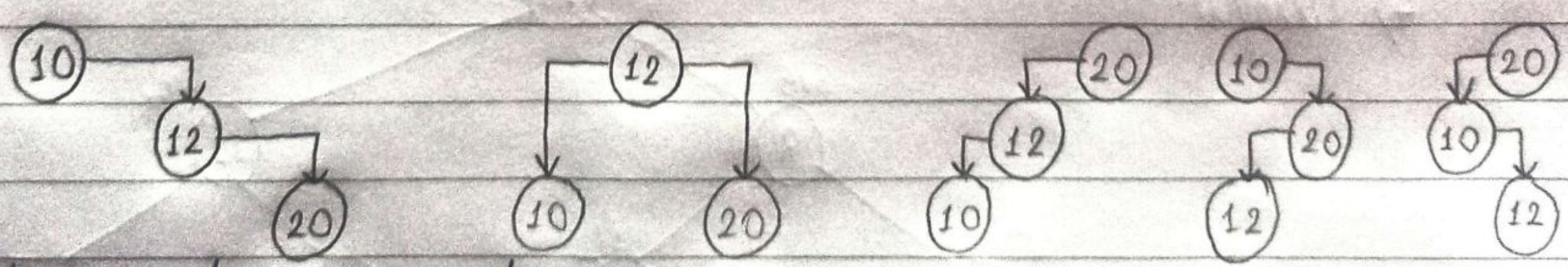
3) A set of integer are given in sorted order and another array. 'freq' for frequency count. Our task is to find minimum cost of all searches.

4) An auxiliary array cost[n] is created to solve and store solution of sub programs. cost matrix will hold data to solve problem in bottom up.

Input - key value as node and freq.

key = {10, 12, 20} freq = {34, 8, 50}

Output - The minimum cost is 142.



Possible BST from given value:

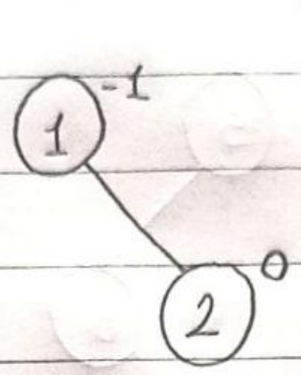
a) cost = (34×1) + (8×2) + (50×3) = 200

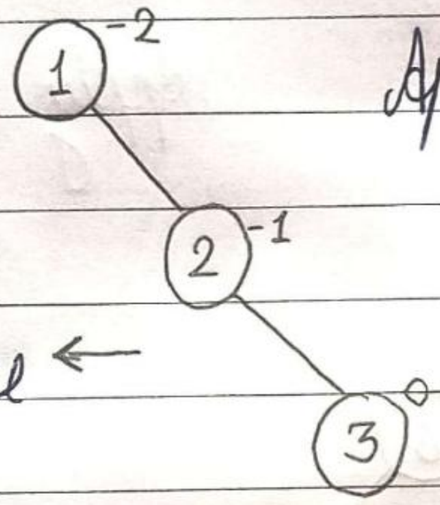
b) cost = (8×1) + (34×2) + (50×3) = 176

c) cost = (50×1) + (34×2) + (8×3) = 142 (min)

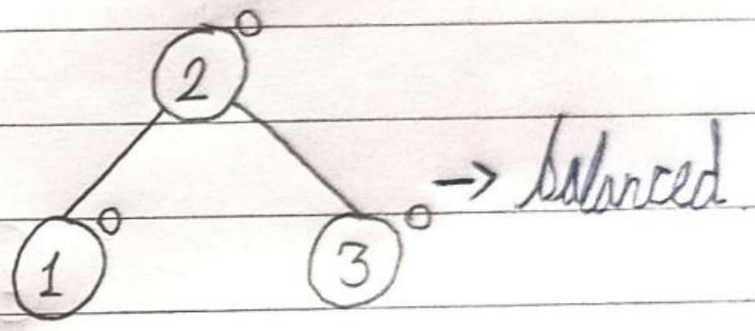
Q-2. Construct an AVL tree by inserting numbers from 1 to 8.

