CHUKA   UNIVERSITY

RESIT/ SPECIAL EXAMINATIONS

**EXAMINATION FOR THE AWARD OF DEGREE OF
BACHELOR OF SCIENCE IN COMPUTER SCIENCE**

COSC 223: OBJECT ORIENTED PROGRAMMING I

STREAMS: **BSC (COMP SCIE)**   **TIME: 2 HOURS**

DAY/DATE: WEDNESDAY 25/7/2018   **8.30 AM – 10.30 AM**

INSTRUCTIONS:

Answer question one and any other two questions

Question One [30 marks]

(a) Explain the difference between data encapsulation and data abstraction.   [3 marks]

(b) Consider the following inheritance hierarchy:

```
class A{
        protected int x, y;
        public int z;
}
class B extends A{
        private int a, b, c;
}
```

    (i)   How many data members does B have? Explain   [3 marks]

    (ii)   How many of B's data members are visible in B? Explain   [3 marks]

(c) Explain the difference between method overloading and method overriding. [3 marks]

(d) Explain the difference between a default constructor and a copy constructor. [3 marks]

(e) Show the syntax for try – catch in Java.   [3 marks]

(f) Write a Java parent class A with the following: public methods – `fg()`, `gy()`, and protected methods: `xy() and yx().` Write also a derived class B that inherits A and has the following private methods: private `te(), pe().`   [6 marks]

(g) Write a Java program with a class circle with the following attributes radius and color. The class also has the following member functions to get radius, area and circumference. Note, the program should prompt a user to enter the radius and display the area and circumference. [6 marks]

Question Two [20 marks]

(a) You are presented with a proposed student management system in the university. The system allows faculty administrators to register students, issue students cards for those students who have completed paying their school fees and processes results for students who have sat exams and also have paid their school fees. Finance officers clear students who have paid their school fees. Each user must login before using any of the system's resources. The students can also check their provisional results online by logging in using their student number and password. Develop Java program code segment to implement the requirements of the proposed system. (HINT: the code should make use of the classes, inheritance, and methods. However, you do not have to show the exact functionality since some information is not provided.) [12 marks]

(b) Describe the following access control modifiers. [6 marks]
   (i)   Public
   (ii)   Protected
   (iii) Private

(c) Explain the difference between a method and a variable. [2 marks]

Question Three [20 marks]

(a) Write a program that has an abstract base class named Quad. This class should have four member data variables (floats) representing side lengths and a pure virtual function Area. It should also have a method for setting the data variables. Derive a class Rectangle from Quad and override the Area method so that it returns the area of the Rectangle.

   (i)   Write a main function that creates a Rectangle and sets the side lengths. [6 marks]

   (ii)   Write a top-level function that will take a parameter of type Quad and return the value of the appropriate Area function. [6 marks]

(b) Write a Java program which prompts a user to input an integer value "mark", and prints "PASS" if the variable "mark" passed is more than or equal to 50; or prints "FAIL" otherwise. [6 marks]

(c) Explain how "multiple" inheritance is achieved using interfaces in Java. [2 marks]

Question Four [20 marks]

(a) Declare a class named Triple with three private data members (floats) x, y, and z. Provide public functions for setting and getting values of all the private data members.

Define a constructor that initializes the values to user-specified values or, by default, sets the values all equal to 0.   Also overload the following operators:
- Addition so that corresponding elements are added together
- Output so that it displays the Triple in the form "The triple is (x, y, z)."
- Assignment that copies x to z, y to x, and z to y.
- Post-increment so that x and z are increased by one each.
- Function call operator so that the values for x, y and z can be set.

[12 marks]

(b) Explain the role of the following in Java.   [6 marks]
   (i)   Dot (.) operator
  (ii)   Keyword "this"

(c) Give two reasons why to pass an object by reference.   [2 marks]

Question Five [20 marks]

(a) Describe the following Object oriented concepts:

   (i)   Polymorphism   [4 marks]
  (ii)   Information hiding   [4 marks]
 (iii)   Inheritance   [4 marks]

(b) Explain the use of interfaces in Java. Using code segment sample, show the syntax for declaring and using an interface.   [8 marks]