Software Engineering

2nd Midterm Exam

Jan. 2, 2013

(請按照題號順序作答，以免批改時遺漏)

1. Explain the following terminologies:
   (a) (3%) Regression testing
   (b) (3%) Beta testing
   (c) (3%) COTS product reuse
   (d) (3%) Service-oriented systems

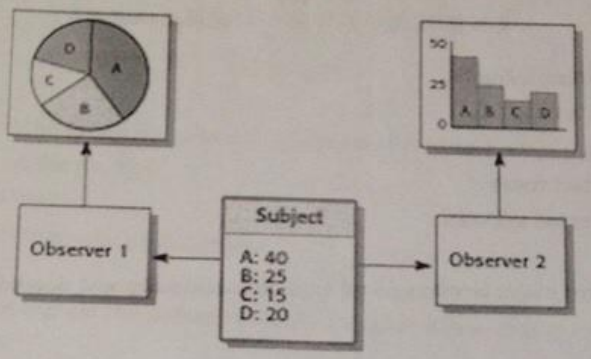
2. (9%) Please provide three major advantages of explicitly designing and documenting software architecture.

3. (9%) Please show the Model-View-Controller pattern and explain each part of the pattern.

4. (10%) Please explain the Test Driven Development process.

5. Consider that you are asked to write an object to emulate a simplified car. The simplified car only contains an engine and an AM radio. The functions of the object include speeding up, slowing down, and tuning the radio up and down.
   (a) (5%) Please draw a simple class diagram design for the car using UML. The car object is composed of an engine and an AM radio. You should also show the interface design for the required functions provided by the engine and the radio.
   (b) (5%) Please show a sequence diagram based on your design when a user tuning up the AM radio.
   (c) (5%) If your boss wants to change the AM radio to FM radio, how would you design the radio so that you do not need to change other parts of the software when you replace the radio? Please draw the class diagram of your radio.
   (d) (10%) Now, suppose that you have developed the AM radio class and FM radio class. One year later, your company gets a project which plans to develop a car emulator with a radio capable of receiving both AM radio and FM radio. The radio only adds a function in the interface to switch the radio from AM/FM to FM/AM. Can you reuse the design of your AM and FM radio classes? If you can, please draw the class diagram of your design.

6. Assume that you are writing a program to show the statistics collected by a questionnaire. You want to show the results using multiple figures like a bar chart and a pie chart as shown in the following figure.
   (a) (5%) Which design pattern discussed in our class would be a good choice for the application?
   (b) (10%) Please draw the UML class diagram of the design using the pattern in (a).



7. Assume that a company will develop a message writer framework for all its product teams. The framework should be flexible enough such that different teams can re-organize their output message formats and adds more output information. One possible way is to design the framework as wrapper classes so that one wrapper can wrap another wrapper to add additional functionality. Moreover, users do not need to know what wrapper classes are included in a message writer object. Users just need to know the general interface to print messages. A piece of Java code showing an example of using the message writer is listed as follows:

```
public void functionA(){
    Message   message = new Message();
    message = new DayMessage(message);

    // The following line outputs "Jan 14, 2011: Good morning." Day message.
    message.print("Good morning.");

    message = new StarMessage(message);

    // The following line outputs "***Jan 14, 2011: Good afternoon.***" star message.
    message.print("Good afternoon.");
}
```

(a) (5%) Which design pattern discussed in our class would be a good choice for the message writer?

(b) (10%) Please draw the UML class diagram for the message writer showing the relation among the classes "Message", "DayMessage", "StarMessage" and any other abstract or concrete classes and interfaces.