→ Insert 1 → 

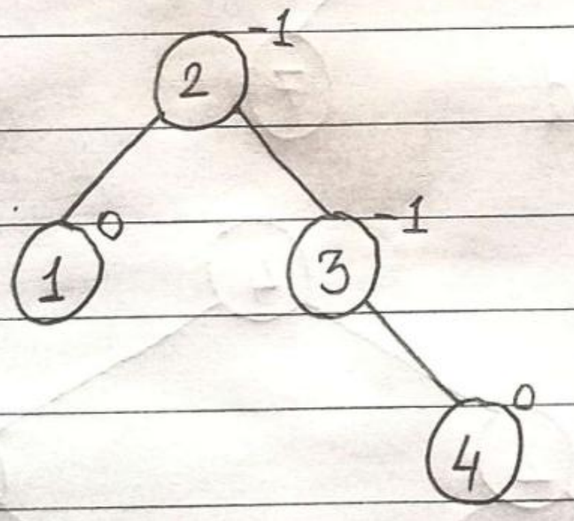
Insert 2 → 

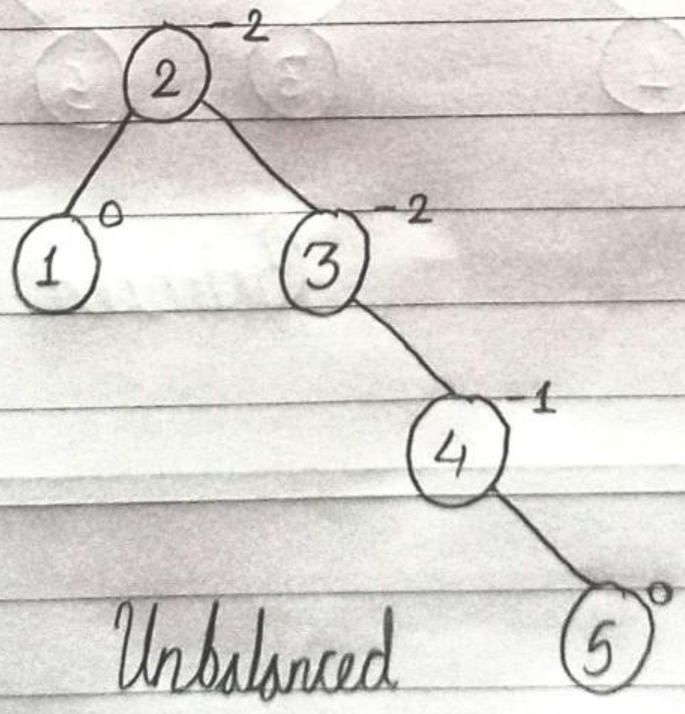
Insert 3 → 

Unbalanced tree ←

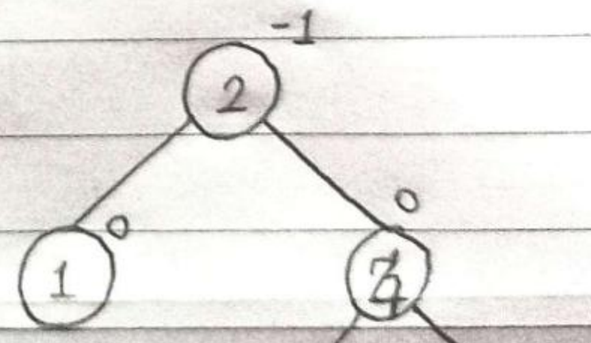
