DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
University of Rajshahi
B.Sc. Engineering Part IV Odd Semester Examination-2021
Course Code: CSE4121 Course Title: Object Oriented Design and Design Patterns

Time: 02 Hours Full Marks: 35

OOD Course Notes

SECTION A
[ANSWER ANY TWO OF THE FOLLOWING]

1.(a) What do you understand by Object Oriented Modelling? 1-5 1.75

(b) What is the key difference between software design and software architecture? solves 2.00

(c) Explain how CRC cards are used in modelling a conceptual design with an example. What are the advantages of using CRC cards? 1-17 3+2

2.(a) The design principle of **'decomposition'** takes a whole thing and divides it into different parts. There are three types of relationships in decomposition, which define the interaction between the whole and the parts: **association, aggregation**, and **composition**. Explain those relationships and also draw the UML diagram for each of these relationships. 1-41 5.00

(b) Consider an activity of **"changing TV channel using remote".** solves 3.75

- When a viewer presses a number on the tv remote, the television changes the channel that the tv viewer can see on the tv screen.
- The viewer can also press the up/down button on the remote to change the channel

Use the above description to draw a UML sequence diagram to model the interaction between the user and TV through the remote.

3.(a) What do you understand by Conceptual Integrity? 1-68 1.00

(b) Consider the following Smartphone class 2.75

1-61

```
public class SmartPhone {
        private byte camera;
        private byte phone;

        public SmartPhone() { … }

        public void takePhoto() { … }
        public void savePhoto() { … }
        public void cameraFlash() { … }

        public void makePhoneCall() { … }
        public void encryptOutgoingSound() { … }
        public void decipherIncomingSound() { … }
}
```

Explain the problems with the class in terms of coupling and cohesion.

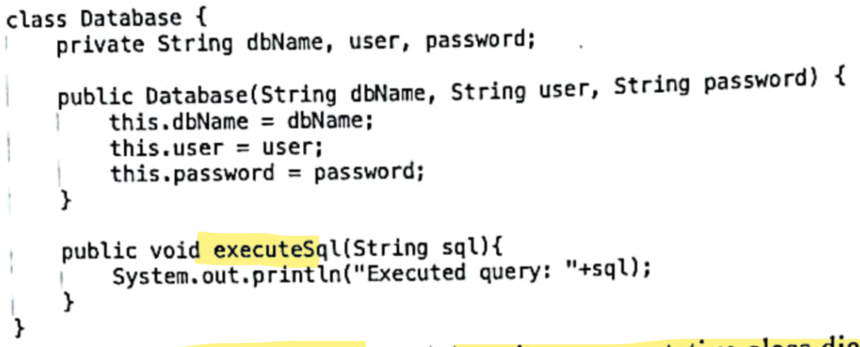
(c) How can you apply the **separation of concern** principle to overcome the problems associated with the previous example? Draw a UML diagram of your proposed solution. 1-63 5.00

Design Pattern

SECTION B
[ANSWER ANY TWO OF THE FOLLOWING]

4.(a) What are “software design patterns”, and why should you use them? 2-7 2.25

(b) Consider the java class below. Modify the class to convert it to a singleton class. Also, show how you can call the *executeSql* method of this singleton class using a demo program. 2-11 3.50



```
class Database {
    private String dbName, user, password;

    public Database(String dbName, String user, String password) {
        this.dbName = dbName;
        this.user = user;
        this.password = password;
    }

    public void executeSql(String sql){
        System.out.println("Executed query: "+sql);
    }
}
```

(c) Describe the Adapter pattern and draw its representative class diagram. 2-25 3.00

5.(a) Explain how the MVC design pattern can be used to develop a maintainable web application. 2-72 4.25

(b) What is the underlying principle of the Observer design pattern? Explain with an example. 2-66 4.50

6.(a) Present a scenario where you may need to use a façade design pattern. 2-20 1.75

(b) Explain steps to implement façade design pattern 2-22 4.00

(c) What are the facilities the façade design pattern provides? 2-25 3.00