

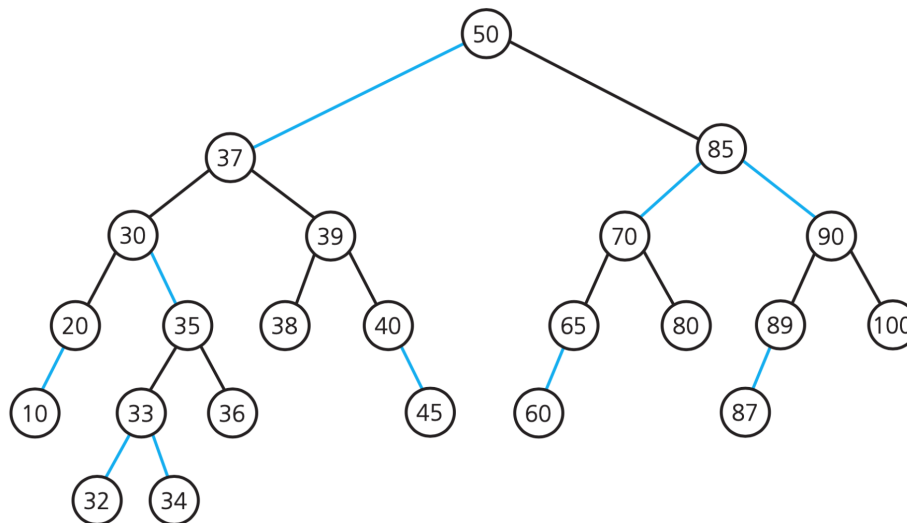
Data Structure and Advanced Programming

Homework #12

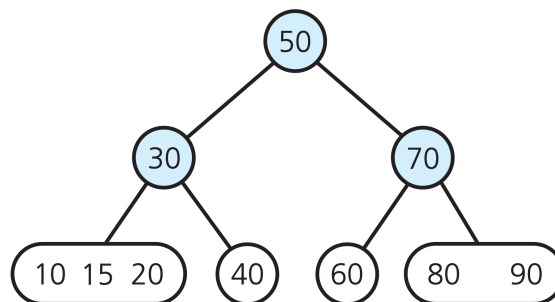
Due: 2021/6/8 08:00am (CST)

NOTE: Please upload your answers in either English or Chinese as a PDF to NTU COOL before the due date and time.

1. (30%) Write pseudocode for the insertion, removal, retrieval, and traversal operations for a red-black tree.
2. (25%) Please draw a 2-3-4 tree that represents the red-black tree in the figure below.



3. (20%) Please draw a red-black tree that represents the 2-3-4 tree in the figure below.



4. (25%) Figure 1 is a red-black tree that represents the 2-3-4 tree in Figure 2. Please draw another red-black tree that also represents the same 2-3-4 tree (Figure 2).

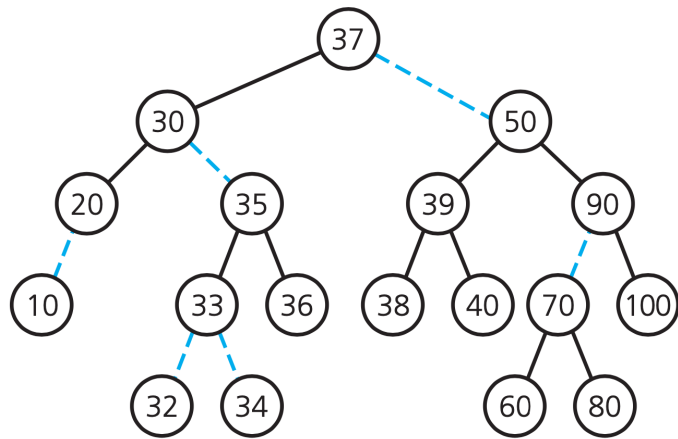


Figure 1. A red-black tree of Figure 2

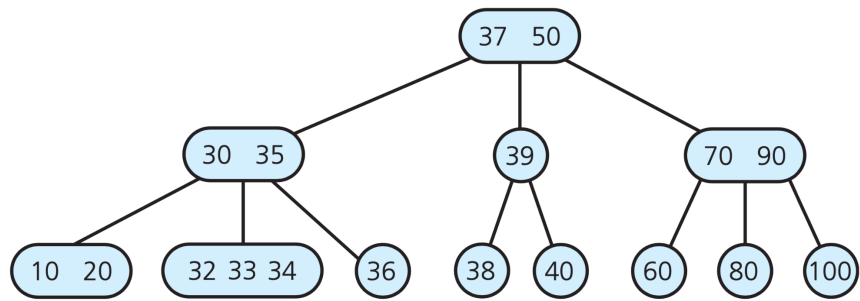


Figure 2. A 2-3-4 Tree