THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

A. M. E. C. E. A

MAIN EXAMINATION

JANUARY – APRIL 2015 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

REGULAR PROGRAMME

CMT 305: OBJECT ORIENTED PROGRAMMING II LAB

Date: APRIL 2015	Duration: 2 Hours
Instructions: Answer Question ONE and any other TWO Questions.	

Q1.　a)　Each student in a class has unique ID Number from 1 to n. Your job is to write astatic method that looks at a list of student ID number and prints out which ones are missing.

　　　You are guaranteed that no number will appear in the list more that once and that all numbers in the list will be valid ID numbers.
The list will be passed to the method you write in the form of an integer array. The second parameter to the methods will be n.

(12 marks)

　　b)　For the purpose of this question, assume that you are developing static methods for your own static class Mystats.

　　　i)　Write a public static method three Equal ( ) for Mystats that takes three integer values as arguments and returns true if all thee numbers are equal, false otherwise.

(8 marks)

　　　ii)　Implement a public static method getMedian ( ) for Mystats that is to take as an argument an array of int values and return the middle value.

(6 marks)

　　　iii)　Write java expressions that a client of Mystats could use to test whether the medias of three arrays of int. values Int [ ]a, int [ ] c are all equal.

(4 marks)

　　　iv)　Give a situation when it could be most appropriate to make a method static in Java.

(2 marks)

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c) Using an example of your choice, demonstrate Action Listening and Action handling in Java.

(8 marks)

Q2. a) A typical hourly employee gets paid a regular hourly rate. It they work ` more than 40 hours a week however, the employee gets "time and a half" for those extra hours. For example, if Sam's hourly rate is KShs.10 but he works 50 hours, he will make Kshs.550. In particular, he gets Ksh.10 an hour for the first 40 hours totaling to Kshs.400 and he gets Kshs.15(50% more) an hour for the last 10 hours, making an extra Kshs.150.

Required: Write a java program that prompts the user to enter their hourly rate (double) and the number of hours they have worked (int) and prints out how much money they've made for the week.

(8 marks)

b) The gad( ) function, defined in a class Euclid, takes two Non-negative integer arguments and return the greatest common divisor of the two integers.

```
Public class Euclid {
        Public Static int gcd(int P, int q) {
                If (q = = 0) return P;
                        Return gcd (q, p%q)
                }
        }
```

i) Write an overloaded function gcd ( ) that takes three non-negative integer arguments and returns the greatest common divisor of the three integers.
Assume that the function is in the same class Euclid as the two-argument version above.

Hint: Use the identity $gcd(P; q; r) = gcd(gcd(p; q);r)$

For example $gcd(504; 4116; 4410) = gcd(gcd(504; 4116); 4410) =$
$Gcd(84; 4410) = 42$

(7 marks)

ii) Give the signature of a function that takes as an argument an array of non-negative integers and returns the greatest common divisor of those integers. (Do not implement the function).

(3 marks)

c) Write java programs that will output the following;
i) * * * * *
    * * * *
    * * *
    * *
    *   **(6 marks)**

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ii)   *   *   *   *   *
       *   *   *
       *

(6 marks)

Q3. a) Imagine creating a Beverage class. A beverage has a name and how much liquid (in milli Litres) it can carry and how much liquid is left in it. in the beginning, how much is left will be equal to the capacity of beverage. For example we can construct a can of coke to have the name "Coke" and to start off with 120 milliliters. There are several operations that we can "do" to beverages. We can drink part of them, or throw away for example. We can also combine two beverages (but only if their names are the same) into one.

Required: Write the complete java class that would implement the beverage class.

(9 marks)

b) A box of cookies can cold 24 cookies and a container can hold 75 boxes of cookies.
Write a java program that prompts the user to enter the total number of cookies. The program should then output the number of boxes and the number of containers to ship the cookies.
Note: Each box must contain the specified number of cookies and each contain the specified number o boxes. If the last box of cookies contains less than the number of specified cookies, you can discard it and output the number of leftover cookies. Similarly, if the last container contains less than the number of specified boxes, you can discard it, and output the number of leftover boxes.

(8 marks)

c) Write nested for ( ) loops that would result in printing of:

0, 0; 0,1; 0,2; 1,0; 1,1; 1,2; 2,0; 2,1; 2,2; 3,0; 3,1; 3,2;

(6 marks)

d) Write a method called sumOneToN( ) that computes and prints the sum of all integers from 1 to n. Your method must take n as an argument. For example, if your method is called with 5 as the argument, it should print the result of 1+2+3+4+5   ie. 15

(7 marks)

Q4. a) Consider the following program, which is supposed to read in integer N from standard input, read N strings from standard input and print them to standard output in reverse order.
1. Public class ReverseInput Buggy
2. {
3. Public static void main (string [ ] args)
4. {
5. Int N = StdIn.read Int( );

```
6.  String S;
7.  For (int I = 1; I < N; itt)
8.  S[ i ] = StdIn.readString ( );
9.  for  (int i = N;  i > = 0; i - - )
10. System.art.println (S [ i ]);
11. }
12. {
```

i)   Which bug prevents the program from compiling successfully? Identify the
        line where the bug appears and give a correct version of this line of code.
                                                                          (4 marks)
ii)   After fixing the first bug, which bug causes the program to crash? Identify
        the line number where the bug appears and give a correct version of this
        line of code.
                                                                          (4 marks)
iii)   After fixing the first two bugs, which bug causes the program to produce
        incorrect output? Indentify the line number where the bug appears and
        given a correct version of this line of code.
                                                                          (4 marks)
b)   Create a Java program called season using a switch construct that obtains
        a number representing a month (January =1, December = 12) and outputs
        what season the month is in. For the purpose of this program, December
        – March is considered summer and September – November is considered
        Autumn.
                                                                          (8 marks)
c)   Write a Java program that will read a sequence of positive real numbers
        entered by the user and will print the same numbers in sorted order from
        smallest to largest.
        The user will input a zero to mark the end of the input. Assume that at
        most 100 positive number will be entered.
                                                                          (6 marks)

d)   A drug looses X% of its effectiveness is below 50% it is considered
        expired and must be discarded.

Required: Write a java program that determines how many years and months
             the drug can remain in storage when the user provides the value X.

Hint: Use the module operator %
                                                                          (4 marks)

END