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The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Electrical and Computer Engineering

Study Programme	: Bachelor of Technology Honours in Engineering / Bachelor of Software Engineering Honours
Name of the Examination	: Final Examination
Course Code and Title	**: EEI3262/EEX3262/EEX3362 Introduction to Object Oriented Programming**
Academic Year	: 2020/21
Date	: 12th January 2022
Time	: 0930-1230hrs
Duration	: **3 hours**

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **Six (6)** questions in **Seven (7)** pages.
3. Question 1(Q1) is compulsory and carries 40 marks.
4. Answer any other **Four (04)** questions out of the **Five (05)** remaining questions. All questions carry equal marks.
5. Answer for each question should commence from a new page.
6. This is a Closed Book Test **(CBT).**
7. Answers should be in clear hand writing.
8. Do not use red colour pen.

Q1 Compulsory Question [40 Marks]

Consider this scenario where **Book** is the **superclass** and **EBook** and **PrintedBook** are **subclasses.** A separate class **ISBN** represents the international standard book number and it is included in the **Book** class as an attribute.

a) Explain the concept of *inheritance* in your own words using this scenario. [4 Marks]

b) Write the java code for the "**ISBN**" class to represent the International Standard Book Number. The "**ISBN**" is made up of ten digits separated into four sections.
For example, the ISBN "0 545 01022 5" represents the following information:

The initial digit "0" indicates the country number.
The publisher number is identified by the second part "545".
The third portion is the book's title number, which is "01022".
The fourth element "5" is a check digit that indicates the sum of the ISBN digits is ten.

Store these in separate variables. Create this class as an *encapsulated* class.

[10 Marks]

c) Create a constructor in the class to set the ISBN number. [2 Marks]

d) Create a method in the class to return the ISBN as a string. [2 Marks]

e) Create the superclass **Book** as an *abstract* class with attributes title(String), author(String) , publisher(String) , price(double) and a variable to hold **ISBN** number. **Book** class includes an *abstract method* **calculateSalePrice()** also.

[8 Marks]

f) Create the subclass **EBook** with its specific attributes url(String) and filetype(String). Implement the *abstract* method to calculate the sale price as follows:
salePrice = price * 15% discount

[6 Marks]

g) Create the subclass **PrintedBook** with its specific attributes weight(int) and noOfPages(int). When implementing the *abstract* method, calculate the sale price as follows:

If noOfPages >= 1000
    salePrice = price * 25% discount
If noOfPages >= 500
    salePrice = price * 10% discount
Else
salePrice = price

[8 Marks]

Answer **ANY Four** (4) questions from Q2 to Q6

Q2 [15 Marks]

a) Define the following terms.

I. Just in Time Compiler (JIT)

II. Bytecode

III. Method overloading

IV. Interfaces

V. Access modifiers

[2x5=10 Marks]

b) Identify the syntax errors and write the corrections that need to be made in the following program.

```
Class Main {
    public void static main (String [] arguments) {

            float num1 = 100.50;
            double num2 = 75.75;
            short num3 = 125000;

            System.out.print(num1+num2+num3);
    }

    double divide (double x, int x) {
            return x/y;
    }
}
```

[5 Marks]

Q3 [15 Marks]

a) Identify the error with this interface and correct it.

```
public interface Shapes
{
        public void printMessage(String s)
        {
                System.out.println("Shape : " + s);
        }
        public double area () ;

}
```

[4 Marks]

b) Create a class called **Rectangle** by implementing the corrected interface of section (a).

I. Create the attributes *width* and *length* [2 Marks]

II. Create an *overloaded* constructor to *initialize width* and *length*. [2 Marks]

III. Implement the interface *methods*. [2x2= 4 Marks]

c) Write the correct answer that should come in the blank. (write in your answer script)

I. In an ..... all methods are abstract.

II. The keyword ..... is used to call methods in the superclass.

III. A class variable is declared using the keyword ..... .

[1x3= 3 Marks]

Q4 [15 Marks]

a) Write the output of the following code.

```
class Main {
        public static void main (String [] arguments) {

                int a = 5;
                for (int b = 1; b < 20; b++)
                {
                        if (b % a  != 0)
                                continue;
                        System.out.print(b + " ");
                }
        }
}
```

[5 Marks]

b) Briefly describe the usage of the "final" keyword with respect to a variable, a method and a class.

[5 Marks]

c) What will be the output if these 5 variables are printed.

I. int a = -5 + 8 * 6;

II. int b = (55-9) % 9;

III. int c = 5 + 15 / 3 * 2 +8 % 3;

IV. int d = 5 + 11 / 3 * 2 - 5 % 5;

V. int e = -1+1-1+1-1+0+1;

[1x5= 5 Marks]

Q5 [15 Marks]

a) Consider the following three classes: **Person**, **Labourer**, and **Employee**. Person class is extended to these two subclasses Labourer and Employee. State whether each assignment is valid or not valid and state the reason.

Person p;
Labourer l;
Employee e;

I. l = new Labourer ( );
II. p = l;
III. p = new Employee ( );
IV. l = new Person ( );
V. l = p;

[1x5= 5 Marks]

b) Identify and explain the OOP principles used in the following Java Program.

```
public abstract class Vehicle {
        private int speed;
        public int getSpeed(){
                return speed;
        }
        public void setSpeed(int speed){
                this.speed = speed;
        }
        public abstract void goForward();
        public abstract void brake();
}

public class Car extends Vehicle {
        public void goForward(){
                System.out.println("Car is going forward");
        }
        public void brake(){
                System.out.println("Car is braking");
        }
}

public class Bicycle extends Vehicle {
        public void goForward(){
                System.out.println("Bicycle is going forward");
        }
        public void brake(){
                System.out.println("Bicycle is braking");
        }
}
```

[7 Marks]

c) Copy this table to your answer script and complete it. (using YES, NO words only)

	default	**private**	**protected**	**public**
Same class	YES			
Same package subclass		NO		
Same package non-subclass			YES	
Different package subclass				
Different package non-subclass			NO	YES

[3 Marks]

Q6 [15 Marks]

a) Define the following.

I. Syntax Error

II. Logical Error

III. Runtime Error

[3 Marks]

b) Dividing a number by 0 is considered as a runtime error. Write a code snippet that would generate that error. (use two int variables and assign the division to a third variable).

[4 Marks]

c) Rewrite the code in (b) with the **exception** handled.

[5 Marks]

d) Briefly explain the usage of try, catch, and final blocks.

[3 Marks]