PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF MATHEMATICS & COMPUTER SCIENCE

SEMESTER 1 EXAMINATION - 2021

CS210 PROGRAMMING III

SECOND YEAR BACHELOR OF SCIENCE IN COMPUTER SCIENCE

TIME ALLOWED: 3 HOURS

INFORMATION FOR CANDIDATES

1. Write your student number and name clearly on the front of the answer booklet.
2. You have 10 minutes to read this paper. You must not begin writing during this time.
3. **There are six (6) questions. You should attempt all the questions.**
4. All the answers must be written in the answer booklet. No other written materials will be accepted.
5. Do **not** use pencil or red pen to write your answers.
6. **MOBILE PHONES MUST BE SWITCHED OFF** for the entire duration of the examination. Students failing to do so will be penalised.
7. Scientific calculators are permitted.

MARKING SCHEME

Marks are indicated at the beginning of each question. The total is **80 marks**.

Question 1. [2 + 2 + 2 + 2 + 2 + 2 = 12 marks]

(a) Explain what a class is.
(b) Briefly describe what an object is.
(c) State two advantages of encapsulation.
(d) Differentiate between a public class and an abstract class.
(e) Explain what a constructor is.
(f) Discuss how a package is used.

Question 2. [6 + 2 + 6 + 2 = 16 marks]

(a) Write code to show polymorphism in practice. Assume a class *Building* that has a method *roomOccupant*. Subclasses of *Building* are Room1, Room2 and Room3. The subclasses should have their own implementation of *roomOccupant*.
(b) Which type of polymorphism is achieved in above?
(c) Write code to create two methods. One adds two doubles and the other adds two floats. The code should illustrate method overloading by calling them in the main method.
(d) Differentiate between method overloading and method overriding.

Question 3. [6 + 2 + 6 = 14 marks]

(a) Write code to demonstrate a nested class (a class within a class). The code should show an integer variable of the outer class being added to the inner class integer variable.
(b) Explain if an outer class can access a private inner class.
(c) Write code to create a static inner class which can be called without creating an object of the outer class.

Question 4. [3 + 3 + 6 + 2 = 14 marks]

(a) Write code to create a default class `Person` with two attributes of type string.
(b) Demonstrate with code how a private attribute of a class can be called from the main method.
(c) Write code to showcase the difference between a static method and a public method in a class.
(d) Explain why the code below will generate errors.

```
public class Main {
final int x = 20;
final double PI = 3.14;

public static void main(String[] args) {
Main myObj = new Main();
      myObj.x = 100;
      myObj.PI = 125;
      System.out.println(myObj.x);
      }

}
```

Question 5 [4 + 5 + 5 + 4 = 18 marks]

(a) Write code to create an abstract class with one abstract method and a regular method with its implementation.

(b) Using the above code, write the implementation of the abstract method and call both methods in the main calling method.

(c) Write code to create two interfaces and their implementation class. Each interface should have at least one method.

(d) Using the keyword `super` write code to demonstrate how an overridden method can be called in the subclass.

Question 6 [2 + 2 + 2 = 6 marks]

Using the code given below answer the questions that follow.

```
import java.util.ArrayList;

   public class Main {
     public static void main(String[] args) {
       ArrayList<String> cars = new ArrayList<String>();
       cars.add("Volvo");
       cars.add("BMW");
       cars.add("Ford");
       cars.add("Mazda");
       System.out.println(cars);
     }
   }
```

(a) Write code to access only the first item in the list.

(b) Write code to change the second item in the list to `Toyota`.

(c) Write code to find the size of the list.

END OF EXAMINATION