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THE OPEN UNIVERSITY OF SRI LANKA
B.Sc. DEGREE PROGRAMME : LEVEL 04
DEPARTMENT OF COMPUTER SCIENCE
FINAL EXAMINATION– 2016/2017
CPU2242 : OBJECT ORIENTED PROGRAMMING USING C++ AND JAVA
DURATION:Three hours only (3 Hours)

Date: 25.07.2017 **Time :1.00 p.m – 4.00 p.m**

Answer FOUR Questions ONLY.

Q1)

a) i. What is Object Oriented Programming?

ii. Describe how data are handled in Procedure Oriented Programming and Object Oriented Programming.

b) List three(3) differences between C++ and Java.

c) Explain how Java programs achieve the platform independency and the portability.

d) Briefly explain following terms in Object Oriented Programming using examples.

i. Polymorphism

ii. Aggregation

iii. Inheritance

iv. Multiple Inheritance

e) Which of the following statements are **True** or **False**, if it is false explain the reason.

i. An object of a derived class can access private members of the base class.

ii. Restricting access to class members via keyword private is called information hiding.

iii. A file may contain as many classes as you like as long as each of these classes is declared public.

iv. Constructors of a super class are inherited into its subclasses.

v Sub class methods can normally refer to protected and private members of the super class simply by using the member names.

vi The compiler will create a default constructor only if your class does not declare any constructors of its own.

Q2)

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

ii Explain the relationship between the Class and the Object.

b) Fill in the blanks using the appropriate term from the given list.

(Public, Private, Protected)

i. A subclass inherits super class members declared as .....and .....

ii. All .....members of the base class become .....members of the derived class.

iii Variables that are declared as .....can be accessed outside the class if public getter methods are present in the class.

iv .....members are accessible only to methods of their class, their subclasses and other classes in the same package

v .....fields and methods of the super class can never be referenced directly by a sub class.

c) Define a class in **C++/ Java** called **Employee** to represent an Employee with following data members

- Employee name
- Employee number
- Employee basic salary

Include the following member functions to the employee class.

i. Modifier and Selector methods for each instance variable.

ii. A method to calculate the net salary by adding 20% from the basic salary as a monthly allowance

d) Write a **main** method to demonstrate the class by creating an object and displaying the following output using the functions defined in part (c).

```
Employee Details
Employee Name : Nimal
Employee Number : 23451
Employee Basic Salary: Rs 20000.00
Employee Net Salary : Rs 24000.00
```

Q3)

a) i Explain the concept of constructor and destructor by indicating the purpose.

ii What is an inline function? State one (1) advantage and one(1) disadvantage of using inline functions

b) Define a **C++/Java** class (named **Rectangle**) to represent a **Rectangle** that includes the following data members and member functions.

Data members

- named "height" and "width" to store the height and the width of the rectangle

Member functions

- A default constructor to create a rectangle with height=1 and width = 1
- A parameterized constructor to initialize height and width
- A one parameter constructor to initialize height and width which are equal
- Display() function to display the data members of the class

c) Write a **'main'** method to display the following output by creating objects by calling the appropriate constructors defined in part (b).

```
Height = 1 width=1
Height = 3 width=2
Height = 5 width=5
```

d) What is meant by 'overloading constructors'? Explain by providing an example from the class defined in part(b).

Q4)

a) i. What is an 'abstract class'?

ii. State three distinct characteristics of an abstract class.

b) Write C++ statements for the followings.

i Class B derived from Class A

ii Class X derived from both Class A and Class B

c) Create a **Java super class** called **Item** which includes the following members

Data members

- Item name to store the name of the item
- Unit price to store the cost per unit

Member functions

- A parameterized constructor to initialize its data members
- A Member function called **Display()** to display the values of the member variables.

Create a **Subclass** called **Dairy Product** inherited from item class which includes the following properties.

- Declare a variable called **Expire_Date**(String)to store the expiry date of the dairy product
- Define a constructor in class child an give an appropriate initial values for all data members
- Define a method called display() in subclass that executes the display() method in super-class and prints the information of item name, unit price and expiry date

d) Create a class called **Test** including the main method and create two objects with appropriate values from two classes(Item and Dairy Product) defined in part (c). Then execute the display methods in Item and Dairy Product class

Q5)

a) Differentiate between function overloading and function overriding.

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

i. A default constructor and parameterized constructor
ii. To overload + operator to add two vectors
iii. To overload – operator to subtract two vectors
iv. To overload == operator to check whether two vectors are equal
v. To overload << operator to print a vector

c) Write a '**main**' method to demonstrate the class by creating an object and displaying the following output using the functions defined in part (b).

```
Vector 1 :  x=6 y=5
 Vector 2 :  x=4 y=3
 Vector 1+ Vector 2 :  x=10 y=8
 Vector 1- Vector 2 :  x=2  y=2
 Vector 1 = Vector 2 : false
```

d) Explain operator overloading, taking examples from class vector in part (b).

Q6)

a) Briefly explain the following terms in Object Oriented Programming using examples.

a) Encapsulation

b) Abstraction

b) i. What is a final method?

ii. Explain two (02) reasons of having a **final** class in Java.

c) i. A **Java** class called **Shape** cannot be instantiated. It has a method called **area()**that do not have implementation details.

area () – calculate and return the area of the shape

Class **Circle** inherited from class Shape. Circle has a member variable called **radius** to store the radius of the circle. Override **area()** method for the circle class.

(Hint : area of a circle = π*radius*radius , π=3.1415)

Implement the Shape and Circle classes according to the given details above.

ii. Provide examples using the classes implemented in part (c)(i).

a) Abstract class

b) Base class

c) Abstract method

d) Subclass

d) Write a copy constructor and a destructor in C++ for **Circle** class in part (c)

e) What is the purpose of defining an abstract method in a class? Explain using an example