SCHOOL OF COMPUTING AND ENGINEERING SCIENCES

BACHELOR OF COMPUTER NETWORKING AND SECURITY

CNS 1207: OBJECT ORIENTED PROGRAMMING I

END OF SEMESTER EXAM

Date: 5th December 2024 **Time: 15:30-17:30 Hours**

Instructions:

1. This Examination consists of **FIVE** questions.
2. Answer **Question ONE (COMPULSORY)** and any other **TWO** questions.

QUESTION ONE (20 marks)

Consider the following code. Use it to answer parts a, b, c and d.

```
abstract class Animal {
    protected String name;
    public Animal(String name) {
        this.name = name;
    }
    public abstract void sound();
    public void display() {
        System.out.println("I am an animal named " + name);
    }
}
```

```
class Dog extends Animal {
    public Dog(String name) {
        super(name);
    }
    @Override
    public void sound() {
        System.out.println("Woof!");
    }
}
class Cat extends Animal {
    public Cat(String name) {
        super(name);
    }
    @Override
    public void sound() {
        System.out.println("Meow!");
    }
}
public class Main {
    public static void main(String[] args) {
        Animal myDog = new Dog("Buddy");
        Animal myCat = new Cat("Whiskers");
        myDog.sound();
        myCat.sound();
```

```
        myDog.display();
        myCat.display();
        if (myDog instanceof Dog) {
            System.out.println("This is a Dog object");
        }
    }
}
```

a. Identify and explain the four major object-oriented programming concepts demonstrated in the code. Indicate where each concept is used in the code. **(8 Marks)**

b. What is the role of the abstract keyword in the Animal class? **(2 Marks)**

c. How does inheritance work in this example? What is the relationship between the Animal, Dog, and Cat classes? **(2 Marks)**

d. Explain the purpose of the instanceof operator in the Main class. **(2 Marks)**

e. What is the main purpose of a constructor? **(2 marks)**

f. If the data member speed is private, is the following statement valid in a client program? **(2 marks)**

```
Robot aibo;
aibo=new Robot();
double currentSpeed =aibo.speed;
```

g. Declare two class constants named MIN_BALANCE and MAX_BALANCE whose data types are double **(2 marks)**

QUESTION TWO (20 marks)

a) What are the two standard Java packages used to implement GUI-based programs? **(2 Marks)**

b) What is the primary advantage of using Swing over AWT? **(2 Marks)**

c) Explain the role of a layout manager in Java GUI applications. **(2 Marks)**

d) Describe the difference between FlowLayout, GridLayout, and BorderLayout.

(6 Marks)

e) Write code for a small program using Swing to create a window with a GridLayout containing two buttons labeled “OK” and “Cancel”. **(8 Marks)**

QUESTION 3 (20 marks)

a) What is the output of the below program. **(4 Marks)**

```
class Student{
    private String studentName;
    public static void main(String args[]){
        Student stud = new Student("Zander Yuma");
        stud.printInfo();
    }
    public Student(String name){
        studentName = name;
    }
    public void printInfo(){
        System.out.println(studentName);
    }
```

b) Explain the following: **(6 Marks)**

i. Overloading

ii. Encapsulation

iii. Inheritance

c) What is the output from the following code? **(6 marks)**

```
class Question{
```

```
        private int one;
        public void myMethod(int one){
            this.one=one;
            one = 12;
        }
    }
    class Test{
        public static void main(String args[]){
            int one=30;

            Question q = new Question();
            q.myMethod(one);

            System.out.println(one);
        }
    }
```

d) Consider the following class.

```
class Modifier{
    public static void change(int x, int y){
        x=x-10;
        y=y+10;
    }
}
```

What will be an output from the following code? **(4 marks)**

```
int x=40;

int y=20;

Modifier.change(x,y);

System.out.println("x =" + x);

System.out.println("y =" + y);
```

QUESTION FOUR (20 marks)

a) Write code to establish a connection to the **library** MySQL database stored locally.

(6 Marks)

b) Define a method getBooks() that retrieves all books from the books table and prints out their details. Include exception handling. **(8 Marks)**

c) Describe how you would modify getBooks() to prevent SQL injection vulnerability.

(4 Marks)

d) d) Why is it important to close database connections in Java? Where in your code should you close the connection? **(2 Marks)**

QUESTION FIVE (20 marks)

a) Distinguish between the following: (**6 Marks)**

i. Accessor Methods and Mutator Methods

ii. Programmer-defined classes and standard classes

iii. Private and public members

b) Design a class that keeps track of a student ‘s food purchases at the campus cafeteria. A meal card is assigned to an individual student. When a meal card is first issued, the balance is set to the number of points. If the student does not specify the number of points, then the initial balance is set to 100 points. Points assigned to each food item are a whole number.

A student can purchase additional points at any time during a semester. Every time food items are bought; points are deducted from the balance. If the balance becomes negative, the purchase of food items is not allowed. There is obviously more than one way to implement the **MealCard** class. Any design that supports the key functionalities is acceptable. Write a test application named Test that demonstrates the class's capabilities.

(14 marks)
