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00372

The Open University of Sri Lanka
Faculty of Natural Sciences
B.Sc./ B. Ed. Degree Programme

Department	: Computer Science
Level	: 4
Name of the Examination	: Final Examination
Course Code and Title	: CSU4301, Object Oriented Programming
Academic Year	: 2020/2021
Date	: 11.12.2021
Time	: 1.30 p.m. -3.30 p.m.
Duration	: 2 hours

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **06** questions in **06** pages.
3. Answer **any four (4) questions** only. All questions carry equal marks.
4. Answer for each question should commence from a new page.
5. Involvement in any activity that is considered as an exam offence will lead to punishment.
6. Having any unauthorized documents/ mobile phones in your possession is a punishable offense
7. Use blue or black ink to answer the questions.
9. Clearly state your index number in your answer script.

Q1) a) i) What is Object Oriented Programming (OOP)?
ii) How does it differ from Procedure Oriented Programming? Explain briefly by using (3) facts.

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

i. Encapsulation ii Polymorphism iii. Inner class

c) Define a class in **JAVA** to represent an **Employee** with the following data members and methods. Use access specifiers and data types appropriately.

i. Data members – Employee number, Name and Salary.

ii. Default constructor with default values with Employee number set to E000

iii. Selector method for salary member variable

iv. Modifier method for Employee name member variable.

v. Write a main class called **Test** to test the Employee class. Creating an object and call all the methods defined in the Employee class.

d) What is an **Abstract Method?** Write three (3) differences between an Abstract Method and a Normal Method.

e) How you archive the data abstraction of a program. Illustrate it by redefining the employee class appropriately (No need to write the whole class again).

Q2 a) Explain how JAVA achieves the platform independence compared to C++.

b) Define a class in **JAVA** to represent a **Book** with the following data members and methods. Use access specifiers and data types appropriately.

i. Data members – Book ISBN, Book Title

ii. Define default, parameterized and copy constructors

c) i. How do the three (3) constructors you have implemented in Q2)(b) behave when creating objects? Explain briefly by providing example JAVA statements for each case.

ii. Do this program achieve **constructor overloading**? Give reasons to support your answer.

d) i. Explain exception and **exception handling** in brief.

ii. Give two runtime exceptions with examples.

Q3) a) A JAVA class called **Pet** consist of **Mammal** class and **Bird** class. For all pets, pet **name** and **pet age** are common attributes. **Mammal** and **Bird** classes have additional attributes **mammal Id** and **bird Id**, respectively.

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

ii. Define methods appropriately to show the method overriding in inheritance

b) What is inheritance? Explain the purpose of using inheritance in OOP, giving a suitable example from Q3)a.

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

i. An interface contains constructors and abstract methods.

ii. Classes can extend to multiple classes in JAVA.

iii. Inner class has access to all members of its enclosing class, but the reverse is not true.

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

v. The keyword final is used as a modifier for a class to inherit another class.

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

Q4) a) Clearly explain the differences and the purpose of the following terms by giving suitable examples for each term.

i. Class and Object

iii. Class method and Instance Method

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, PI =3.1415

ii. Define suitable methods to illustrate the **Method Overloading.**

iii. Write a main class called **Test.** Create an object of Circle class and call all methods defined above (b-ii).

c) i. Explain the **Method Overloading** by taking example method signatures from Circle class in part (b)

ii. Explain **Operator Overloading** providing an example.

d) State three (3) special features that JAVA language has.

Q5) a) Explain the process of converting a JAVA stand-along program (source code) into the machine language.

b) State whether the following statements are **TRUE** or **FALSE**. If any statement is **FALSE** explain the reason, and correct and rewrite it.

i. Implementation of an interface salary by class manager is

```
class manager imports salary {}
```

ii. Implementation of IShape interface is

```
interface IShape {
        void f1();
        void f2();
}
circle implements IShape {

        public void f1() {}
}
```

iii. Suppose A is an abstract class, B is a concrete subclass of A, and both A and B have a default constructor. Then,

```
B b =new A()
```

iv. Class declaration for a final class Test is

```
final abstract class Test{}
```

v. A thread can be created as follows.

```
public abstract class test implements Runnable {
    public void dosomething() {};
}
```

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 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 Q5 (c)-i statements.**

d) Explain the following relationships between Classes using appropriate examples.

i)Association ii) Aggregation iii) Composition

Q6) a) Explain how **Constructor Channing** happens within the same class and between subclass and superclass by giving a complete JAVA class definition.

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

(this, static, final, super, instance, class, private, protected)

i. .....can be used to invoke current Class methods and constructors.

ii. ..... can be used to invoke the parent class constructor within the child class constructor.

iii. JAVA does not allow the use of ..... keyword inside the ..... method block.

iv. private, ...and ..... methods cannot be overridden as they are local to the class.

v. The only fields that can appear in an interface must be declared .....and .....

c) State whether the following statements are **TRUE** or **FALSE** according to the given program below. If any statement is **FALSE,** explain the reason by providing a suitable statement from the program.

```
private class xyz{
    protected int number;
    private xyz(){}
}
public class TestMain {
    String msg_2= "Hello World";
    static String msg_3 = "Hello World";
    public static void main(String[] args) {
        String msg_1 = "Hello World";
    }
}
```

i. msg_1 is a class variable.

ii. msg_2 is a local variable.

iii. msg_3 is an instance variable.

iv. xyz() can be declared as a private method.

v. number variable can be accessed by the subclass and the other classes.

vi. xyz class can be declared as a private class.

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