CSE 373 Data Structures WI15 HW04

Problem 1

(Adapted from Weiss 4.9 and 4.19)

In this problem you will practice insertion into binary search trees and AVL trees.

A (2 pts) Show how to insert 3, 1, 4, 6, 9, 2, 5, and 7 into an initially empty binary search tree. (Show each step.)

B (3 pts) Show how to delete the root from the binary search tree you created. (Show all work.)

C (5 pts) Show how to insert 2, 1, 4, 5, 9, 3, 6, 7 into an initially empty AVL tree. (Show each step, including rebalancing.)

Problem 2

In this problem you will practice insertion and deletion in binary heaps (default min heap).

A (7 pts) Show how to insert 10, 12, 1, 14, 6, 5, 8, 15, 3, 9, 7, 4, 11, 13, and 2 into an initially empty binary heap. Insert each value, one at a time (not with buildHeap), and show each of the 15 steps as separate trees (pictorially with nodes and edges). For *only* the step of adding the 3, show the initial array representation and each step of the percolate up until the 3 is in the right place.

B (7 pts) Show the results of two consecutive **deleteMin** operations on the heap above (show each). For *only* the first *deleteMin*, show the initial array representation and each step of the percolate down until the operation is complete.

Problem 3

(Adapted from Weiss 8.1)

In this problem you will practice working with the union-find algorithms and up-tree data struc-

ture. You are given 17 individual sets numbered 0 through 16. Show the results of the following sequence of instructions (show each step as a tree):

union(1,2), union(3,4), union(3,5), union(1,7),
union(3,6), union(8,9), union(1,8), union(3,10),
union(3,11), union(3,12), union(3,13), union(14,15),
union(14,16), union(1,3), union(1,14)

when unions are:

A (7 pts) Performed arbitrarily by making the second argument a child of the first argument.

B (7 pts) Performed by size.