Homework 5

100 Points

Recursion and Heaps - ADT

An airline company uses the formula shown below to determine the priority of the passengers on the waiting list for overbooked flights.

Priority number = A / 1000 + B – C

Where

A is the customer's total mileage in the past year

B is the customer's number of years in the flier program

C is the sequence number representing the customer's arrival position when the flight was booked (the first customer's sequence number is 1, second in the file is 2, and so on).

Two or more customers could have the same priority number. For instance Robert Hill and Tom Martin have the same priority number:

Robert Hill's priority number: 53000 / 1000 + 5 – 1 = 57

Tom Martin's priority number: 56000/1000 + 5 – 4 = 57.

Customers with the same priority number must be served on a first come first serve basis, therefore build the heap based on a unique serial number determined using the following formula:

serial number = priority * 100 + (100 – C).

Robert Hill's serial number is: 57 * 100 + (100 – 1) = 5799

Tom Martin's serial number is: 57 * 100 + (100 – 4) = 5796

Given a file with overbooked customers, **`overbooked.txt`**, write a program that reads the file and determines each customer's priority number and prints a list of waiting customers (name and their priority and serial numbers) in priority sequence, including the number of customers. A line in the input file contains the number of years in the frequent flier program, total mileage in the past year, and the name of the customer as shown below:

```
5 53000 Robert Hill
```

Grading

1. Customer class	– 10
2. Build heap from file	– 25
3. Print heap as an indented tree (Right –Root–Left traversal) (show the serial number and the name of the customer)	– 10
4. Print customers in priority sequence (show year, mileage, and name)	– 20
5. Heap class (ADT)	– 20
6. main(), and other functions	– 10
7. Self Assessment Report	– 5

To test your program create an input file using the data shown below and name it **`overbooked.txt`**:

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5 53000 Robert Hill
3 89000 Amanda Trapp
3 90000 Jonathan Nguyen
5 56000 Tom Martin
1 21000 Mary Lou Gilley
3 89000 Bob Che
7 72000 Warren Rexroad
2 65000 Vincent Gonzales
3 34000 Paula Hung
6 21000 Lou Masson
4 42000 Steve Chu
3 99000 Linda Lee
3 69000 Dave Lightfoot
3 83000 Daniel Oh
5 50000 Sue Andrews
2 73000 Joanne Brown
7 96000 Paul Ng
5 53000 Steven Chen
2 65000 Vladimir Johnson
7 72000 Peter Edwards