THE OPEN UNIVERSITY OF SRI LANKA
BSc DEGREE PROGRAMME: LEVEL 04
FINAL EXAMINATION: SEMESTER 1 - 2021/2022
CSU4301: OBJECT ORIENTED PROGRAMMING

DURATION: **TWO HOURS** (2 HOURS)

DATE: **16.10.2022** TIME: **1.30 p.m. to 3.30 p.m.**

Answer FOUR Questions ONLY.

Q1) a) i. Briefly explain the terms, Class, and Object with examples.

ii. Explain the difference between the Class and the Object.

b) Define a class in **JAVA** to represent a **Date** with the following data members and methods. Use access specifiers and data types according to the OOP concepts.

i. Data members – day, month, year

ii. Default constructor, Parameterized constructor, Copy constructor

iii. printDate() method to output date in the format *month-day-year*

iv. Write a main class called **Test** to test the **Date** class. Create objects to illustrate three (3) constructors.

c) i. Explain the concept of constructor by indicating the purpose.

ii. Give two differences between a constructer and a normal class.

d) i. Does this program achieve **Constructor overloading**?

ii. If so, explain the **Constructor Overloading** by taking example method signatures from the Date class in part (b).

Q2 a) i) What is Object Oriented Programming (OOP)?

ii) Explain how data are handled in Object Oriented Programming compared to Procedure Oriented Programming

b) Write **Java** statements for the following.

i. Create a class called *Parent* with a variable called *ParentNumber* (value =10). Create an inner class called *child* with a method called *print*, to print the Number variable.

ii. Declare an Interface called *Printable* with a method called *Print.*

iii. Declare an Interface called *Drawable* by inheriting the interface *Printable.* The *Drawable* interface has an additional method called *Draw.*

iv. The Square class implements the *Drawable* Interface partially.

c) Clearly explain the differences and the purposes of the following terms.

i. Abstract class and Normal class

ii. Final class and Normal class

d) Explain the concept of **multithreaded programming** in brief.

Q3) a) Explain the following terms in brief by giving a suitable example for each.

i. Polymorphism

ii. Inheritance

iii. Abstraction

b) A JAVA class called **Account** consists of a **Savings Account** class and a **Current Account** class. For all accounts, Account **Name** and Account **Number** are common attributes. Account class cannot be instantiated.

i) Write suitable complete class definitions for the above classes. (You may include any additional variables and methods if necessary)

ii) Define suitable methods to illustrate the **Method Overriding.**

c) i. Explain the Method Overriding by giving suitable method signatures from Q2(b).

ii. There are two ways of changing the content of the method by overriding it. what are they?

d) State three (3) differences in JAVA language compared to C++.

Q4) a) Draw the lifecycle of a thread and explain **runnable, running,** and **blocked** states in brief.

b) Define a class in **JAVA** to represent a **Circle** with the following data members and methods. Define access specifiers, data types, and input parameters appropriately.

i. Data members – radius, colour

ii. Define suitable methods and classes to illustrate the **Constructor Channing** which happens within the same class and between subclass and superclass by giving a complete JAVA class definition.

c) What is the purpose of using the **super** keyword when accessing variables, constructors, and methods in JAVA. Explain briefly by providing examples for each case.

d) Explain **garbage collection** by giving three (3) situations.

Q5) a) What is an Inner class? Explain briefly, providing three(3) advantages.

b) Define a class in **JAVA** to represent a **Rectangle** with the following data members and methods. Define access specifiers, data types, and input parameters appropriately.

i. Data members – height, width

ii. Define suitable methods to illustrate the **Method Overloading** by giving a complete JAVA class definition.

iii. Explain the Method overloading by giving suitable method signatures from the Rectangle class.

c) State whether the following statements are **TRUE** or **FALSE**. If any statement is **FALSE** explain the reason.

i. A child class inherits its parent's static methods and may override those methods.

ii. Every individual Object created from the Class shares the instance method(s) of that Class.

iii. Methods declared in an interface are always protected and abstract.

iv. All static, private and final methods have always been bonded at run-time.

v. Garbage Collection is a manual process.

d) Give two (3) differences between a **Constructor** and a **method.**

Q6) a) i. What is an Exception? Explain in brief.

ii. Java handles exceptions using five keywords. Explain them briefly using suitable JAVA statements.

b) Explain the differences between the following terms briefly using appropriate examples.

i. Composition and Aggregation

ii. Single Inheritance and Multiple Inheritance

iii. The class variable vs Instance variable

c) Consider the following JAVA class and answer the questions

```
class Person {
    static void speak() {
        System.out.println("Person speaks"); }
    public void print(){
        System.out.println("superclass speaks"); }

    }
```

i. Modify the person class by adding a subclass called the Teacher and the main class called Test to illustrate the **dynamic** and **static binding.**

ii. Explain and differentiate the **dynamic binding** and **static binding using part (c)-i statements.**

d) Explain the process of converting a JAVA stand-alone program (source code) into the machine language.