Comsats University
Department of Computer Science
Mid Term Examination, Spring 2022

Class/Section: - BSCS – 3A,3B
Subject: - Object Oriented Programming
Instructor: - Ms. Saneeha Aamir

Marks: - 40
Time: - 90 min
Dated: - May 13, 2

1. Give short answers for the following: **(5 marks) (10 min)**
   a. Does an object created with a copy constructor reference the same memory location that the object reference?
   b. What is the purpose of creating private methods in class?
   c. Why 'this' operator cannot be used in a static method?
   d. When do we declare a class as abstract?
   e. Which class is present at the top level of all inheritance hierarchies?

2. Consider the following Mutable class. Convert it to an Immutable one. **(5 marks) (10 m**

```
class Marks {

   private int oopMarks; .
   private int dsaMarks;

   public int getDsaMarks() {
      return dsaMarks;
   }

   public void setDsaMarks(int dsaMarks) {
      this.dsaMarks = dsaMarks;
   }

   public void setOopMarks(int oopMarks) {
      this.oopMarks = oopMarks;
   }

   public int getOopMarks() {
      return oopMarks;
   }

   public int totalMarks() {
      return getDsaMarks() + getOopMarks();
   }
}
```

```
==========
class Student {
   String name;
   String rollNumber;
   Marks marks;
   public Student(){
   }
```

```
    public Student(String name, String rollNumber, Marks marks) {
        this.name = name;
        this.rollNumber = rollNumber;
        this.marks = marks;}

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public String getRollNumber() {
        return rollNumber;
    }

    public void setRollNumber(String rollNumber) {
        this.rollNumber = rollNumber;
    }

    public void setMarks(Marks marks) {
        this.marks = marks;
    }
    public Marks getMarks() {
    return marks;
}
}
```

3. Consider the following code and write the output. (3 m

```
class Marks {

    private int oopMarks;
    private int dsaMarks;

    public int getDsaMarks() {
        return dsaMarks;
    }

    public void setDsaMarks(int dsaMarks) {
        this.dsaMarks = dsaMarks;
    }

    public void setOopMarks(int oopMarks) {
        this.oopMarks = oopMarks;
    }

    public int getOopMarks() {
        return oopMarks;
    }

    public int totalMarks() {
        return getDsaMarks() + getOopMarks();
    }}
```

```
lass Student {

   Marks marks;

   public void setMarks(Marks marks) {
      this.marks = marks;
   }

   public Marks getMarks() {
      return marks;
   }
}
```

```
public class MyClass {
public static void main(String args[]) {
    Student std = new Student();
    Marks marks;
    System.out.println(std.getMarks());
    marks = new Marks();
    std.setMarks(marks);
    System.out.println(std.getMarks());
    System.out.println(std.getMarks().getOopMarks());
    std.getMarks().setOopMarks(85);
    System.out.println(std.getMarks().getOopMarks());
     }
     }
```

4. Write output of following code: **(3 ma**

```
public class TestExample {

public static int a;
public int b;

public void increament (){ a++; b++; }
public void display() { System.out.println(a + " "+ b); }

}
Class runner
{
Public static void main(String args[]){
TestExample t1 = new TestExample();
TestExample t2 = new TestExample();
t1.increament();
t2.increament();
System.out.println(TestExample.a);
System.out.println(t1.a);
System.out.println(t2.a);

}
}
```

5. Write the output for the following scenario: **(4 marks) (5 min) [CLO 1]**

Suppose you have a parent class Animal that has a method speak() which returns: Awk.

- Cat has a speak method that returns: Meow.
- Bird does not have a speak method.
- Dog has a speak method that returns: Woof.
- Pig does not have a speak method.
- Cow has a speak method that returns: Moo.

What is the output from looping through the array a created below and asking each element to speak()?

```
Animal[] a = { new Cat(), new Cow(), new Dog(), new Pig(), new Bird() }
```

6. Create design (class diagram) for Hotel Management System using the following classes **(10 marks) (1 min) [CLO 2]**
   a. Person
   b. Client
   c. Staff
   d. Room
   e. Booking

Following points must be considered.

a. Each class should have at least two data members.
b. All possible is-a and has-a relationships must be considered.
c. The system should display information about a client.
d. The system should display information about a room.
e. The system should show the final cost of booking.

Note: You may incorporate concept of abstract class.

7. Consider the following classes. Complete the class "Shop" and write the definition of method "countExpiredProducts". **(4 marks) (10 min) [C**

```
public class Date {

 private int day;
 private int month;
 private int year;

 public Date(int day, int month, int year) {
 this.day = day; this.month = month; this.year = year; }

 public int getYear() { return year; }
 }
 ==========================================================

public class Product·
{
 private String name;
 private Date dateOfExpiry;
 private double price;

 public Product(String name, Date dateOfExpiry, double price) {
```

```
this.name = name; this.dateOfExpiry = dateOfExpiry; this.price = price;
}

public String getName() { return name; }

public Date getDateOfExpiry() { return dateOfExpiry; }

public double getPrice() { return price; }

}
==========
public class Shop {

Product [] p_array = new Product[100];
String location;

public Shop(String location) {
this.location = location;
}

public void addAProduct( Product p)
{
for (int i = 0; i< 100; i++)
{
if (p_array [i]==null)
{
p_array[i] = p;
break;
}
}
}
// count all products that have expired
public int countExpiredProducts()
{
// To do

}
}
```

8. A new housing scheme has been announced with certain advertising campaign to sale the propert types of plots are available; residential plots and commercial plots. The definition for general 'Plo is provided. You need to define ResidentialPlot and CommercialPlot classes.

Note: Tax calculation is as follows:

- If occupation is "Government" a discount of 2 percent on residential plot price is applica
- Tax of 10 percent on residential plot price is applicable.
- If occupation is "Government" a discount of 3 percent on Commercial plot price is applic
- Tax of 15 percent on commercial plot price is applicable.

In runner class call the 'calculateTax' method polymorphically to calculate tax for 10 Marla re and 12 Marla commercial plot for both government and private sector employee. **(6 ma min) [CLO 3]**

```
public class Customer {

    private String name;
    private int age;
    private String occupation;

    public Customer(String name, int age, String occupation) {
        this.name = name;
        this.age = age;
        this.occupation = occupation;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public int getAge() {
        return age;
    }

    public void setAge(int age) {
        this.age = age;
    }

    public String getOccupation() {
        return occupation;
    }

    public void setOccupation(String occupation) {
        this.occupation = occupation;
    }
}
```

```
public abstract class Plot {

    protected int plotnumber;
    protected int sizeInMarlas;
    protected double cost;
    protected Customer customer;

    public Plot(int plotnumber, double size, double cost, Customer customer) {
        this.plotnumber = plotnumber;
        this. sizeInMarlas = size;
        this.cost = cost;
        this.customer = customer;
    }

    public abstract double calculateTax();
}
```