CSC 225: Lab 8 Solutions

1. `Ans:` The corresponding left leaning red-black tree is shown in Figure 1.

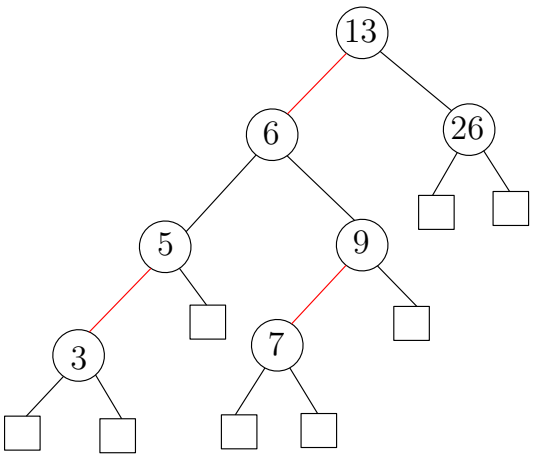

Figure 1:

2. `Ans:` $3, 6, 7, 13, 26, 5, 9$

3. `Ans:` The $2-3$ tree for the insertion sequence $3, 5, 7, 6, 13, 9, 26$ is shown in Figure 2. It is a different tree, it has height 3.

4. `Ans:` To check its validity, we calculate the number of black edges on the paths to all the leaf nodes (null nodes) from the root. The left children of 19 and 20 have 2 and 3, respectively, black edges on their path to (or from) the root. All the other leaf nodes have 4 edges on their paths to the root. Since, all the leaf nodes do not have the same black height/depth, this red black tree is not valid.

   If we draw the $2-3$ tree corresponding to the given red black tree, it would like the tree shown in Figure 3. It is not a valid $2-3$ tree because the nodes 19 and 20 are 2-nodes but they each have only one child.

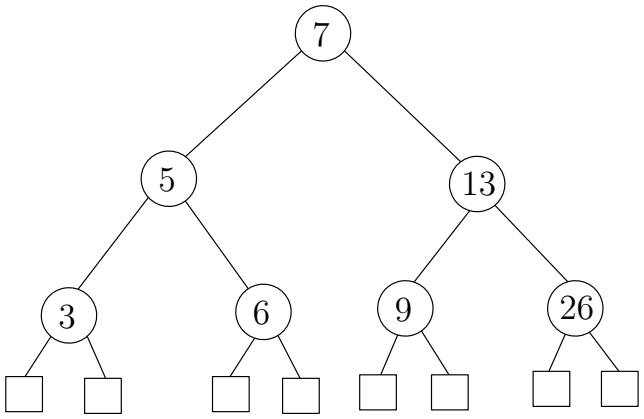

Figure 2:

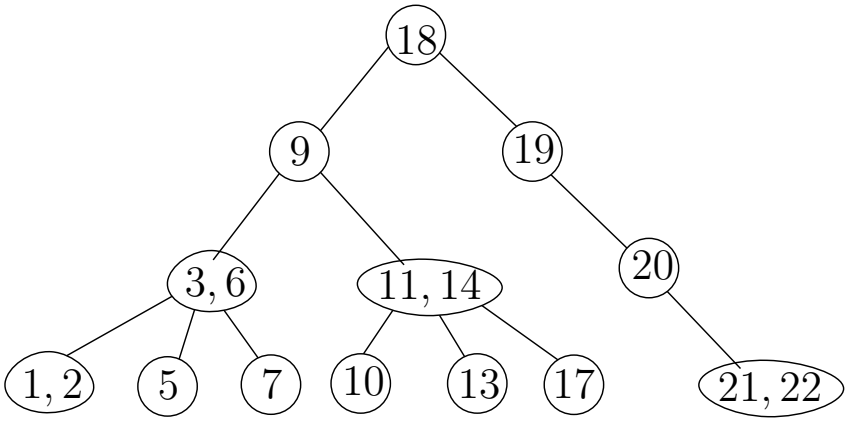

Figure 3: