THE OPEN UNIVERSITY OF SRI LANKA
B.Sc DEGREE PROGRAMME: LEVEL 04
FINAL EXAMINATION: SEMESTER 1-2013/2014
CPU2242: OBJECT ORIENTED PROGRAMMING USING C++ AND JAVA

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

Date: **11th June, 2014** Time: **1.00 pm – 4.00 pm**

Answer FOUR Questions ONLY.

Q1.

a) What is *Object Oriented Programming* (OOP)? Write down four (04) advantages of Object Oriented Programming over Procedure Oriented Programming?

b) Differentiate between *procedure-oriented programming* and *object-oriented programming*.

c) List three (03) differences between C++ and Java.

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

e) What is an *abstract class*?

Q2.

a) Write three (03) advantages of using functions in a C++ program.

b) Explain the following types of errors in a computer program.

i. Syntax errors

ii. Logical errors

iii. Run-time errors

c) Is the following code correct? Precisely write the output of the code.

```
int intvar = 333;
int *intptr;
intptr = &intvar;
cout << *intptr;
```

d)

i. Write a function called `zeroSmaller()` that is passed two `int` arguments by reference and then sets the smaller of the two numbers to 0.

ii. Write a `main()` function to call the function in question d) (i).

e) State whether the following statements are **TRUE** or **FALSE**.

i. x++ is a valid C++ variable name.

ii. When an argument is passed by reference, a variable is created in the function to hold the argument's value in C++.

iii. Java was invented by Bjarne Stroustrup.

iv. Member functions defined inside a class definition are public by default in C++.

v. The following C++ statements,

```
for (int i=1;i<=5;i++){
   for (int j=1;j<=i;j++){
      cout << '*';
   }
}
```

produces the following output.

```
*
* *
* * *
* * * *
* * * * *
```

Q3.

a) Write three (03) differences between a *Java applet* and a *Java stand-alone application*?

b) Consider the following Java class

```
class Hello {
   public static void main (String[] args) {
   System.out.println ("Hello: This is my first Java program");
   }
}
```

Explain why the keywords **public**, **static** and **void** are included in the header of the main () method.

c) State whether the following names are valid Java identifiers. Briefly explain how you arrived to your conclusion.

i. totalPay

ii. volatile

iii. 3StudentsName

iv. _months

v. total-days

d) Consider the following Java program and precisely write the output of the program.

```
class MyClass {
   static int maxElements;
   MyClass (int maxElements){
      this. maxElements = maxElements;
   }
}
public class Q2 {
   public static void main (String[] args) {
      MyClass a = new MyClass (100);
      MyClass b = new MyClass (100);

      if (a.equals (b))
         System.out.println ("Objects have the same values");
      else
         System.out.println ("Objects have different values");
   }
}
```

Q4.

a) What is *encapsulation*? What are its advantages?

b) Differentiate between *function overloading* and *function overriding*.

c) State whether the following statements are **TRUE** or **FALSE**.

i. In a class definition, data or functions designed private are accessible only to public members of that class.

ii. A dot operator (class member access operator) connects a class member and a class object when reading the statement from left to right.

iii. In a class you can have more than one constructor with the same name.

iv. Adding a derived class to a base class requires fundamental changes to the base class.

v. The scope resolution operator usually tells what base class a class is derived from.

d) Briefly explain the following terms in object-oriented programming:

i. Abstraction

ii. Inheritance

iii. Polymorphism

e) Give an example to describe the relationship between a *class* and an *object*.

f) Define a C++ class (named `Circle`) to represent a circle that includes the following data member.

- Radius of the circle

Include the following member functions to the `Circle` class and implement them.

i. A default constructor to create a circle with radius 1.

ii. A parameterized constructor to initialize data member of the class to the value passed as the parameter.

iii. To return the area of the circle πr^2 where r is the radius of the circle.

iv. To display the area of the circle.

Q5.

a) What is *operator overloading*?

b) Write a C++ class named **Time** to represent 12-hour time that consists of seconds, minutes and hours. Use integer values to hold them and include the following member functions.

i. A default constructor and a parameter constructor.

ii. To overload + operator to add two times.

(Hint: *If read the two times as; time 1 = 5:59:59, time 2 = 4:30:30, then resulting time should be as 10:30:29*)

c) What are *friend functions*? Explain three (03) characteristics with a suitable example.

d) Rewrite the question (b) (ii) using a friend function.

Q6.

a) How do the properties of following two derived classes differ?

```
class X : public A{
  //..
}
class Y : private A{
  //..
}
```

b) Class Y has been derived from class X. The class Y does not contain any data members of its own. Does the class Y require constructor. If yes, why?

c) What is *multiple inheritance*? Discuss the syntax and rules of multiple inheritance in C++.

d) Write the following classes in c++:

i. **Student** is a base class having two data members: entryno and name; entryno is integer and name of 20 characters long. The value of entryno is 1 for Science student and 2 for Arts student, otherwise it is an error.

Include a member function to the class named `getdata()` to read information of a student.

ii. **Science** and **Art** are two derived classes, having respectively data items marks for Physics, Chemistry, Mathematics and marks for English, History, Economics.