CSU213 Exam 1 – Fall 2008

Name: _____

Student Id (last 4 digits): _____

- Write down the answers in the space provided.
- You may use all forms that you know from *ProfessorJ (Beginner)*, or *ProfessorJ (Intermediate*, where indicated. If you need a method and you don't know whether it is provided, define it.
- Remember that the phrase "design a class" or "design a method" means more than just providing a definition. It means to design them according to the design recipe. You are *not* required to provide a method template unless the problem specifically asks for one. However, be prepared to struggle if you choose to skip the template step.
- We will not answer *any* questions during the exam.

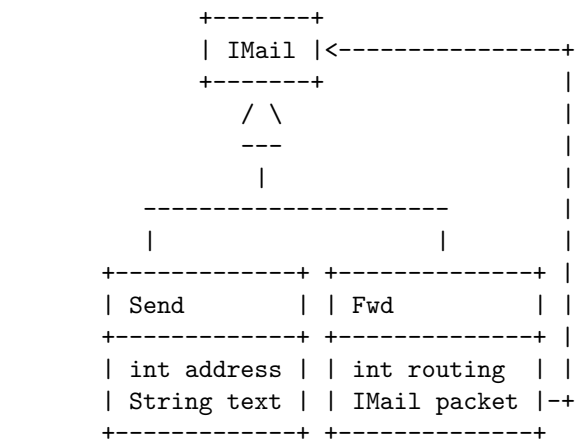
Good luck.

Problem	Points	/
1		/21
2		/15
3		/22
Total		/57

21 Points

Problem 1

The following class diagram represents the class hierarchy that records the sending of a message through a network. The sender sends a message with the address where it should be delivered. The sender's router selects the next node and sends the message there. If it is that node's address does not match the message destination, the router on the next node selects another node to send the message to.



A. Define the Java classes and interfaces that are represented by this class diagram.

B. The `IMI` class hierarchy can be used to represent the following information about a message:

```
A sample network:

    7 ---------- 1 -------- 4
    | \           \
    |  6---------- 9 -------2
    |                       |
    3 ---------- 8 -------- 5
```

```
A message is sent From: node 1, To: node 5, Message: "hello"
it is forwarded to node 7,
                then to node 3,
                then to node 8,
                then to node 5,
                where it is delivered.
```

Make examples of data that represent this information. Make one more example that represents a message that can be sent in the shown network.

C. Design the method `countf` that counts the number of times the message has been forwarded.

D. Design the method `msgText` that produces the text of this message.

E. Design the method `getAddress` that produces the destination address for this message.

F. Design the method `isDelivered` that determines whether this message has been delivered to its address. (Assume that the message is never routed through the same address twice.)

G. Show the complete templates for this problem.

18 Points

Problem 2

A children's game deals with colored pebbles of different sizes. We represent the pebbles as follows:

```
+-------------+
| Pebble      |
+-------------+
| int size    |
| String col  |
+-------------+
```

A. Define the Java classes and interfaces that represent a list of pebbles. Make examples of data.

B. Design the method that counts all pebbles of the given color.

C. Design the method that produces a list of all red pebbles from this list of pebbles.

D. Design the method that determines whether this list of pebbles contains two blue pebbles in a row.

22 Points

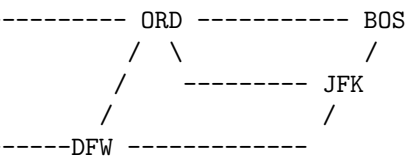
Problem 3

We want to design a program for the travel agency that will help in in planning air travel. We need to represent flights from one airport to another, recording the departure and the arrival times. (We assume every flight starts and ends on the same day - no overnight flights - at least for now.)

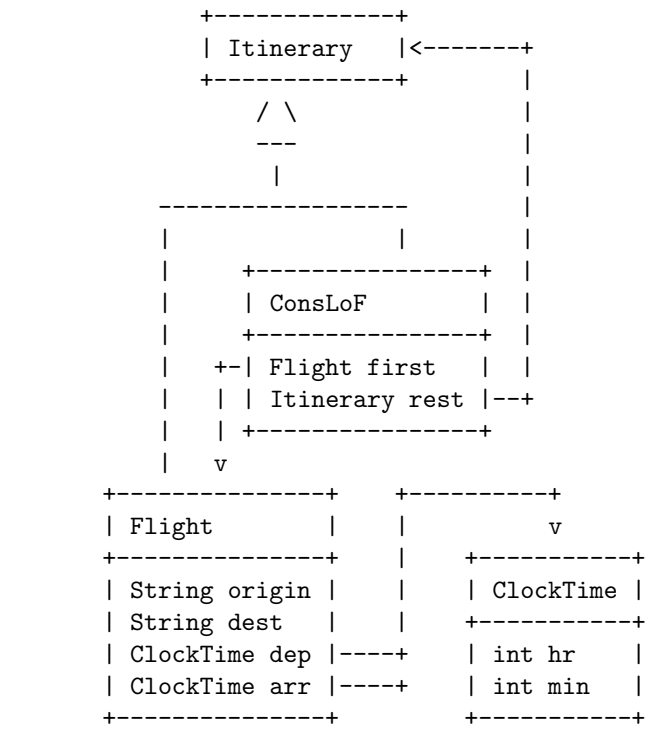
Here is a sample information available to us:

```
Airports:
  SFO - San Francisco
  ORD - Chicago O'Hare
  JFK - New York, JFK
  BOS - Boston, Logan
  DFW - Dallas/Fort Worth

  Flights: SFO -> ORD  9:30 - 12:00
           ORD -> BOS 13:00 - 15:30
           ORD -> JFK 13:00 - 16:00
           ORD -> DFW 12:30 - 15:00
           ORD -> DFW 14:00 - 16:30
           ORD -> SFO 12:00 - 14:30
           JFK -> DFW 18:00 - 20:00
           BOS -> ORD 10:00 - 12:00
           DFW -> SFO 21:00 - 23:30
           SFO -> DFW 15:00 - 18:00
```



The following class diagrams describe the classes needed to define an itinerary.



A. Write the class and interface definitions for the class hierarchy that represents an itinerary. You do not have to show the constructors. Include purpose statements.

B. Make examples of data for the following itineraries using only the flights listed above:

```
Boston -> San Francisco
JFK -> San Francisco
San Francisco -> Boston
```

C. We want to know whether an instance of `Itinerary` represents a valid travel plan. The requirement is that the traveler has at least an hour to change from one flight to another flight, and, of course, that the next flight originates at the same airport where the previous one landed. In the next part you will design the method `isValid` that verifies the validity of an itinerary. **In this part, make examples of data for both valid and invalid itineraries according to the given rules.** Include a comment that explains whether it is a valid itinerary, or why it is not a valid itinerary.

D. Design the method `isValid` that determines whether an itinerary is a valid one. The requirement is that the traveler has at least an hour to change from one flight to another flight, and, of course, that the next flight originates at the same airport where the previous one landed.

Design recipe is your lifeline — helper methods will be graded.

Show all templates for this problem. These will also be graded.