

AHSANULLAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

Department: Computer Science and Engineering

Program: Bachelor of Science in Computer Science and Engineering

Semester.Final Examination: Spring 2019

Year: 1st

Semester: 2nd

Course Number: CSE1205

Course Name: **Object Oriented Programming**

Time: 3 (Three) hours

Full Marks: 70

[There are seven questions carrying a total of 14 marks each. **Question # 1 is mandatory.** Answer any four from the rest.

Marks allotted are indicated in the right margin.]

1. Consider that there is a WordProcessor class that has the attributes such as [14]
softwareName (String), version (String), Offline word processor and Online word processors, are the two different types of word processors. Offline and online word processors have all the attributes of a word processor. Microsoft word and Libreoffice contain all the attributes and functionalities of an offline word processor and Google doc inherited all the features of an online word processor.

A Picture class contains three instance variables, length, width and a two dimensional array that keeps the pixel values.

Also consider Microsoft Excel is a class from different hierarchy rather than word processor hierarchy.

The system designer wants the following facilities:

- I. A word processor can add a Picture object in a file.
- II. A word processor can compare two different word processor files.
- III. An online word processor has the functionality to check the internet connectivity.
- IV. Microsoft word and Microsoft excel can add each other objects into its file.

Draw a UML class diagram by considering the scenario mentioned above. Your design should be scalable i.e., the system designer should be able to add some more Word processor classes in the future. You should consider that class names bear common meanings regarding superclass and subclass relationship.

2. Read the scenario described in Question # 1 and write down all the necessary [14]
components in Java by considering the following considerations:

- I. When adding a picture to a file, your program prints "Adding a picture to word processor X", X refers to the name of the word processor.
- II. When comparing two files, your program prints "Comparing X and Y files".
- III. An online word processor prints "X is checking internet connectivity" when the particular method is called,

IV. Microsoft word prints "Adding an excel object to the file" when an Excel object is added to a word file.

V. When adding a Microsoft word object to an Excel file, your program prints "Adding a word object to an excel file."

You also need to demonstrate the capabilities of your code by using the *main* method.

3. a) Describe the three principles of object oriented programming with proper examples. [5]
b) A government office of a municipality wants to save all the information of the people, that is, name, age, gender, occupation and ID. The ID has two parts: ward code and serial number. For example, 04 and 05 are the ward codes for Tejgaon and Gulshan, respectively. Rahim and Karim are the random persons from Tejgaon and Gulshan wards, respectively. Please assume missing information. [5]

Identify classes and objects from the above scenario and write down Java code demonstrating it.

- c) class A{ [4]
 int a, b;
 A(int a, int b){
 this.a = a;
 this.b = b;
 }
}

public class TestDemo {
 public static void main(String[] args) {
 /*Line # 1*/ A r1, r2;
 /*Line # 2*/ r1 = new A(1,2);
 /*Line # 3*/ r2 = new A(3,4);
 /*Line # 4*/ r = r1;
 /*Line # 5*/ r1 = r2;
 /*Line # 6*/ r2 = r;
 }
}

Demonstrate graphical representations for each line from line # 1 to line #4 of TestDemo class.

4. a) Consider that a programmer wants to design an "Circle" class that has one instance variables, radius. The programmer has written the following code: [7]

```
class Circle{  
    double radius;  
}  
Class Demo{  
    Public static void main(String args[ ]){  
        Circle c1 = new Circle();  
        Circle c2 = new Circle();  
        c1.radius = 5.2;
```



```

        c2.circle = 3.5;
        System.out.println("Area of a circle: ", +Math.PI*radius*radius);
        if(c1.radius>c2.radius)
            System.out.println("first circle is larger");
        else
            System.out.println("second circle is larger");
    }
}

```

Design a proper encapsulated *Circle* class.

- b) All the mobiles can display messages. Classic mobiles can not display long text messages as a single message, it displays the long message as two separate messages by splitting the message into two parts. However, the smart mobile display a long text message as a single message. [7]

Your task is to design the mentioned system using object-oriented concepts. Message length over 100 characters is considered as a long message.

You might need to following Java methods:

String.substring(int i, int j) with two arguments returns the substring beginning at i and ending at j-1.

- 5/ a) Consider there are two types of files (classes) pdf and jpeg. Moreover, there is another class named Printer that has a method called print. The print method prints in a console "printing pdf file" or "printing jpeg file" depending on which file it prints. Use proper object-oriented concept to design the system. [7]
- b) A Person class is a superclass of a class called Student. The Person class has one abstract method and the Student class has three methods where one method is the overridden method from Person class. [5]

Now consider the following piece of code:

```

Person p;
Student s = new Student();
p = s;

```

Can the reference of a Person class (p) access all the methods of an object of a Student class (s)? Please explain with proper arguments.

- c) Why a main() method is declared as public and static? [2]
6. a) Why does the following java code generate a compile time error? Provide proper explanations and make proper corrections. Note that ArrayIndexOutOfBoundsException and FileNotFoundException do not have any superclass and subclass relationship between them. [4]

```

class Demo{
    public static void main (String args[]){
        BufferedWriter bw = null;
        double [] array = {3.0,5.3,6.5,8.2,2.7};
        try{

```

```

        FileWriter fw = new FileWriter("test.txt");
        bw = new BufferedWriter(fw);
        for(int i=0; i<array.length-1;i++){
            bw.write(array[i]);
        }
    } catch(Exception e){
        System.out.println("Other exceptions have happened.");
    } catch(ArrayIndexOutOfBoundsException e){
        System.out.println("You may access outside of the array");
    } catch(FileNotFoundException e){
        System.out.println("Something happen when the file is opened");
    }
}
}

```

- b) Consider that you are assigned to develop a student management system where student information need to input into the system. *Student* is a class of the system and first name, last name, age, email and mobile numbers are the attributes of the class. There are some constraints that need to be fulfilled when inputting student information: i) first name and last name should not contain any space (" "), ii) email address must ends with "@gmail.com" and iii) the mobile number must starts with "+8801". [8]

Design appropriate user-defined exception/s to handle these unexpected situations. You should have a main method that takes input and throw appropriate exceptions.

- c) Write down a scenario where *finally* block could be used? [2]

7. a) Please describe the life cycle of a thread in java. [3]

- b) Why does "join" method important in a multithreading environment? Explain with an example. [3]

- c) A bus counter performs two tasks: i) controlling departure of a bus, and ii) boarding passengers in a bus. A bus has to wait until all the seats of the bus are filled and the passengers try to board into the bus. [8]

You have to write threads for the bus counter. Use appropriate threading concepts while writing codes.