UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 5 Examination in Engineering: January 2024

Module Number: EE5262 **Module Name: Object Oriented Design Patterns and Principles**

[Three Hours]

[Answer **all questions**, each question carries 10 marks]

Q1. a) Answer using the knowledge on object-oriented design patterns.

i) What is a design pattern?

[2.0 mark]

ii) Briefly explain three different types of design patterns.

[3.0 mark]

b) Sometimes it's important to have exactly one instance of a class.

i) What is the purpose of a Singleton design pattern?

[2.0 mark]

ii) Discuss the advantages and disadvantages of using the Singleton design pattern?

[3.0 mark]

Q2. a) MVC is a commonly used design pattern in software development.

i) Briefly explain MVC design pattern using a diagram. [2.0 marks]

ii) Give an example scenario where MVC design pattern is beneficial.

[2.0 marks]

b) Imagine you are tasked with designing a system for an online shopping platform. The system includes various components like shopping carts, payment processing, and product listings.

i) What are the SOLID Principles?

[5.0 mark]

ii) Describe how you would apply Single Responsibility Principle (SRP) to the design of the shopping cart class.

[1.0 mark]

Q3. a) Read the following scenario and answer the related questions. "CodePlex" is Microsoft's open source project hosting web site. The person who is starting a new project can allocate all the contributors to the project. Contributors keep "Clones" from the original project. When something got change with the project this website

will send a notification to all contributors who are allocated to the relevant project. When the contributors see the notification they can get a "Pull" and update their local projects into the current state.

i) Identify the design pattern which suites the above scenario and explain why you selected this design pattern?

[3.0 mark]

ii) Draw a rough class diagram to this design pattern related to the scenario.

[2.0 mark]

b) Answer using the knowledge on Template Method design pattern

i) Briefly explain Template Method design pattern.

[2.0 mark]

ii) Draw a rough class diagram Template Method design pattern.

[3.0 mark]

Q4. a) Answer using the knowledge on Factory Method design pattern

i) Explain the Factory Method design pattern. [4.0 marks]

ii) provide a real-world example where Factory Method design pattern could be applied.

[2.0 marks]

b) Discuss the key components and their roles in implementing the Factory Method design pattern.

[4.0 marks]

Q5. a) Consider the following design patterns list.

```
1: Strategy design pattern
2: Adapter design pattern
3: Decorator design pattern
4: Proxy design pattern
5: Command design pattern
```

i) Explain any two of the design patterns from the above list.

[6.0 marks]

ii) Draw a rough class diagrams for the design patterns used in the above section (Q5.a.i).

[2.0 marks]

b) Provide a practical example where the Strategy design pattern can be applied.

[2.0 marks]