00133

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

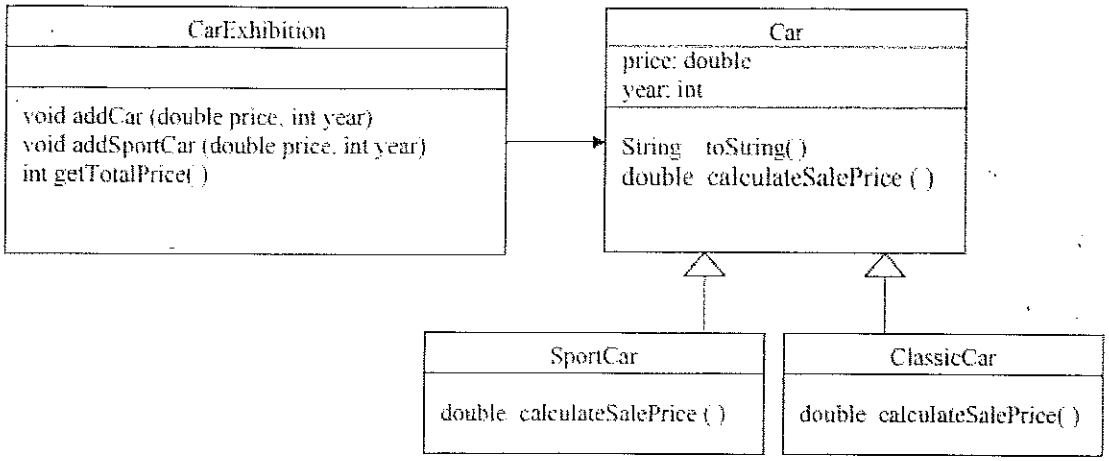
Study Programme	: Bachelor of Software Engineering Honours
Name of the Examination	: Final Examination
Course Code and Title	**: EEI3262/EEX3262/ECX3162/EEX3362 Introduction to object oriented programming**
Academic Year	: 2019/2020
Date	: 07th October 2020
Time	: 0930-1230hrs
Duration	: **3 hours**

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **Six (6)** questions in **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**.



a. Class **Car** is an abstract class. Explain the role of an abstract class in your own words.
b. 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)**
c. Write the Java codeof 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)**

d. 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 * its original price; if year > 1995 then the sale price is 0.5 * its original price; otherwise the sale price is 0.25 * its original price.
e. 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("Wooooooooof!"+ 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.

i. What is an abstract data type? What is the major difference between an abstract data type and a type in procedural programming languages?

ii. What is the meaning of the keyword *static* in java? What are the differences between static and non-static members?

iii. 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.

i. What is an interface?

[1 Marks]

ii. How is extending a class different from implementing an interface?

[2 Marks]

iii. Write a **GrowingDisk** class that extends the **Disk** class. A **GrowingDisk** behaves in all respects like any other **Disk**, except that every 100^{th} 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]