

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



Study Programme	: Bachelor of Software Engineering Honours
Name of the Examination	: Final Examination
Course Code and Title	: <b>EEI3262/EEX3262/ECX3162/EEX3362 Introduction to object oriented programming</b>
Academic Year	: 2019/2020
Date	: 07 <sup>th</sup> October 2020
Time	: 0930-1230hrs
Duration	: <b>3 hours</b>

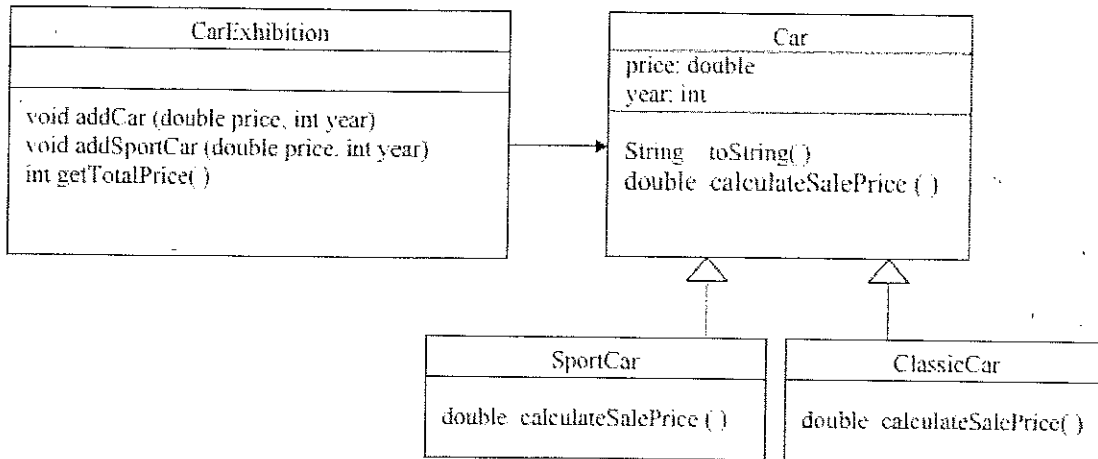
**General Instructions**

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **Six (6)** questions in **Four (5)** pages.
3. **Question 1(Q1)** is compulsory and carries 40 marks.
4. Answer any **Four (4)** questions out of the Five (5) questions. All questions carry equal marks.
4. Answer for each question should commence from a new page.
5. This is a Closed Book Test (**CBT**).
6. Answers should be in clear hand writing.

### Q1 Compulsory Question [40 Marks]

Consider the following class hierarchy where Class **Car** is the supper class and the classes **ClassicCar** and **SportCar** are two subclasses derived from **Car**.

Class **CarExhibition** contains a field of type **ArrayList** that stores objects of type **Car**.



- Class **Car** is an abstract class. Explain the role of an abstract class in your own words.
- Write the Java code of class **Car** assuming it has the given constructor and that the method `calculateSalePrice()` is abstract.

Constructor : **public Car(double price, int year)**

- Write the Java code of class **ClassicCar** assuming it has the given constructor and the method `calculateSalePrice()` returns 10,000 as the sale price of the car.

Constructor : **public ClassicCar(double price, int year)**

- Write the Java code of class **SportCar** assuming it has the constructor: **public SportCar(double price, int year)**

and that the method `calculateSalePrice()` calculates the sale price of the car as follows:

if `year > 2000` then the sale price is  $0.75 * \text{its original price}$ ; if `year > 1995` then the sale price is  $0.5 * \text{its original price}$ ; otherwise the sale price is  $0.25 * \text{its original price}$ .

- Write the Java code of class **CarExhibition** assuming it has the constructor: **public CarExhibition()**

where **CarExhibition** has cars of different types stored in an **ArrayList** and `getTotalPrice` method that returns the total prices of all cars in the exhibition.

