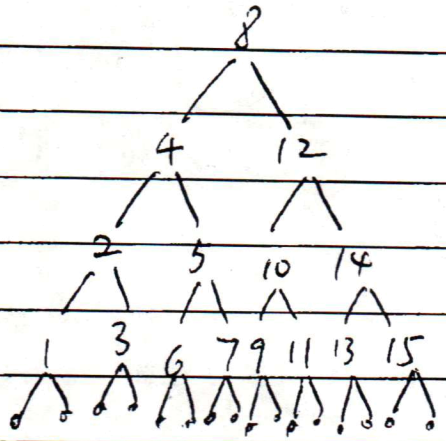
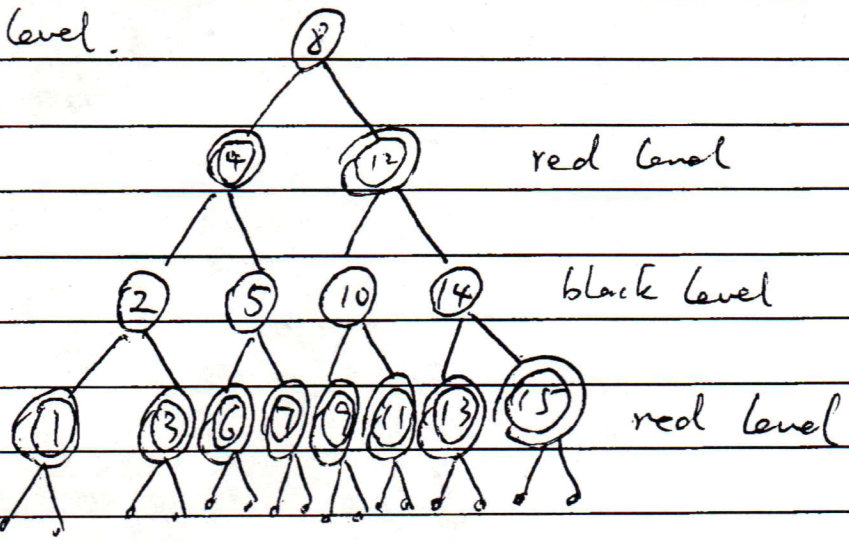
CS 303 ch 13 homework solution.

13.1-1 the complete BST w/ nils as

10 pts



bh=2 : root has to be black, nils are black. just one more black level.

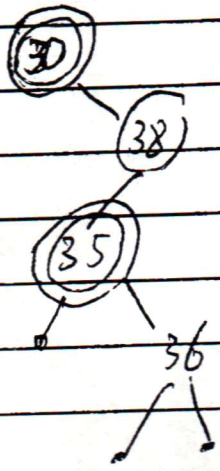


bh=3 : just change the lowest red level (1, 3, 6, 7 ...) to black.

bh=4: Every node is black in the BST will do.

13.1-2 36 will be inserted as the right child of 35.
the local subtree will be

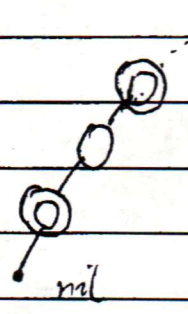
6 pts



if 36 is red, it isn't a rb tree because 36's parent is red.
obviously 36 is black is bad too because the local bh isn't constant

13.1-6 the largest number of internal nodes given a fixed bh=k shold be a rb tree w/ as many red nodes as possible. since the lowest black level is nils, the pattern has to be red-black pattern.

6 pts



# of nodes here is $2^{2k}-1$

the smallest n will be from a rb tree where all nodes are black. there will be 2^k-1