CS2023 - Data Structures and Algorithms
Take Home Assignment

Week – 06

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1.

```
Delete(root, value):
      if root = null then
            return null
      else if value < root.data then
            root.left = Delete(root.left, value)
      else if value > root.data then
            root.right = Delete(root.right, value)
      else
            if root.left is null and root.right is null then
                  delete root
                  root = null
            else if root.right is null then
                  temp = root
                  root = root.left
                  delete temp
            else if root.left is null then
                  temp = root
                  root = root.right
                  delete temp
            else
                  temp = findMax(root.left)
                  root.data = temp.data
                  root.left = Delete(root.left, temp)
            end if
      end if
      return root

findMax(root):
      if root.right is not null then
            return findMax(root.right)
      return root
```

2.

Expected time complexities for operations

insertion – O(log n)

search – O(log n)

deletion – O(log n)
in-order traversal – O(n)

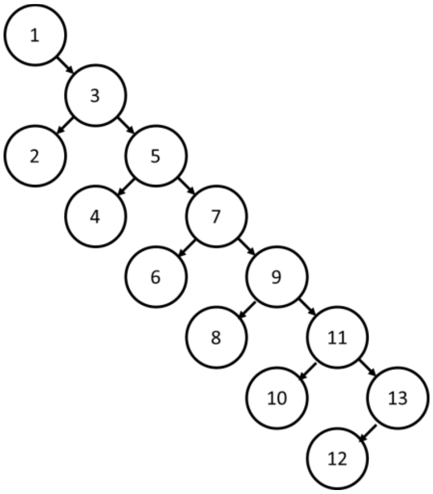
here **“n”** is the number of nodes.

but, the actual time complexity will deviate from the expected time complexity if the binary search tree is unbalanced.

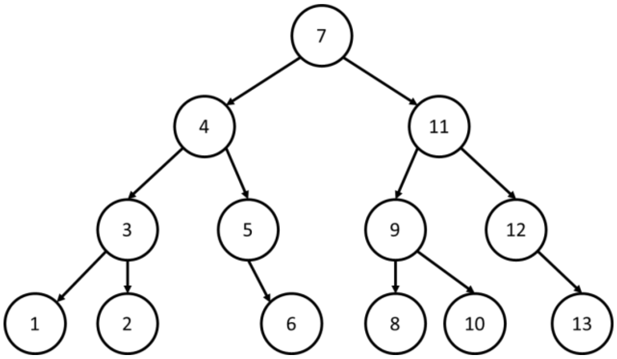
in an unbalanced tree, it is possible to have a linked list as binary search tree, and the height of the tree can be up to n.

in this kind of cases, the actual complexities for all operations will be O(n).

3.



a) 7
b) , c)



minimum height = 3
insertion ordering = [7,4,11,3,5,9,12,1,2,6,8,10,13]