THE OPEN UNIVERSITY OF SRI LANKA
B.Sc. DEGREE PROGRAMME : LEVEL 04
DEPARTMENT OF COMPUTER SCIENCE
FINAL EXAMINATION – 2019/2020
CPU2242/CSU4616 : OBJECT ORIENTED PROGRAMMING USING C++ AND JAVA
DURATION : Three hours only (3 Hours)

Date: 29.12.2019	Time :1.30 p.m – 4.30 p.m

Answer FOUR Questions ONLY.

Q1) a) Explain Object Oriented Programming and Procedure Oriented Programming by giving 3 features of each.

b) Explain the process of converting a JAVA standalone program (source code) into machine language.

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

 i. int &Marks is a valid variable declaration.

 ii. When creating Classes scope resolution operator used to link together Classes and defined methods, if methods are declared inside the Class.

 iii. All C++ operators can be overloaded for user defined Classes.

 iv. The following statement creates a dynamic object of BankAccount Class
 BankAccount Ac1;

 v. The following is a valid method declaration
 public void setName(char Name){
 Myname=name;}

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

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

 ii. Default constructor with default values
 Item number - 0000

 iii. A parameterized constructor to initialize the data members of the Class.

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

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

e)   What is meant by 'overloading constructor'? Explain by providing an example from the Class defined in part(d)

Q2) a)   Explain the following terms briefly by giving suitable examples.
     i.   Class / Object   iii.   Encapsulation
     ii.   Logical Errors   iv   Syntax Errors

b)   Fill in the blanks using the appropriate term from the given list.
(private, public, protected)
     i.   In order to allow data to be visible to all other Classes, members are declared as ....

     ii.   ....members cannot be accessed from outside the Class, however, they can be accessed within inherited Classes.

     iii.   The derived Class cannot access the................. members in the base Class, however, derive Class has access to the .... and .... members of the base Class.

c)   Define a Class in **C++** to represent a **Book** with the following data members and methods.
     i.   Data members – Title, ISBN and Author.
     ii.   Default constructor with default values
          ISBN- 230001
     iii.   A user defined constructor and copy constructor
     iv.   Destructor
     v.   Selector and modifier methods for Book ISBN member variable.
     vi.   Write a suitable main method to test the defined methods in part (c)- i, ii, iii, iv and v)

d)   What is the purpose of using **final** keyword when declaring variables, methods and Classes in JAVA? Explain briefly by providing examples for each case.

e)   List two(2) differences between a constructor and a normal method.

Q3) a)   What is **Single Inheritance** and **Multiple Inheritance**. Explain with an example for each.

b) Define a Class in **Java** named as **Employee** to represent an employee with the following data members and methods.

    i. Data members - Employee Name, Employee Number, Employee basic salary

    ii. A user defined Constructor

    iii. A method to print the Employee details (Name, Number, Basic Salary).

Create a subclass called **Clerk** inherited from Employee Class which contains the following properties

    i. A user defined Constructor to initialize Name, Number, Basic Salary

    ii. A method called **calNetSalary** by adding 20% from the Basic Salary as monthly allowance.

    iii. Override the Print method to print Clerk details. (Name, Number, Basic Salary) and Net Salary.

c) What is the purpose of writing **Abstract Classes and Abstract methods** in object-oriented applications.

d) Considering the Classes in Q3-b) select a suitable Class as an **abstract Class** and suitable method as an **abstract method** and redefine it. (It is not required to write all methods)

e) List two differences between a final Class and a normal Class

Q4) a) "Java is a Platform independent language". Explain the platform independency related to JAVA language.

b) Define a Class named **Vehicle** in C++ to represent a vehicle. The Class has the following data members and methods.

    i. Data members - number of wheels

    ii. A user defined Constructor

    iii. A method to print the vehicle details (number of wheels).

Create a subclass called **Car** inherited from Vehicle Class which contains following properties.

    i. Data member - passengers

    ii. A user defined Constructor to initialize the number of wheels and passengers.

iii. Override the Print method to print Car details (number of wheel and passengers)

c) Differentiate between the Constructor and Destructor in C++ by providing examples.

d) i. Explain the term aggregation in Object Oriented programing.

ii. What are the three properties of aggregation?

e) List three (03) differences between C++ and JAVA.

Q5) a) Explain the following terms in brief by giving suitable examples.

i. Polymorphism iii. Abstraction

ii. Generalization/Specialization

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

i. Parameterized constructor

i. To overload + operator to add two vectors

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

iii. To overload << operator to print a vector

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

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

d) State whether the following statements are **TRUE** or **FALSE** with respect to **Java**. If the statement is FALSE correct it by explaining the reason.

i. Constructors are members and inherited by subclasses.

ii. When instantiate a new object from a Class, a new copy of each of the instance variables and methods of the Class is generated.

iii. Class methods can access the instance variables declared within the Class.

iv. Static method of a Class is called by using an object of the Class.

v. Derived Classes can override a function when it is defined with final keyword in the Base Class.

e) Mention three (3) C++ operators that cannot be overloaded.

Q6) a) Explain the difference between **Function Overloading** and **Function Overriding** by providing suitable method signatures.

b) Define a Class in **Java** called **Cuboid** with the following methods using method overloading concept.

    i. Data members - Width, Height, Length

    ii. A method to change width by a given amount

    iii. A method to change width and height by a given amount

    iv. A method to change width, height and length by a given amount

    v. Write a main Class called **Test.** Create an object of Cuboid Class and call all methods defined above in (b-ii,iii,iv).

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

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

    i. Class A derived from Class B and Class C

    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) What are Static Binding and Dynamic binding? Explain by providing examples.

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