Assignment 4

October 29, 2020

Deadline:-7/November/2020 11:59 PM IST

1 Theory

1. Given n integers in sorted order, give a simple way to generate a red black tree, which takes $O(n)$ time. 2

2. Given two red black trees with $\sqrt{n}$ and n number of elements what is the best strategy to construct a new red-black tree, consisting of elements from both the trees. (Hint there exists a $o(n)$ time solution.) 4

3. Given two BST's how do you check if they represent the same set of the elements? 2

4. Mr. Lazyrus feels that Red-black Trees deletion operation is complicated, so he suggests the following tweak. Each node has an additional boolean variable which denotes whether an element is active or deleted. Active elements are part of the input, while deleted elements are elements were part of the input at some point, but they were subsequently deleted.

   While trying to delete an element, we do not remove the node from the tree. We simply set its additional boolean to zero, indicating deletion. While insertion of a node, we set its boolean to 1 indicating active node.

   Explain the effectiveness/ineffectiveness of this tweak. Suggest additional tweaks if needed, in order to make this tweak work. Assume all elements are distinct. 4

5. How many rotations and color changes are needed to be performed per insertion/deletion in a red black tree? Explain your answer. 2

6. Given an element x, explain how to find the successor of an element in a red black Tree (Assume all elements in that tree are distinct)? 2