THE OPEN UNIVERSITY OF SRI LANKA
BSc DEGREE PROGRAMME: LEVEL 04
FINAL EXAMINATION: SEMESTER 1 - 2021/2022
CSU4616: OBJECT ORIENTED PROGRAMMING USING C++ AND JAVA

DURATION: **THREE HOURS** (3 HOURS)

DATE: **16.10.2022** TIME: **1.30 p.m. to 4.30 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).

e) State whether the following statements are **TRUE** or **FALSE** with respect to C++. If a statement is **FALSE** correct it by explaining the reason.

i. The following statement outputs the memory address of the variable num.

```
*num;
```

ii. The following is a valid constant variable declaration.

```
#define count =25;
```

iii. The following is a valid variable declaration.

String name;

iv. The following statement creates an automatic object from the class Student.

Student S1= new student();

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) Define a Class in **C++** to represent an **Invoice** with the following data members and methods.

i. Data members – Item number, Item quantity, and Price per item.

ii. A parameterized constructor and destructor.

iii. Selector and modifier methods for Item price member variable.

iv. A method to print the Invoice details. (Item number, Item quantity, and Price per item)

c) i. What is a destructor in C++? Explain by providing an example.

ii. Differentiate between constructer and destructor in C++.

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

i. Abstract class and Normal class

ii. Final class and Normal class

e) Explain Public, Private and Protected access specifiers clearly indicating the differences.

Q3) a) 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

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 Q3(b).

d) Write **C++** statements for the following.

i. Class XY derived from Class X and Class Y.

ii. Create a dynamic object called **Rec1** from Class Rectangle and call the print method.

iii. Create an automatic object called Rec2 from Class Rectangle and call the print method.

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

Q4) a) Explain the following terms in brief by giving a suitable example for each.

i. Polymorphism

ii Inheritance

iii Abstraction

iv Logical Errors

b) Consider the following Class named **Vector** in **C++** to represent a vector in the Cartesian coordinate system in the plane which includes **x and y coordinates** as **integer values**. Include the following member functions in the Class.

i. Default constructor and Parameterized constructor

ii. To overload + operator to add two vectors

iii. To overload == operator to check whether two vectors are equal

iv. Write a suitable main method to test the defined functions in part (c- i, ii, iii, iv).

c) Write a suitable main method to test the class defined in part(b).

i. Create an object called *V1* that initializes the data members to default values

ii. Create two objects called *V2* and *V3* and initialize them to (3, 4) and (5, 6), respectively.

iii. Add *V2* to *V3* using the operator overloaded member function and display the results.

d) "Java is a Platform independent language". Explain the platform independency related to the JAVA language.

Q5) a) What is meant by **operator overloading**?
State two (2) operators that can be overloaded and two(02) operators that cannot be overloaded.

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 a 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) i. What is an inline function in C++. Explain a disadvantage of having an inline function.

ii. Redefine the **Rectangle** class given in part (b) in C++, including data members and an inline function to print the data members.

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

Q6) a) What are the two types of inheritance supported by C++? Explain them by giving suitable examples.

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

i. Composition and Aggregation

ii. Abstract method and Normal Method

iii. Class method and Instance method

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 provide above.

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

e) What is a virtual function. Explain by providing an example.