



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 7 Examination in Engineering: July 2016

Module Number: EE7205

Module Name: Object Oriented Design Patterns and Principles

[3 Hours]

[Answer all questions, each question carries 10 marks]

Q1 a) Briefly explain GRASP software patterns.

[2.0 Marks]

b) Explain what 'I' is in SOLID principles by using an example.

[2.0 Marks]

c) Identify the violated SOLID principles in the following code segment and propose a solution to fix the identified problem.

```
public class Calculator{
    public int add(int a, int b){
        return a + b;
    }

    public void print(String str){
        System.out.println(str);
    }
}
```

[4.0 Marks]

d) Name two GoF patterns that are aligned with 'Creator' in GRASP.

[2.0 Marks]

Q2 a) Both Factory and Builder patterns are object creation patterns. Explain the difference between these two patterns in terms of usage.

[2.0 Marks]

b) What are the differences between 'Factory' and 'Abstract Factory' patterns?

[2.0 Marks]

c) Write a builder for the following class.

```
Public class Notification{
    private String code;
    private String description;
    private Date time;
}
}
```

[6.0 Marks]

- Q3 a) Explain the differences between 'Observer' pattern and the 'Mediator' pattern giving suitable example scenario for each pattern. [4.0 M]
- b) Draw the class diagram for the above explained example scenario of the 'Observer' pattern'. [2.0 M]
- c) Both Observer & Mediator patterns help for a loosely coupled design. Explain how it is achieved. [4.0 M]

- Q4 a) Briefly explain the Decorator pattern by giving an example from "java.io" package. [2.0 M]
- b) "Rectangle, Triangle & Circle classes implements the Shape interface, The Shape interface has a method draw(). The shapes must be decorated with a Border.
- i) Draw the class diagram for the above implementation following the decorator pattern. [4.0 M]
- ii) Explain the benefits of your design compared to "non decorator pattern used" design. [4.0 M]

- Q5 "Test Driven Development (TDD)" is one of the current trends in the software industry."
- a) Explain How TDD helps achieving loose coupling in an Object Oriented Software Design. [2.0 M]
- b) List down the characteristics of a good unit test. [2.0 M]
- c) SonarQube is a widely used static code analysis tool. Find one issue that was raised by SonarQube (with the possible solution) in the following code.

```
public class Hello{  
    public static void main(String args[]){  
        System.out.println("Hello World");  
    }  
}
```

[2.0 M]

- d) Find one issue that will be raised by SonarQube (with the possible solution) in the following code.

```
public class DeductionCalculator{

    private EpfCalculator epfCalc;
    private TaxCalculator taxCalc;

    public DeductionCalculator(EpfCalculator epfCalc, TaxCalculator
taxCalc){
        this.epfCalc = epfCalc;
        this.taxCalc = taxCalc;
    }

    public double calculate(double basicSalary){
        double epf = epfCalc.calculate(basicSalary);
        double tax = taxCalc.calculate(basicSalary);
        return epf + tax;
    }
}
```

[4.0 Marks]