(Knowledge for Development)

KIBABII UNIVERSITY

(KIBU)

UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR

MAIN EXAMINATIONS
FIRST YEAR SEMESTER TWO EXAMINATIONS

FOR THE DEGREE OF
BACHELOR OF SCIENCE
(COMPUTER SCIENCE)

COURSE CODE : **CSC 120**

COURSE TITLE : **OBJECT ORINTED PROGRAMMING I**

DATE: 19/04/2023 **TIME: 9.00AM-11.00AM**

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTIONS ONE AND ANY OTHER TWO.

SECTION ONE [COMPULSORY]

Question #1 [30 Marks]

a) Differentiate the following terms.   **[3 Marks]**

    i) Object and Class.

    ii) Inheritance and Polymorphism.

    iii) Abstraction and Encapsulation.

b) With examples, describe any **THREE** types of comments used in Java.

                                                    [3 Marks]

c) Differentiate between an abstract class and an interface in Java.   **[2 Marks]**

d) Using a recursive method, write a Java program that returns the GCD of two integers from the user.   **[3 Marks]**

e) Explain the **THREE** types of variables in Java. Illustrate your answer using Java code excerpts.   **[3 Marks]**

f) Using loop construct of your choice, write a Java code except that will produce the below integer.   **[4 Marks]**

```
*
* *
* * *
* * * *
* * * * *
* * * * * *
* * * * *
* * * *
* * *
* *
*
```

g) **Person** is an **Object** with name, date of birth and gender. **Person** has behaviours body mass index. **Employee** is a **Person** with attributes PF Number and salary. **Manager** is an **Employee** with a department he heads.

    i) Draw a class diagram for the scenario above   **[4 Marks]**

    ii) Write a Java code to implement the classes diagram in *a* above.

                                                     [6 Marks]

h) Explain the difference between *private* and *protected* access modifiers in Java.

                                                    [2 Marks]

SECTION TWO [ANSWER ANY TWO]

Question #2 [20 Marks]

a) Differentiate between method overriding and method overloading.   **[2 Marks]**

b) A class **Person** is defined as shown below:-

```
public class Person
{
    private String name;
    private double height;
    private int age;
```

```
public Person ()
{
{
}
```

i)   Write **THREE** method definitions that will initialize the class variables.
                                                                    [2 Marks]
ii) Write **THREE** method definitions that will return the values of the variables.
                                                                    [2 Marks]
iii) Write the values of the variables as initialized by the constructor Person.
                                                                    [2 Marks]
iv) Write a class definition for a class **Student** that inherits **Person's** properties and methods. In addition to Persons properties, the student has **regNo** and **yearOfStudy**. Write getters and setters for the **Student** class. Use **Person's** methods to initialize and return the **name, age** and **height** properties of the student.   **[6 Marks]**
v)   Write a class definition for a class **GraduateStudent** that inherits Student's properties and methods. In addition to students properties, the graduate student has **researchTopic**. Write getters and setters for the **GraduateStudennt** class. Use **Person's** and **Student's** methods to initialize and return the **name, age, yearOfStudy, and regNo** and **height** properties of the graduate student.
                                                                    [6 Marks]

Question #3 [20 Marks]

a) Using illustrations differentiate between parameters and arguments as used in Java.
                                                                    [2 Marks]
b) Shape is an abstract class defined as shown below.
```
public abstract class Shape
{
        private String name;
        public void setName(String name)
        {
                this.name = name
        }
        public String getName()
        {
                return name;
        }
        public abstract getArea();
        public abstract getPerimeter();
}
```
   i)   **Rectangle** *is a* **Shape** with attributes *length* and *width* in addition to the attributes of **Shape**. Write the class definition for **Rectangle**.   **[4 Marks]**
   ii) **Triangle** *is a* **Shape** with attributes *base* and *height* in addition to the attributes of **Shape**. Write the class definition for **Triangle**.   **[4 Marks]**
   iii) Write a driver class **ShapeTest** to test your class in (i) and (ii) above. Create one rectangle and one triangle objects and initialize all its attributes with values from the user.   **[3 Marks]**

c) Using flowcharts, explain the basic difference between *while* loop and the *do...while* loop. **[4 Marks]**

d) Assuming a = 4, b = 2 and c = 5, write the output of the following Java expressions. **[3 Marks]**

    i) 6 + b * ++a / (8 – b++)

    ii) 9 – c-- / ++b * b + (17 % 5)

    iii) 10 * -a + --c * a++ / 7 – a--

Question #4 [20 Marks]

a) Explain the difference between *public* and *default* access modifies. **[2 Marks]**

b) Write the following Java code excerpt as a *for* loop. **[2 Marks]**

```
int i = 1;
while (i <= 10){
if(i<7 && i %2 !=1)
    println(i--);
i++
}
```

c) Write the output of the code in d above. **[1 Mark]**

d) Differentiate between object aggregation and object composition **[2 Marks]**

e) A car is made up of Door, Tyre, Engine and Screen. The attributes of Door are size, colour and lock. Attributes of Tyre are diameter, type and pressure. Engine has attributes manufacturer, date manufactured and number of horse pipes. Screen has attributes of size, colour and intensity (high or low).

    i) Write the class definition of these objects that make up the car. **[4 Marks]**

    ii) Write the definition of the class Car showing how it's made up of objects in (i) above. **[3 Marks]**

e) Write the output of the following Java code excerpt. **[2 Marks]**

```
int x = 10;
int sum = 3;
sum +=x++;
sum *=++sum
--x;
println("The value of x is " + x);
println(" The sum is ", sum);
```

f) Using Java code excerpts explain the effect of *break* and *continue* key words when used in a loop. **[2 Marks]**

g) Explain what is meant by the keyword *final* in Java. **[2 Marks]**

Question #5 [20 Marks]

a) What is a constructor? **[1 Mark]**

b) Using illustrations distinguish between an array and a Linked list. **[3 Marks]**

c) Class Animal is defined as shown below.

```
public class Animal
{
    private String name;
    private Date dob;
    public Animal ()
    {

    }
}
```

An interface is defined as shown below.

```
public interface Move
{
    public abstract String howToMove();
}
```

i) Write the getters and setters for the class Animal. **[2 Marks]**

ii) A **Frog**, **Man** and a **Tortoise** are all **Animal**s with attributes color, height and length respectively. Write the definitions of their classes. Use methods in (i) above to set and return their name and date of birth. Your classes should implement the interface **Move** to show how each of these animals move *(Hint: Frog jumps, a Man walks and a Tortoise crawls).*

   [7 Marks]

d) An array is declared as *int marks[4][5];*

   i) How many elements can be stored in this array? **[1 Mark]**

   ii) What is the name of the first element in the array? **[1 Mark]**

   iii) What is the name of the tenth element in the array? **[1 Mark]**

   iv) What is the name of the last element in the array? **[1 Mark]**

   v) Using a control structure of your choice, write a Java code excerpt that displays all the elements of *the marks[4][5]* array and their sum. **[3 Marks]**