Apply RR rotation ← 

→ balanced

Insert 4 → 

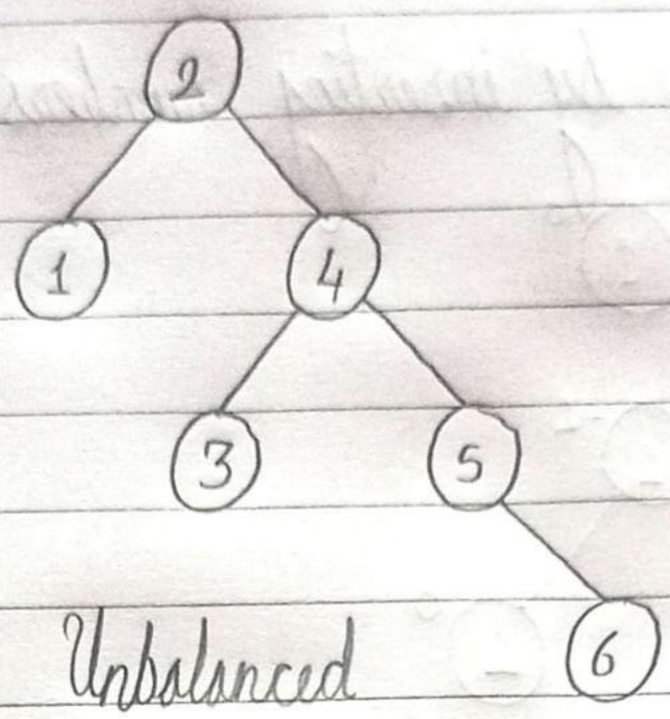
Insert 5 → 

Unbalanced

RR rotation on 3. 

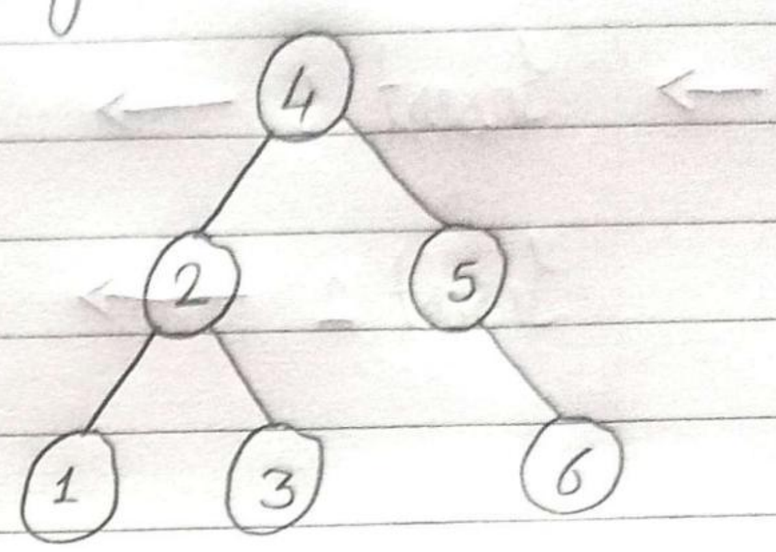
Balanced.

