Beijing-Dublin International College

SEMESTER 1 FINAL EXAMINATION - 2020/2021

COMP3018J - Software Methodology

MODULE COORDINATOR: MI Qing

Time Allowed: 95 minutes

Instructions for Candidates

BJUT Student ID: _____UCD Student ID: _____

I have read and clearly understand the Examination Rules of both Beijing University of Technology and University College Dublin. I am aware of the Punishment for Violating the Rules of Beijing University of Technology and/or University College Dublin. I hereby promise to abide by the relevant rules and regulations by not giving or receiving any help during the exam. If caught violating the rules, I accept the punishment thereof.

Honesty Pledge：_____ (Signature)

Instructions for Invigilators

All electronic devices, notebooks, books, work papers are strictly prohibited.

Section 1. True or False (1.5 point for each question, 15 points in total).

1. For generic software products, the specification of what the software should do is owned by the customer and they make decisions on software changes that are required.
2. IEEE-1026 is a recommended standard guideline for writing software requirements specification.
3. Agile methods serve very well for software projects that do not have all requirements completely specified at the beginning of the project.
4. A software project developed with the XP process will have huge amounts of documentation.
5. Use case diagram is used to describe functional requirements.
6. A good architecture maximizes the cohesion of each module.
7. Refactoring code is likely to change the code's logic and behavior.
8. You should always optimize your code for performance.
9. System testing is mainly done to check how individual modules interact with each other when integrated into a system as a whole.
10. Running all the branch coverage test cases would ensure total statement coverage.

Section 2. Fill in the blanks (1 point for each blank, 20 points in total).

1. _____ is a framework that is used to help a software organization define its level of maturity in software development.
2. The four fundamental activities in software processes are: _____, _____, _____, _____.
3. Extreme programming practices writing test cases _____ (before/while/after) writing the code.
4. In Scrum, _____ should be responsible for the product backlog, including its content, availability, and ordering.
5. During the requirements validation process, different types of checks should be carried out on the requirements in the requirements document. These checks include: _____, _____, _____, _____, _____.
6. A user story has three primary components, each of which begin with the letter 'C'. They are: _____, _____, _____.
7. _____ is a creational design pattern that provides an interface for creating objects in a superclass, but allows subclasses to alter the type of objects that will be created.
8. _____ means that if the same set of test cases are executed again and again over the period of time then these set of tests are not capable enough to identify new defects in the system.
9. In _____ testing, users of the software work with the development team to test the software at the developer's site.
10. _____ is a commonly used tool for version management.
11. If you use open source software that is licensed under the _____ license, then you must make that software open source.

Section 3. Answer the questions (65 points in total).

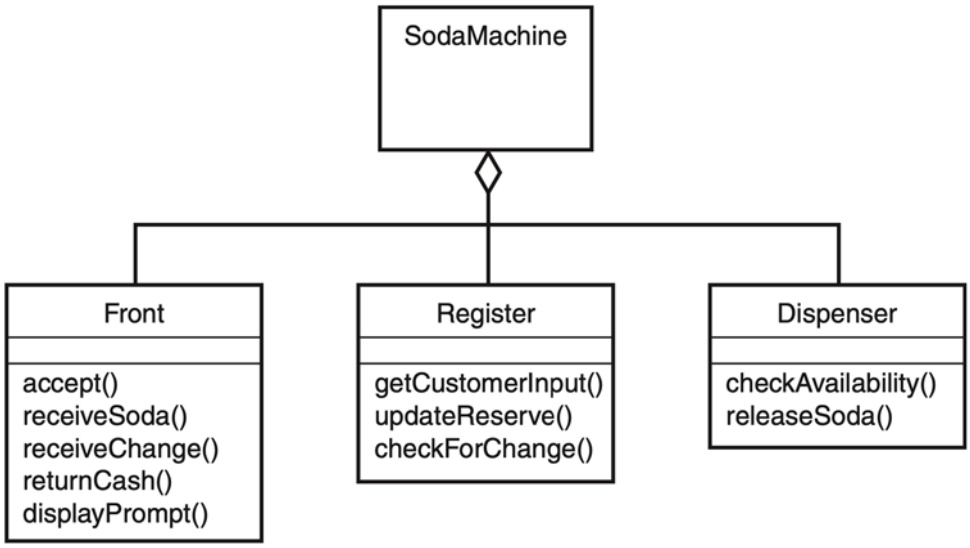
1. (5 points) Suppose you are required to develop a system to control anti-lock braking in a car. Which software process model do you plan to use? Why?

2. (8 points) Answer the following questions regarding agile methods.
   1) Tell the differences between Scrum and XP.
   2) Why has the Scrum agile method been widely adopted in preference to methods such as XP?

3. (6 points) The following table lists all the stories in your project and they are sorted in order of descending priority. The team estimates a velocity of thirteen story points per iteration. How do you allocate these stories to iterations? Propose two release plans and explain your answer.

Story	Story Points
Story A	3
Story B	5
Story C	5
Story D	3
Story E	1
Story F	8
Story G	5
Story H	5
Story I	5
Story J	2

4. (8 points) Suppose you are required to design a soda machine, which consists of three components: a front, a register, and a dispenser. The model of the soda machine is displayed in the following figure. Your task is to develop a sequence diagram showing the interactions involved when a customer buys a can of soda. Suppose the customer's selection is available, but the customer does not insert the correct amount of change.



5. (8 points) Fill in the table with appropriate architectural patterns.

Architectural patterns	When used
①_____	Commonly used in data processing applications (both batch- and transaction-based) where inputs are processed in separate stages to generate related outputs.
②_____	Used when building new facilities on top of existing systems. Also used when there is a requirement for multi-level security.

③_____	Used when you have a system in which large volumes of information are generated that has to be stored for a long time.
④_____	Use when your application can be factored in functionally separable modules that are capable of communicating through simple messages.

6. (10 points) Answer the following questions regarding software design.
   1) What are SOLID principles in object-oriented design?
   2) Which principle is violated by the following code? How to fix the violation?

```
interface IAnimal{
   public void eat();
   public void swim();
   public void fly();
}

class Goldfish implements IAnimal{
   public void eat(){
      System.out.println("Goldfish is eating");
   }
   public void swim(){
      System.out.println("Goldfish is swimming");
   }
   public void fly(){}
}

class Sparrow implements IAnimal{
   public void eat(){
      System.out.println("Sparrow is eating");
   }
   public void fly(){
      System.out.println("Sparrow is flying");
   }
   public void swim(){ }
}
```

7. (12 points) Read the following code segment carefully.

```
double func(int a, int b, double c)
{
   if (a>0 && b>0) {
      c = c/a;
   }

   if (a>1 || c>1) {
      c = c+1;
   }

   c = b+c;
   return c;
}
```

Based on the code segment:

1) Draw the control flow graph.
2) Write a set of test cases that can satisfy the condition coverage criterion but cannot satisfy the decision coverage criterion.
3) Write a set of test cases that can satisfy the multiple-condition coverage criterion.

8. (8 points) Answer the following questions regarding legacy system management.
   1) What are the strategic options for legacy system management?
   2) Assume that an organization has 10 legacy systems, as shown in the following figure. Decide on the most appropriate strategy for evolving these systems.