MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

FIRST SEMESTER EXAMINATION FOR DEGREE IN BACHELOR OF SCIENCE IN PURE MATHEMATICS
SMA 391: OBJECT ORIENTED PROGRAMMING

Date: 10/8/2016 **Time: 8:30 – 10:30 AM**

INSTRUCTIONS

- Answer QUESTION I and any other TWO QUESTIONS
- This is a CLOSED BOOK EXAM, no reference materials allowed
- No use of mobile phones, no electronic calculators
- Write your answers legibly and use your time wisely.

QUESTION ONE (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 TWO (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 THREE (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 FOUR (20 MARKS)

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

b) What are wrapper classes? What are their 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 FIVE (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)