National University of Computer and Emerging Sciences

Karachi Campus

# Object Oriented Programming (CS1004)

# Sessional-II Exam

**Total Time (Hrs):** 1

**Total Marks:** 30

**Total Questions:** 03

Date: April 6th 2024

**Course Instructor(s)**

Mr. Basit, Mr. Minhal, Ms.Sumaiya, Ms.Sobia, Ms.Abeeha, Ms.Bakhtawer, Ms.Abeer, Ms.Atiya, Ms.Rafia

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Roll No Section Student Signature

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**Attempt all the questions.**

***CLO #1: Discuss knowledge of underlying concepts of object-oriented paradigm like abstraction, encapsulation, polymorphism, inheritance etc.***

**Q1:** Write short answers (2-3 lines) for the following questions: **[15 minutes, 10 marks(5*2)]**

**a.** Can we override or over loaded the static method in Java? What is method hiding in Java?

**b.** Can a constant(final) member function be overloaded with a non-constant (non-final) version?

**c.** Why multiple inheritance is not supported in java through class? What is the difference between Polymorphism and Inheritance.

**d.** What will be the order of constructors in a code snippet given below: What will be the output of the program. Provide Proper Explanation.

| | | |
|---|---|---|
| *class Base{ int value = 0;*<br>*Base(){ addValue();}*<br>*void addValue(){value += 10;}*<br>*int getValue(){return value;}}* | *class Derived extends Base{*<br>*Derived(){addValue();}*<br>*void addValue(){value += 20;}}* | *public class Test {*<br>*public static void main(String[] args){Base b = new Derived();*<br>*System.out.println(b.getValue());}}* |

**e.** Is there any problem in a code snippet given below? If yes, how can we resolve it?

```
class A { A (int i ) { System.out.println(1) } };
class B  extends A {B () {System.out.println(2) } };
main() { B b1 = new B();}
```

***CLO #4: Design and assess small and medium scale JAVA programs using OOP principles.***

**Q2:** Write a Program that defines three classes: Passenger, Bike , and two sub classes of Bike, Yango and Bykea **[20 minutes, 10 marks (4*2.5)]**

**a.** Passenger has three private data members: name, age, and destination. It has one constructor which takes in name, age, and destination as arguments, and three member functions: getName(), getAge(), and getDestination(),which return the corresponding data members.

**b.** Bike is class with five data members: make, model, year, passengerCount, and passengers, which is an array of Passenger objects. make, model, and year are initialized by its constructor, and passengerCount is initialized to 0. It has five member functions: getMake(), getModel(), getYear(), getPassengerCount(), and printPassengers().

**c.** The last one prints the name and destination of all passengers ride on the bike. Two of its member functions are : addPassenger() and calculateFare().
**d.** Bykea and Yango are subclasses of Bike. They inherit all data members and member functions from Bike and implement their own versions of the addPassenger() and calculateFare() functions.
**e.** addPassenger(Passenger p) function in Bykea adds a passenger to the passengers array if there is room for it (less than 3 passengers). addPassenger() function in Yango adds a passenger to the passengers array if there is room for it (less than 2 passengers).
**f.** calculateFare(double distance, bool isPeakHour) function in Bykea calculates the fare based on a base fare of 50, a distance rate of 5.5, and a peak hour rate of 1.2 if isPeakHour is true.

The main() function creates three Passenger objects, two Bike objects (Bykea and Yango), and adds passengers to each bike. It then calculates and prints the fares for each bike and prints the passengers ride on each bike.

***CLO #4: Design and assess small and medium scale JAVA programs using OOP principles.***

**Q3:** You are required to develop a Software for a pastry shop located in UAE. The system should assist in managing the pricing, taxes, and profits from pastry sales. Each pastry has a production cost, and the price at which it is sold by the shop is subject to certain taxes and pricing regulations. Additionally, there is a requirement to calculate the retail price for each pastry, considering a 6% Goods and Services Tax (GST). **[25 minutes, 10 marks (5*2)]**

Below are the detailed regulations:

- All pastries are subject to a 10% production cost markup to cover labor and other expenses.
- Sweet pastries are subject to an 8% sales tax, whereas savory pastries are subject to a 5% sales tax.
- After calculating taxes, the shop retains 70% of the retail profit from the total cost per pastry.

**Tasks**: The system should accommodate the following functionalities:

**a. Pastry Classes:** Implement two classes, SweetPastry and SavoryPastry, derived from a base class Pastry. Each class should store information about the pastry name, ingredients, production cost, and tax rates specific to each type of pastry.
**b. Polymorphism:** Utilize function overriding for the function(s) defined in the Pastry base class to calculate total cost, retail price, and profit for each type of pastry.
**c. Protected Function:** Implement a function named PastryCalculator to perform specific calculations related to pastries. This function should calculate the total cost of a pastry, including taxes.
**d. Protected Class:** Implement a class named PastryReport to generate a report of the total sales and profits for the pastry shop.
**e. PastryShop Class:** Implement a class named PastryShop to manage multiple pastries. This class should allow adding pastries and calculating the total profit from all sales.

**---------- The End ----------**