UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 7 Examination in Engineering: August 2018

Module Number: EE7205

Module Name: Object Oriented Design Patterns and Principles

[Three Hours]

[Answer all questions, each question carries 10 marks]

Q1 a) What is "Dependency Inversion Principle" in SOLID design principles?

[2.0 Marks]

b) Explain Interface Segregation using a suitable example.

[2.0 Marks]

c) Identify the problems in the following code segment in terms of best practices. Rewrite with the fixes.

```
public class CommonUtils {

        public static Student JsonToStudent(String studentJson) {
                JsonProcessor p = new JsonProcessor();
                return (Student)p.parse(studentJson);
        }

        public static Teacher JsonToTeacher(String teacherJson) {
                JsonProcessor p = new JsonProcessor();
                return (Teacher)p.parse(teacherJson);
        }

        public static NonAcademicStaff JsonToStudent(String nonAcademicJson) {
                JsonProcessor p = new JsonProcessor();
                return (NonAcademicStaff)p.parse(nonAcademicJson);
        }
}
```

[6.0 Marks]

A **programmer** was assigned to write a program to build a Graphical User Interface (GUI) creation tool. Answer following questions based on the given requirement.

The GUI creation tool supports different types of GUI components such as Panel Component, Text view component, Input box component, Button component etc. Three types of borders can be added to each GUI component - Plain, 3D and Fancy. The Panel component can be associated with Horizontal and Vertical scrollbars.

a) What is the design pattern which can be used to implement the above requirement?

[2.0 Marks]

b) Draw a class diagram for the above requirement implementation by following the specified design pattern in part (a)?

[8.0 Marks]

Q3 a) Explain the benefits of Mediator pattern using a suitable example.

[4.0 Marks]

b) Write the source code only for the Mediator class in the above scenario. Clearly state any assumptions.

[6.0 Marks]

Q4 a) What is the importance of General Responsibility Assignment Software Patterns (GRASP) for a software architect when designing an Object Oriented Program?

[4.0 Marks]

b) "There are certain classes that do not represent a concept in the problem domain."
   i) What is the GRASP pattern which can be used for these kinds of classes?
   ii) What are the benefits of using the above mentioned pattern?

[6.0 Marks]

Q5
```java
public class SMSController {

        private static final CHARGE_PER_SMS = 2;
        private BillingSystem billingSystem;
        private SMSC smsc;

        public SMSController(BillingSystem billingSystem){
                this.billingSystem = billingSystem;
        }

        public void sendSms(String sender, String receiver, String message){
                boolean hasCredit = billingSystem.authorize(sender,
        CHARGE_PER_SMS);
                if(hasCredit) {
                        smsc.send(sender, receiver);
                } else {
                        throw new CreditLimitExceededException();
                }
        }
}
```

a) Identify the list of unit tests you should perform on the above class.

[4.0 Marks]

b) Implement one of the happy path tests.

[4.0 Marks]

c) Implement a test to cover an error scenario.

[2.0 Marks]