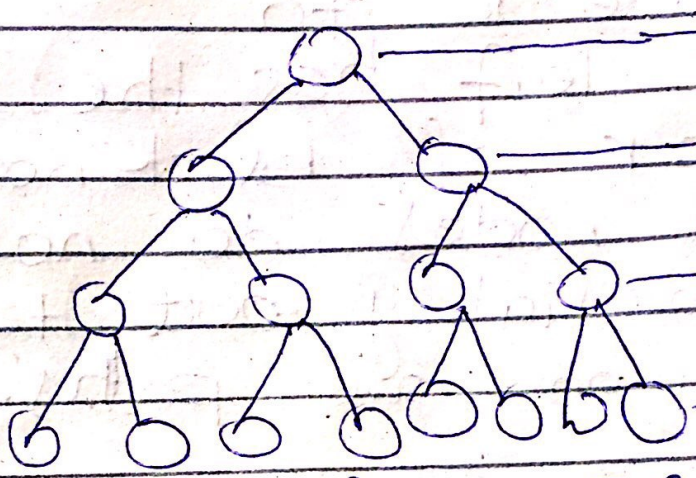
Q:7

∴ From red black properties, we have that every simple path from node x to a decendant leaf has the same number of black nodes and that red nodes do not occure immediatly next to each other on such paths.

Then the shortest possible simple path from node x to a decendant leaf will have all black nodes, and the longest possible simple path will have alternating black and red nodes Since the leaf must be black, there are at most the same number of red nodes as black nodes on the path.

Q:8) heap height

as we know CBT is implemented at the back of Heap.



$\therefore n = 2^0 + 2^1 + 2^2 + \cdots 2^h = \sum_{i=0}^{h} 2^i =$

no. of node in CBT of $(h) = (2^{h+1})$

So $n = 2^{h+1} - 1$

$n+1 = 2^{h+1}$

Taking log both sides.

$\log_2 (n+1) = \log_2 (2^{h+1})$

$\log_2 (n+1) = h+1 \log_2 2$

$h+1 = \log_2 (n+1)$

$h = (\log_2 (n+1) - 1)$