UGANDA MARTYRS UNIVERSITY

UNIVERSITY EXAMINATIONS
FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION SYSTEM

END OF SEMESTER FINAL ASSESMENT

SEMESTER 2, 2022/2023

COURSE	:	**BACHELOR OF INFORMATION TECHNOLOGY, BACHELOR OF COMPUTER SCIENCE**
PAPER	:	**OBJECT ORIENTED PROGRAMMING**
CODE	:	**oopl2023**
SEMESTER	:	**TWO**
DATE	:	**22/5/2023**
TIME	:	**9.30 - 12.30 PM**
DURATION	:	**3 HOURS**

Instructions

3. *Attempt All Questions in Section A and three Questions in Section B*
4. *Time Allowed 3 Hours Only*
5. *Use of relevant Illustrations/diagrams will earn you a bonus mark (s)*
6. *Remember to indicate the question number you have answered.*
7. *Write your name, course and registration number on all your answer sheets*
8. *All answers should be written on the answer booklet*
9. *All university rules apply*

Section A (25 Marks)

1. Which is not a feature of OOP in general definitions?
   a) Efficient Code
   b) Code reusability
   c) Modularity
   d) Duplicate/Redundant data

2. Which feature of OOP indicates code reusability?
   a) Abstraction
   b) Polymorphism
   c) Encapsulation
   d) Inheritance

3. Which among the following doesn't come under OOP concept?
   a) Data hiding
   b) Message passing
   c) Platform independent
   d) Data binding

4. The feature by which one object can interact with another object is _____
   a) Message reading
   b) Message Passing
   c) Data transfer
   d) Data Binding

5. What is encapsulation in OOP?
   a) It is a way of combining various data members and member functions that operate on those data members into a single unit
   b) It is a way of combining various data members and member functions into a single unit which can operate on any data
   c) It is a way of combining various data members into a single unit
   d) It is a way of combining various member functions into a single unit

6. What is an abstraction in object-oriented programming?
   a) Hiding the implementation and showing only the features
   b) Hiding the important data
   c) Hiding the implementation
   d) Showing the important data

7. In which access should a constructor be defined, so that object of the class can be created in any function?
   a) Any access specifier will work
   b) Private
   c) Public
   d) Protected

8. Which among the following represents correct constructor?
   a) –classname()
   b) classname()
   c) ()classname
   d) ~classname()

9. Which access specifier is usually used for data members of a class?
   a) Protected
   b) Private
   c) Public
   d) Default

10. Which of the following is not a property of an object?
   a) Properties
   b) Names
   c) Identity
   d) Attributes

Section B (75 Marks) (Attempt any 3 (THREE) Questions)

1.

A programmer has been asked to write a method powersOfTwoArray(n) which should return an array containing the powers of 2 from 20 up to and including 2n, where n is an integer that is supplied as an argument. For example, if n=4, then the method should return an array containing the numbers [1, 2, 4, 8, 16]. You can assume that the integer n supplied is non-negative and that it is less-or-equal to 30.

The programmer has written the method below. The numbers on the left are line numbers; they are not part of the code

```
1  public static int[] powersOfTwoArray(int n) {
2  int[] result = new int[n];
3  int i = 0;
4  int power = 0;
5  while (i <= n) {
6    result[i] = power;
7    power *= 2;
8  }
9  return result;
10 }
```

a. The program compiles without any syntax error messages. Nevertheless, the method contains three errors that lead to incorrect behavior of the program at runtime. (15 marks)

(i) Clearly identify each of the errors, stating The line(s) on which the error appears, what effect the error would have and how the error should be corrected?

b. In the program description above, the argument n is limited to be at most 30. Explain the reason for this limitation. Suggest a change that would make it possible to implement a method powersOfTwoArray(n) that would also work for larger values such as n=31. (10 Marks)

2.

a. Give three differences between an interface and an abstract class in Java.(3 Marks)

b. A young programmer writes the following code in order to be able to completely clone an object of type Car.

```
public class Tyre {
private int treadRemaining;
public void SetTread(int t) { treadRemaining=t; }
public int GetTread() { return treadRemaining; }
}
public class Car extends Vehicle implements Cloneable {
private Tyre tyres[] = new Tyre[4];
public Car() {
for (int i=0; i<4; i++) tyres[i] = new Tyre();
}
public Object clone() throws CloneNotSupportedException {
Car c = new Car();
c.tyres = this.tyres;
return c;
}
```

}

(i) Explain what it means for the treadRemaining field to be private. (4 Marks)

(ii) Explain why it is good programming practice for such fields to be private. (3 marks)

(iii) Identify and explain reasons why this code may not function as intended (15 Marks)

3.

Consider the following Java class that is intended to represent a specific day in an eight-week University term.

```
public class TermDay {
public int day; // The day of the week as a number 0-6
public int week; // The week of the term as a number 0-7
};
```

(i) Create a class EncapsulatedTermDay, which applies the principles of data encapsulation as an alternative to TermDay. (25 Marks)

4.

A CSV (= "comma separated values") file contains person records formatted as in the example below. Each record specifies the name of a person followed by their age. Each record is on one line. Fields on a line are separated by a comma.

Fred Smith, 28

Jim Brown, 33

Ann Simpson, 31

A programmer has created the following class Person to represent person records:

```
public class Person {
  public String name;
  public int age;
}
```

(i) Write an appropriate constructor for class Person. The constructor should have two parameters which should be used to initialise the object fields. (12 Marks)

(ii) In class Person, write an appropriate toString() method. The method should return a string with the person's name followed by their age separated by a blank. Your method should override the default toString() method from class Object. (13 Marks)

5.

a. Write a method in Java, called mySubString that takes 2 strings as arguments and returns a boolean value: true, only if one of the strings in a substring of the other. Do NOT use any manipulation methods of the String class other than length() (5 Marks)

b. Override the taste method from the Candy class in the Chocolate class to return "tastes chocolately". It should print "tastes sweet!" and then "tastes chocolately". (10 Marks)

```
public class Candy
{
   public String taste()
   {
      return "tastes sweet!"
   }

   public static void main(String[] args)
   {
      Candy c1 = new Candy();
      System.out.println(c1.taste());
      Candy c2 = new Chocolate();
      System.out.println(c2.taste();
   }
```

```
}

class Chocolate extends Candy
{
   // ADD CODE HERE
}
```

c. Add public getter and setter methods to the Store class so its variables can be accessed by other classes. It should print the store's name and address and then change both and print the new values. (10 Marks)

```
public class Store
{
   private String name;
   private String address;

   public Store(String theName, String theAddress)
   {
      this.name = theName;
      this.address = theAddress;
   }

   // ADD CODE HERE

   public String toString() { return this.name + "\n" + this.address; }

   public static void main(String[] args)
   {
      Store myStore = new Store("Barb's Store", "333 Main St.");
      System.out.println(myStore);
      myStore.setName("Barbara's Store");
      myStore.setAddress("555 Pine St.");
```

```
        System.out.println(myStore);

    }
}
```