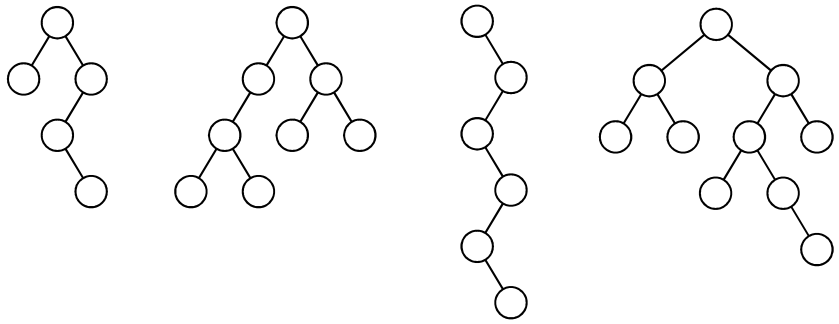
10.4 HEIGHT BALANCE: AVL TREES

Exercises 10.4

E1. *Determine which of the following binary search trees are AVL trees. For those that are not, find all nodes at which the requirements are violated.*



(a) (b) (c) (d)

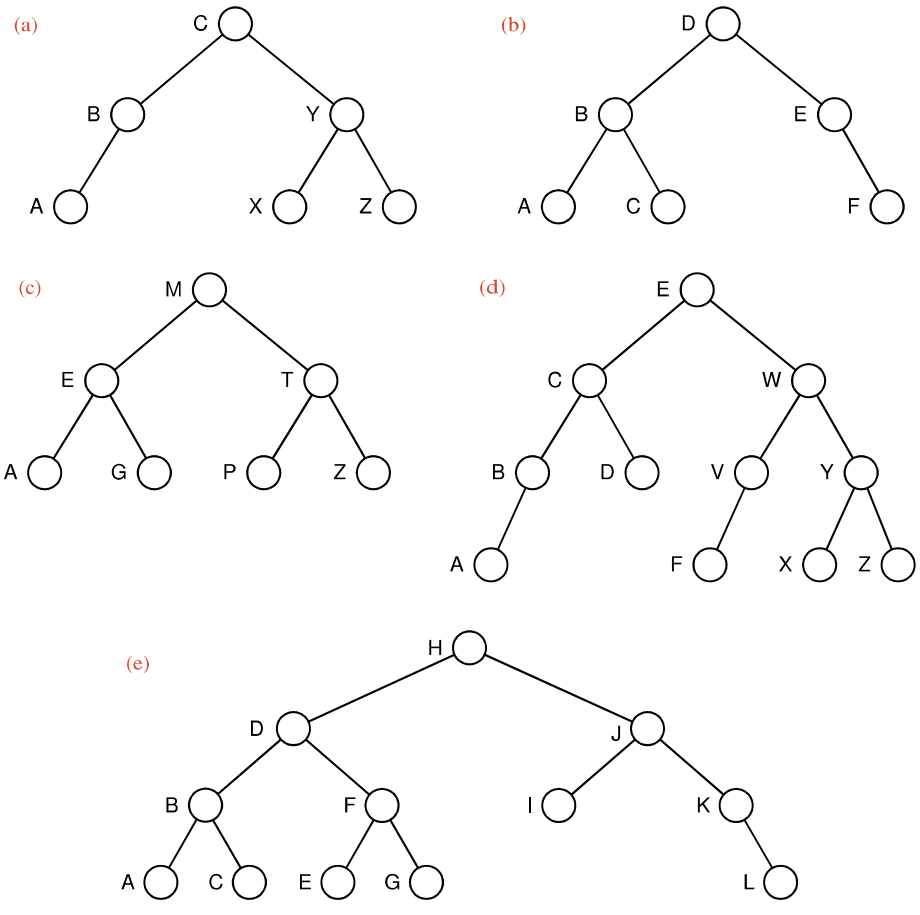
Answer

(a) The tree is not an AVL tree because the right subtree is two levels taller than the left subtree.
(b) The left child of the root is too much unbalanced to the left.
(c) The top four nodes are all too unbalanced.
(d) The tree is not an AVL tree because the right subtree is two levels taller than the left subtree.