Insert 6 →

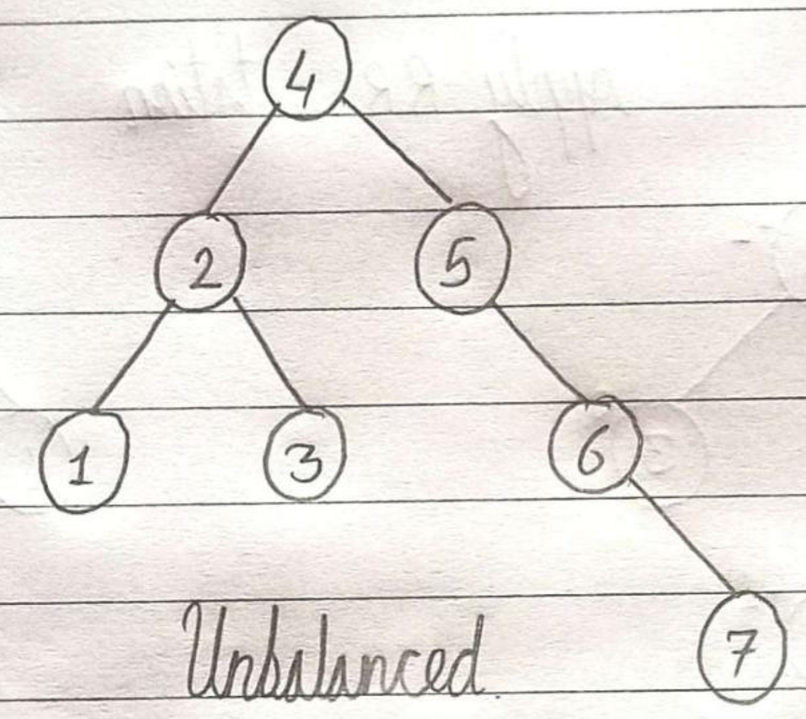


Unbalanced

Apply RR rotation on 2 -

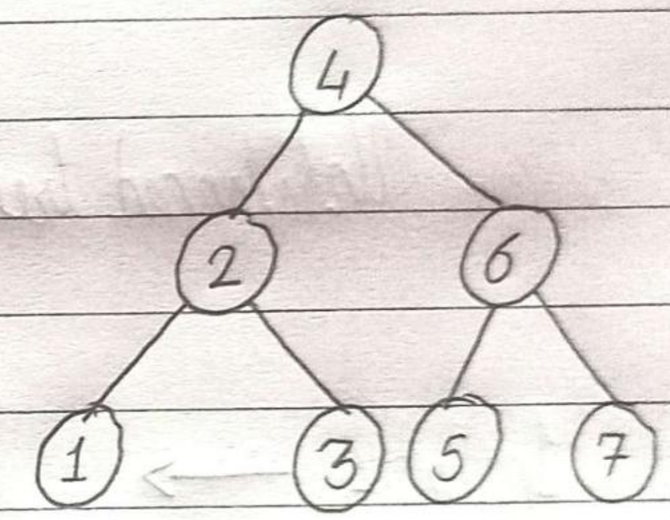


Insert 7 →

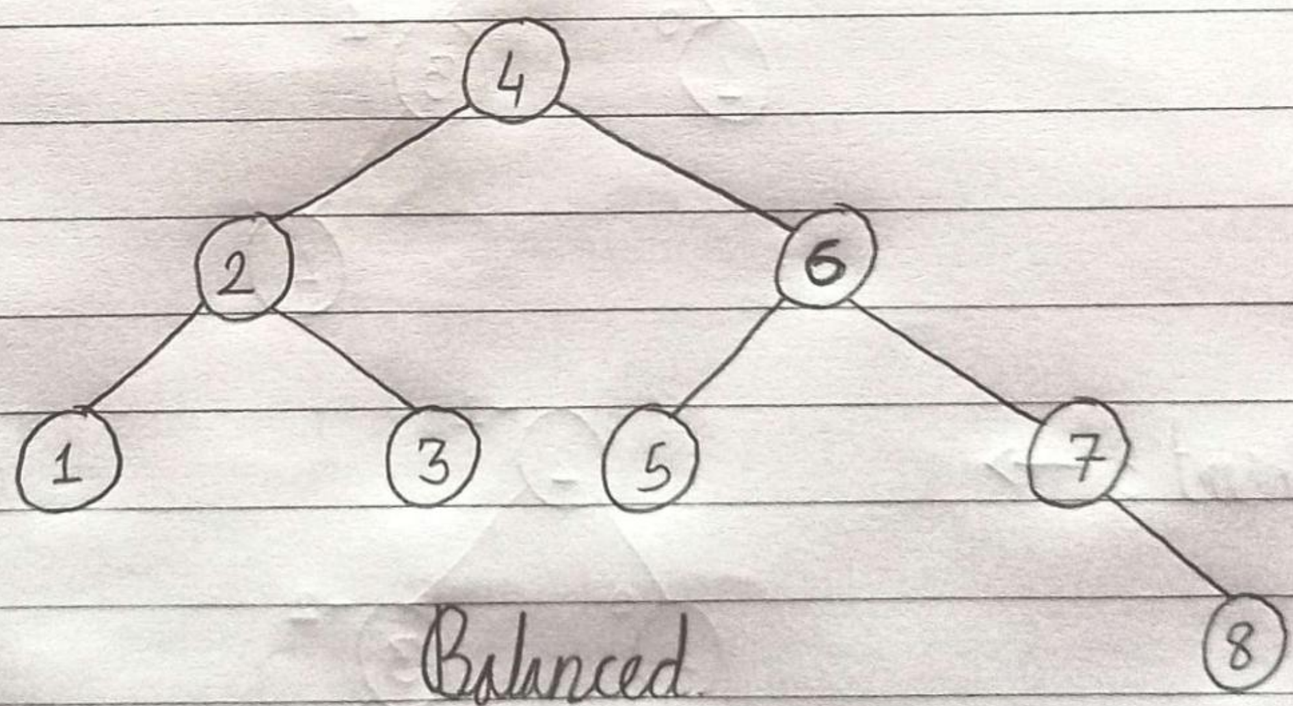


Unbalanced

Apply RR rotation on 5



Insert 8 →



Balanced.