MACHAKOS UNIVERSITY

University Examinations for 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

THIRD YEAR FIRST SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE IN STATISTICS AND PROGRAMMING

SMA 391: OBJECT ORIENTED PROGRAMMING

DATE: 1/8/2017 **TIME: 11.00-1.00 PM**

INSTRUCTIONS

Answer **question ONE and any other TWO questions**

QUESTION ONE (30 MARKS)

a) Giving examples of each, differentiate between primitive and reference data types (4 marks)

b) Define an Instance Variable. Give an example of the same. (2 marks)

c) Explain the terms as applied to Object Oriented Programming

i An Object

ii A Class

iii Inheritance

iv A package (8 marks)

d) Explain **any three** benefits that are derived from bundling code into individual software objects (6 marks)

e) Method declarations have six components. Please explain **any five** such components (5 marks)

f) Explain the concept of encapsulation and code reuse as used in object oriented programming. (3 marks)

g) Explain the meaning of a compound statement in Java using a suitable example.(2 marks)

h) Differentiate between the term Constructor and the term Method in Java. (2 marks)

QUESTION TWO (20 MARKS)

Define the following in Java based on the following description:

a) Define a Java Class of type Point with the following

- i an Integer Variable that stores the x-axis value in the Cartesian plane
- ii an Integer Variable that stores the y-axis value in the Cartesian plane
- iii A constructor for the point class that initializes the those two values; x and y-axis.
- iv An accessor method that returns the x-axis value
- v An accessor method that returns the x-axis value

b) Define a Java Class of type Rectangle with the following

- i a Point Variable that indicates the original point in the Cartesian where the Rectangle initializes from/ or is to be drawn from.
- ii an Integer Variable that stores the width of the Rectangle
- iii an Integer Variable that stores the height of the Rectangle
- iv exhaustive constructors that provide multiple ways to initialize the Rectangle objects
- v An accessor method for computing the area of the rectangle
- vi a mutator method that moves the Rectangle by manipulating the x and y coordinates

c) Write an executing class that has the main method which will create a rectangle object having a width of 100 and height of 200 starting from the Cartesian values (25,40).

d) a public interface called Relatable that defines how to compare the size of objects, and this interface has a method called is Larger Than which returns the values 1, 0, -1 if this is greater than, equal to, or less than the other

e) A public class RectanglePlus that inherits from Rectangle and that implements the Relatable interface.

QUESTION THREE (20 MARKS)

a) With the aid of a table, explain the access to members permitted by each modifier as applied to the Java programming language (4 marks)

b) Explain the **four** properties that an algorithm must possess to be considered complete and precise. (8 marks)

c) Name and explain the **four** basic building blocks forms for flowcharts. (8 marks)

QUESTION FOUR (20 MARKS)

a) Write a class named **Book** that keeps track of book objects such that the instance data contains the book's ***title*** and ***author*** and a unique identification number, say ***id*** that starts form 1 for the first book object and is incremented by 1 each time a new book with at least the title specified is created. The required methods in the Book class are as follows:

i 3 constructors: One without parameters that sets the title and author to "unknown" and id to 0; one with a single parameter that sets the title to the given value as parameter, sets the author to "unknown", increments the sequence by 1 and sets id to this sequence number; one with two parameters for title and author, setting the corresponding instance data, and id as in the second constructor.

ii The setter methods for title and author.

iii The getter methods for title, author, and id.

iv The toString method that returns a text including the book's title, author and id. Refer to the sample execution window for the test program for details.

b) Write a **driver class** that tests the Book class. Allow the user to enter as many book objects as s/he wants. Take care of necessary object initializations.

Sample execution windows:

```
To end the input process bypass each question by typing the enter key!
Type the title of the book:
Type the name of the author:
Press any key to continue...
```

QUESTION FIVE (20 MARKS)

Define the following in Java or C++ based on the following description:

a) Define an abstract Java Class of type Animal with the following

i Double variable that stores its hunger state and

ii Boolean variable that stores its awake or asleep state.

iii An accessor method that returns its hunger state

iv An accessor method that return whether it is awake or asleep

v a mutator method that makes it sleep

vi an abstract method that returns the sound that the animal makes (11 marks)

b) A public interface that identifies if the animal is trainable with two methods that print out if it can sit or stand. (1 mark)

c) A public abstract class called Canine inherits from the class Animal which has two methods (1 mark)

i bite and

ii roam

d) A public class doberMan which inherits from Canine and implements the Trainable interface. (4 marks)

e) A public class Wolf which also inherits from Canine (3 marks)

Note that both doberMan and Wolf implement polymorphism in the behavior sound made from class Animal,