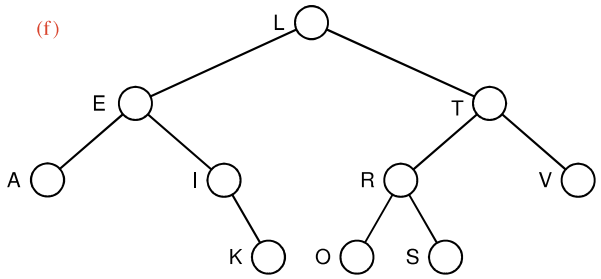
E2. *In each of the following, insert the keys, in the order shown, to build them into an AVL tree.*

(a) A, Z, B, Y, C, X.
(b) A, B, C, D, E, F.
(c) M, T, E, A, Z, G, P.
(d) A, Z, B, Y, C, X, D, W, E, V, F.
(e) A, B, C, D, E, F, G, H, I, J, K, L.
(f) A, V, L, T, R, E, I, S, O, K.

Answer

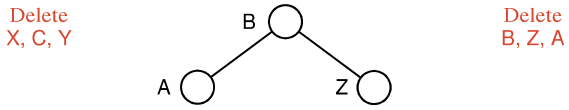


(f)

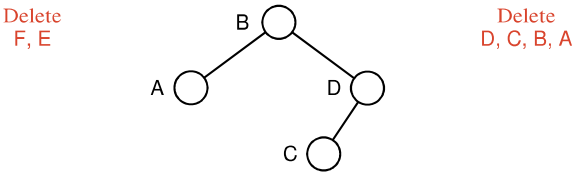


E3. *Delete each of the keys inserted in Exercise E2 from the AVL tree, in LIFO order (last key inserted is first removed).*

Answer **(a)**

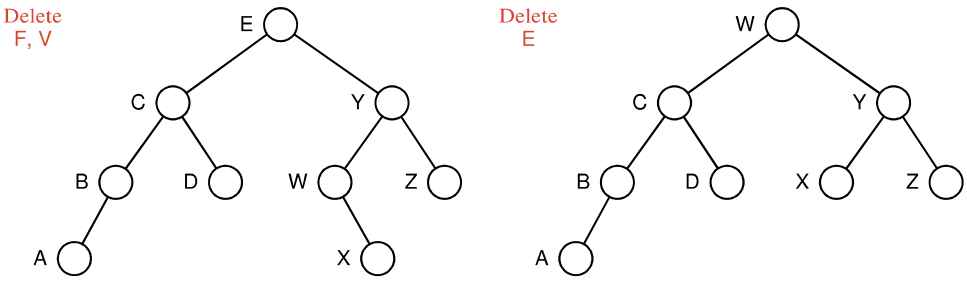


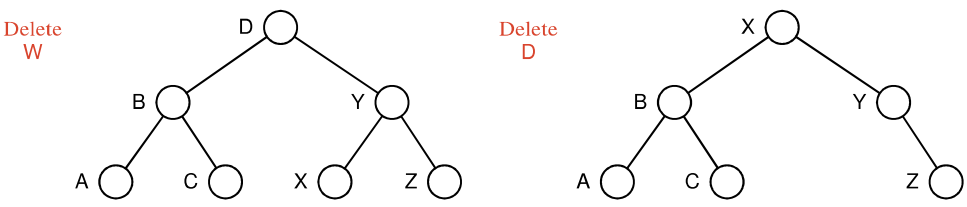
(b)

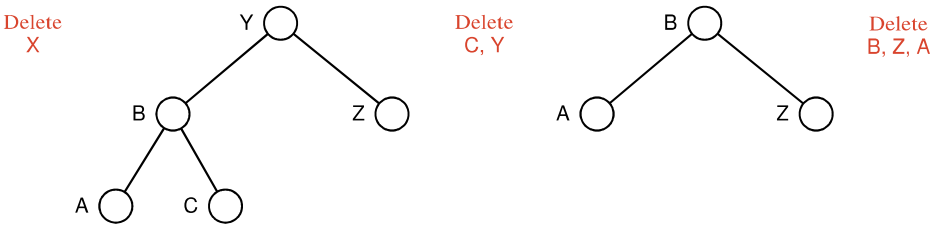


(c) No rotations are required in the process of deleting all nodes in the given order.

(d)







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