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Assignment-4 Anakool Durwedi Theory (CCS-202) B19071 Grp-13

D The procedure to create red black tree from n clements (sorted) is :-@ Find the middle clement and make it as root.

(b) Then place [ left mid) elements
on left and [mid+] oright] elements
on right recursively.

(c) Mark all the nades of Black encept

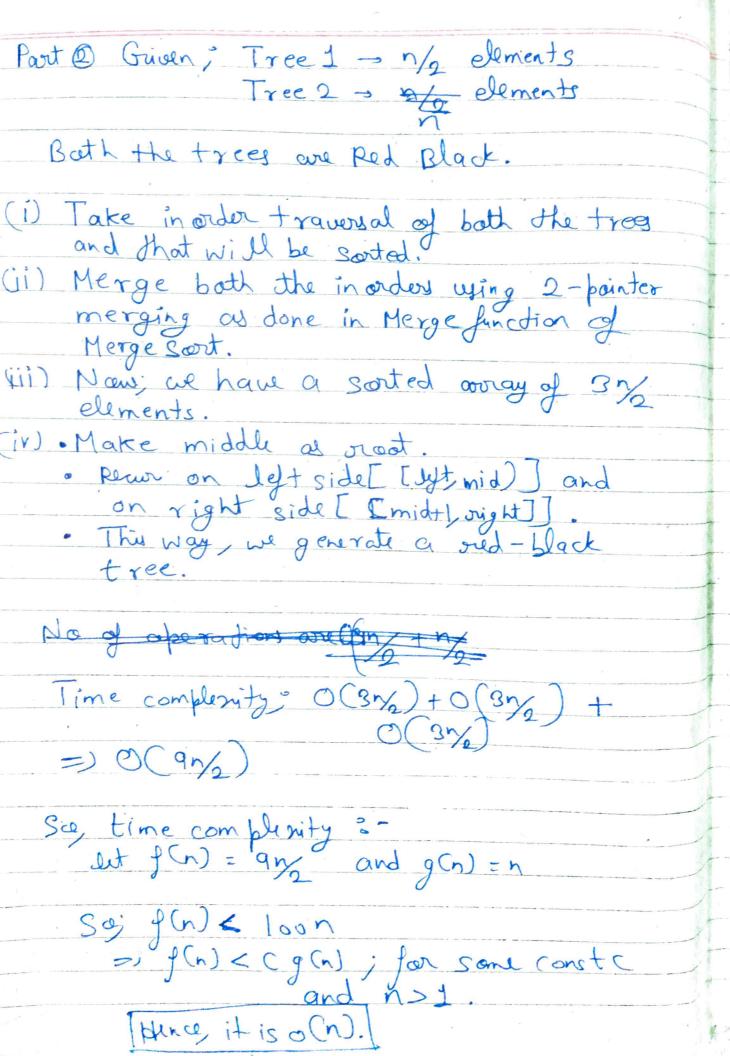
Mark all the nades of Black encept the last level. Mork last level rady as ned.

In this way the ored black tree can be generated.

@ Part D: Tree 2 = n elements

Insert nodes (or elements) from Free I to Tree 2. This would take O(In logn) time which is o(n). It lim In logn - lim legh -> O

So; our algorithm would take och) time.



Dements.

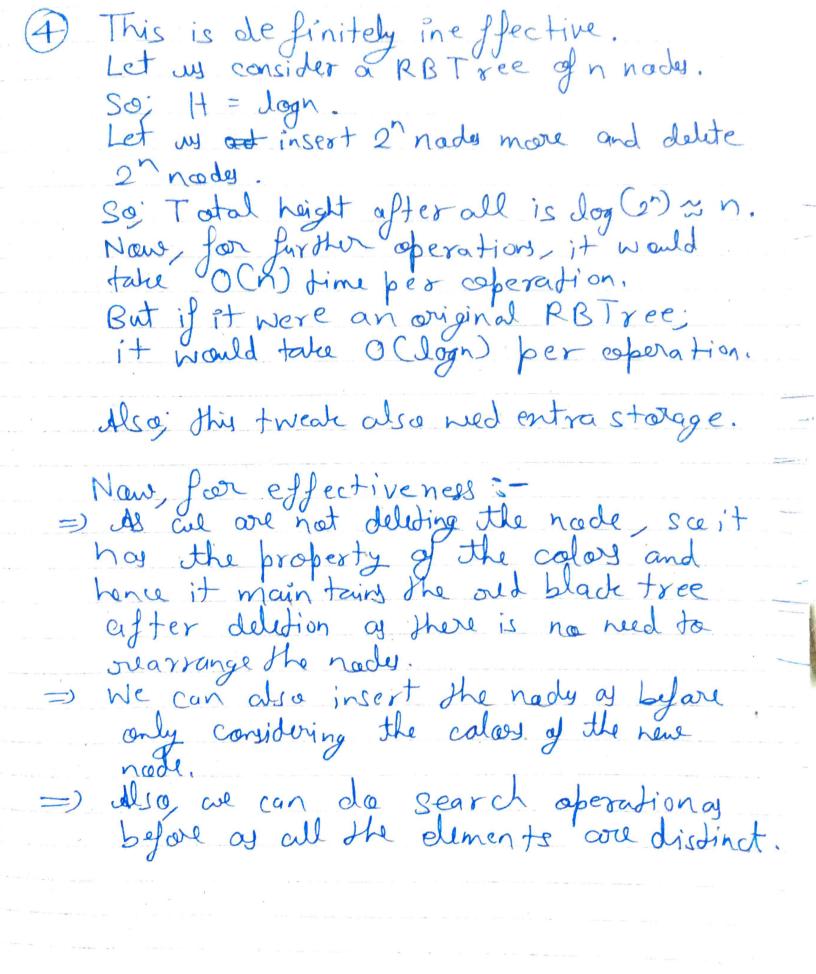
So: the procedure is:

O Sor Find incorders of both the trees.

O Compare the incorders element wise.

O If all some then some set of elements.

Else, different set of elements.



**F** For insertion: Rotations 9 - OCID [2 ratations] ( when the unde is black in color) There are 4 ratations:-LL, LR, RR, RL Recoloning: - OCologn)
( contra cohen the uncle is red in color) We recolor parent unde and grand parent. Then secure on grand parent. So, it is propositional to height of Tree. For deletion: Rotations: - OCI) [2 ratations] Recoloring: O(logn) If sibling is black fits both dildren and recover for the parent. So it could be O (logn), the height of tree. But al require at most 2 rotations in all eagle.

- 1 The procedure is as falland:
  - Thin successor lies in right subtrue. So, we go to right subtree and return the node with minimum key value in the right subtree.
  - B If sight subtree of node is NULL, then successor is one of the ancestors. So, one travel up using the parent pointer until we see a nade which is left child of its parent. The parent of such a node is successor.