Answer any Four(4) questions from Q2 to Q6**Q2 [15 Marks]**

- a. Define the following terms, use complete sentences.
- i. Overriding
  - ii. Mutator method
  - iii. Inheritance
  - iv. Sequence diagram
  - v. UML

[2x5 = 10 Marks]

- b. Identify and explain the OOP principles used in the following Java program.

```

abstract public class Animal {
    abstract public void MakeVoice();
}
public class Cat extends Animal {
    int LegsNumbers;
    public void MakeVoice() {
        System.out.println("Meow!");
    }
}
public class Dog extends Animal {
    String Color;
    public void MakeVoice() {
        System.out.println("Woof!");
    }
    public void MakeVoice(String c) {
        System.out.println("Woooooooooof!" + c);
    }
}

```

[5 Marks]

**Q3 [15 Marks]**

- a. Write down the class 'Rectangle' containing the following:

- i. Attributes *length* and *width*
- ii. A no-argument constructor to initialize both *length* and *width*
- iii. An overloaded constructor to initialize the *length* and *width* by passing values
- iv. Set and get methods for both the *length* and *width*
- v. Method to calculate the area of the rectangle

[2x5 = 10 Marks]

- b. Briefly explain what garbage collection in java is.

[2 Marks]

- c. Explain how you can make java objects eligible for garbage collection using a code snippet.

[3 Marks]

**Q4 [15 Marks]**

- a. Briefly answer each of the following questions.
- What is an abstract data type? What is the major difference between an abstract data type and a type in procedural programming languages?
  - What is the meaning of the keyword *static* in java? What are the differences between static and non-static members?
  - What is polymorphism? Give an example to illustrate the use of polymorphic variables in java.

[2x3 = 6 Marks]

- b. Designing an electronic voting machine is a challenging task. Assume that you have been asked to implement a simplified voting machine class with the following specification.

A voting machine has a list of candidates and the following methods:

- `addCandidate(String name)`  
/\*Add a candidate with the name to the list\*/
- `castVote(String name)`  
/\*Cast a vote to the candidate with the name\*/
- `printResults()`  
/\*Print out the number of votes each candidate has received. The order does not matter\*/

Write the Java code to implement the given specifications for the voting machine.

[9 Marks]

**Q5 [15 Marks]**

- a. Explain the behavior of "String" in java comparing with primitive data types. [2 Marks]
- b. Name and describe the use of 'final' keyword when it is used with a method, class and a class variable. [3 Marks]
- c. Briefly answer these questions about interfaces.
- What is an interface? [1 Marks]
  - How is extending a class different from implementing an interface? [2 Marks]
  - Write a **GrowingDisk** class that extends the **Disk** class. A **GrowingDisk** behaves in all respects like any other **Disk**, except that every 100<sup>th</sup> time it `paint()`s itself, it grows one pixel bigger in every direction. State if you have any assumptions as comments. [7 Marks]

## Q6 [15 Marks]

- a. State the importance of having proper exception handling mechanism in programming.

[2 Marks]

- b. Take a look at the following code snippet,

```
int x = 10, int y = 0
```

```
....
```

```
int z = x/y
```

```
....
```

```
int k = z*10;
```

- i. Could there be an error during the run time in the above snippet? Briefly explain.
- ii. How would you handle this situation

[1x2 = 2 Marks]

- c. Write the purpose of using the following key words in exception handling in Java.  
throw, throws, try-catch, finally

[2 Marks]

- d. Suppose that class **Car** exists.

- (i) What is wrong with the following code? Illustrate by giving an example of the use of this code where this would be an issue.

```
import java.util.*;
public class myCarCollection
{
    private ArrayList cars;
    // A method that returns information of all cars in the collection
    public String toString ()
    {
        String result = "My Car Collection \n";
        Iterator iter = cars.iterator ();
        while (iter.hasNext () ) {
            Car car = (Car) iter.next ();
            result = result + "" + car.toString ();
            result = result + "\n";
        }
        return result;
    }
}
```

- (ii) How would you improve the code?

- (iii) Write class **Car** that has two fields: **model** that represents the model of the car; and **year** that represents the year of manufacturing. It has **accessor** methods and **toString** method that returns a string representing the information of a car.

[9 Marks]

