CPSC 2150 – Algorithms and Data Structures II

Assignment 1: Hotel Reservation

Total - 80 Marks

You should spend 80 percent of your time on solving the problem and only 20 percent for programming.

Learning Outcomes

- Design and solve problem using linear data structures
- Practice on calculating the time complexity
- Implementing and programming with C++

Resources

- Chapter 3 , 4, and 6 of the text book

Description

You are a manager of a hotel. You have a number of rooms and a number of customers requesting rooms. Customers want rooms with different number of beds. In your hotel, you have 100 rooms with only one bed, 50 rooms with 2 beds and 30 rooms with 3 beds.

A. **[50 marks]** Create two efficient classes: Room, Customer; in their own h and/or cpp files. The room has information such as the customer who's currently occupying it, when the customer gets the room (check in date), when the customer is leaving the room (check out date), and the number of beds in the room. The Customer class carries the customer id and the number of requested beds.
   Write an efficient program that slots as many as customers into the hotel.

- If your best available room has more beds than what customer asked for, you should assign that room to the customer. But switching the room when it's assigned is not allowed.
- If the number of beds requested by customer is more than the biggest number of beds in all rooms, the program must accommodate the customer with more than one room.

  For example, if the customer asks for 5 beds, and the available rooms of hotel has maximum 3 beds, the best choice is to accommodate the customer with a room of 3 beds and a room of 2 beds. However, if room with 2 beds is not available, then 2 room of 3 beds may be a good choice. Alternatively, there is another choice like 1 room of 3 beds and 2 rooms of 1 bed. Your program must decide which one is the best. In the real world's problem, you always have to compromise and there is no best solution for all the situations.

- If it is not possible to assign room(s) to a customer, you program must declare that by sending an appropriate message.
- Your program can't refuse to accommodate a customer if there are available room(s).
- Finally, the program must report how many customers have been serviced as total.
- To test your program, you can use **customers.txt** file which is already provided and simulates the requests of random customers. The file includes data such as date, customer identification number, number of requested bed(s), and duration of stay in terms of day(s). The following shows a line of the file:

1/1/2018, 843A62A1MR, 3, 7

which means customer with id number 843A62A1MR has checked-in to a room with at least 3 beds on Jan 1, 2018, and (s)he has checked-out that room on Jan 8, 2018. In other words, this room is available again on Jan 8, 2018. To simplify the program, consider that the records in the file are issued in the same day as check-in date (ie. for each record check-in is today).

B. **[10 marks]** What type of list are you using to implement your program? Justify your choice. **(readme.pdf)**

C. **[10 marks]** If growing the hotel with rooms of more beds is a possibility in the future, how would you design your data structure to accommodate this change? **(readme.pdf)**

D. **[10 marks]** Internal and external documentation and programming style.

For external documentation, explain your data structure and time complexity of different functions in your class **(readme.pdf)**.

E. **[5 bonus marks]** This is a competition for programs that service the maximum number customers in total.

Note

- Do not use STL except for dates and vectors

SUBMIT to D2L

Submit a zip file named **StudentNumber-Asgn1.zip** including **readme.pdf** and all related **cpp** and **h** files by the due date. For example, if your student number is 10023449, the submitted file must be named as **10023449-Asgn1.zip**.