CS 284: Endterm – T2 – Fall 2020

December 9, 2020

Student Name:

Honor Pledge:

Grade sheet:

Problem 1 (20 points)	
Problem 2.1 (10 points)	
Problem 2.2 (10 points)	
Problem 3 (20 points)	
Problem 4 (20 points)	
Problem 5 (10 points)	
Problem 6 (10 points)	

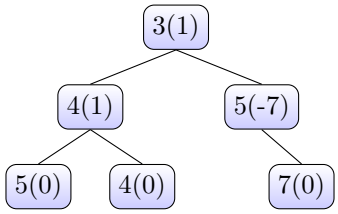
Problems

Exercise 1 (*Trees*)

Given a binary tree, return the **tilt** of the whole tree by implementing:

```
public static int tilt(BTree<Integer> t)
```

The tilt of the whole tree is defined as the sum of all nodes' tilt. The tilt of a tree node is defined as the absolute difference between the sum of all left subtree node values and the sum of all right subtree node values. A null node has tilt 0. The tilt of each node of the tree below is indicated between parenthesis. For example, the tilt of the root node is 1. The tilt of the whole tree is thus 1.



You may make use of helper methods (which you have to implement too).

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Exercise 2 (*Heaps*)

1. Build the min heap that would result from inserting the following elements in the order in which they are presented. Show the intermediate heaps resulting from each individual insertion.

   18, 10, 90, 82, 55, 33, 15, 47, 25

2. Show the heap resulting from performing a deletion.

Exercise 3 (*Sorting*)

Sort the following list using quicksort sort

72, 35, 18, 22, 43, 12, 52, 21, 12

Exhibit the list resulting from each pass.

Exercise 4 (*Trees*)

Suppose we have int values between 1 and 1000 in a BST and search for 363. Which of the following cannot be the sequence of keys examined? Why?

1. 2 252 401 398 330 363
2. 3 923 220 911 244 898 258 362 363
3. 4 924 278 347 621 299 392 358 363
4. 5 925 202 910 245 363

Exercise 5 (*Hashing*)

Insert the items in the following table

Key	Hash Code
A	17
B	9
C	25
D	11
E	15
F	24
G	77
H	11
I	1

into the hash table below. Resolve collisions using chaining.

0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Exercise 6

1. Construct the AVL tree resulting from inserting the following items: 5, 7, 50, 10, 3, 30, 25, 8, 15. Show the intermediate AVL trees that are obtained after each individual insertion.

2. Remove the key 7

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