THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

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MAIN EXAMINATION

MAY – JULY 2019 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER AND LIBRARY SCIENCE

SPECIAL / SUPPLEMENTARY EXAMINATION

DIT 008: OBJECT ORIENTED PROGRAMMING

Date: JULY 2019	**Duration: 2 Hours**
INSTRUCTIONS: Answer Question ONE and any other TWO Questions	

Question 1: (30 Marks) - Compulsory

a) What is object-oriented programming? What are some features you would expect to find in an object-oriented programming language? Are these features present in Java? Use brief examples to illustrate your answer. **(5 Marks)**

b) The following are listed as advantages of the Java programming language:

   i. Java is Platform independent
   ii. Java is Multithreaded
   iii. Java is Distributed

   Explain as thoroughly as possible the above advantages **(6 Marks)**

c) Using examples, demonstrate the usefulness of the following OOP concepts:

   i. Inheritance
   ii. Polymorphism
   iii. Information hiding **(9 Marks)**

d) Using examples, explain the following Java related terms:

   i. static
   ii. Instance

iii. Java Virtual Machine

iv. Java Runtime Environment

v. this **(10 Marks)**

Question 2 (20 Marks)

a) Using examples, differentiate between the following terms:

i. Class and object

ii. Interface and abstract class

iii. Try and err

iv. Protected and private

v. Finally block and Exception **(10 Marks)**

b) "Java follows a double compilation process".

Required:

i. Explain what you understand by the above phrase. **(1 Mark)**

ii. Explain an advantage and a disadvantage of the Java compilation process **(4 Marks)**

c) List and explain any **THREE** types/kinds of Java programs. **(3 Marks)**

d) Give any TWO advantages of using the Java programming technology **(2 Marks)**

Question 3 (20 Marks)

a) What is a type in Java? What are the primitive types? What is a user-defined type? How does Java use types to make programming easier and more robust?

(4 Marks)

b) What is method overloading? What things should be kept in mind while overloading a method? **(4 Marks)**

c) What is a constructor? Give its properties. How do we declare/ define it? Can they be overloaded?

(4 Marks)

d) How can we access methods and variables of a class outside the class? **(4 Marks)**

e) What are access specifiers? Draw a table showing all the access specifiers and their accessibility in the class, package, subclasses and other packages. **(4 Marks)**

Question 4 (20 Marks)

a) What are static variables/methods? What is the other name given to them? **(4 Marks)**

b) What are wrapper classes? What is its advantage?. Give 3 examples of Wrapper classes. **(5 Marks)**

c) What is a package? Name some predefined packages in Java **(2 Marks)**

d) How can we declare a variable whose value cannot be changed in Java? **(1 Mark)**

e) Mark the following statements as true or false.

i. An identifier can be any sequence of digits and letters **(1 Mark)**

ii. In Java, there is no difference between a reserved word and a pre-defined identifier. **(2 Marks)**

iii. The operands of the modulus operator must be integers **(2 Marks)**

iv. If the value of a is 4 and the value of b is 3, then after the statement a=b; the value of b is still 3. **(1 Mark)**

v. In an output statement, the newline character may be a part of the string. **(1 Mark)**

vi. Suppose x=5. After the statement ++x; executes, the value of x is still 5 because the value of the expression is not saved in another variable. **(1 Mark)**

Question 5 (20 Marks)

a) For this problem, you should write a very simple but complete class. The class represents a counter that counts 0, 1, 2, 3, 4,....

The name of the class should be **Counter**. It has one private instance variable representing the value of the counter.

It has two instance methods: **increment()** adds a value of one to the counter value, and **getValue()** which returns the current counter value.

Write a complete definition for the class **Counter**. **(10 Marks)**

b) This problem uses the Counter class from Qn 5 (a) above. The following program segment is meant to simulate tossing a coin 100 times. It should use two Counter objects, **headCount** and **tailCount**, to count the number of heads and the number of tails. Fill in the blanks so that it will do so.

```
Counter headCount, tailCount;
tailCount = new Counter();
headCount = new Counter();
for ( int flip = 0;  flip < 100;  flip++ )
        {
if (Math.random() < 0.5)// There's a 50/50 chance that        this is true.
_____;   // Count a "head".
        else
_____;   // Count a "tail".
}
System.out.println("There were " + _____ + " heads.");
System.out.println("There were " + _____ + " tails.");
```

(5 Marks)

c) Implement a Java method with three local integer variables a, b and c that sorts these three values in ascending order by comparing and exchanging their values.
At the end of the program, a<=b <=c must hold. **(3 Marks)**

d) Write a Java program that prompts the user to input the radius and calculates the area of a circle **(2 Marks)**

END