EASTERN UNIVERSITY, SRILANKA
DEPARTMENT OF MATHEMATICS

FIRST EXAMINATION IN SCIENCE - 2009/2010
FIRST SEMESTER (June. /July., 2011)

CS 103 – INTRODUCTION TO PROGRAM DESIGN AND PROGRAMMING
(Proper & Repeat)

Answer all questions.   Time : 2 Hours

1.

a) Define *logical error* and *compile-time error* giving two examples for each error.

b) Define the terms *algorithm*, *pseudo code* and *flowchart*.

c) Draw a flowchart to the process of determining prime numbers.

d) Write an algorithm to solve quadratic equations. A *quadratic equation* is an equation of the form $ax^2 + bx + c = 0$, where a, b, and c are given coefficients and x is the unknown.

   (Hint : $x = \dfrac{-b + \sqrt{(b^2 - 4ac)}}{2a}$ or $x = \dfrac{-b - \sqrt{(b^2 - 4ac)}}{2a}$)

e) Evaluate each of the following expressions. Assume that in each case, a=13, b=6.

```
i.      a-b+10*8
ii.     (--a)/(++n)+2
iii.    a%b
iv.     a%(a++)
v.      (a++) - (++a)/(b+1)
```
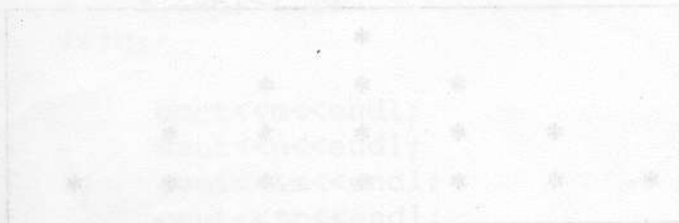
2.

a) Describe the uses of break and continue statements.

b) Consider the following C++ code segment:

```cpp
#include <iostream>
int main()
  int z=0;
  int i, j;
  int g=10;

  for (i=1; i=<11; i++)
  {
      for (spaces=g; spaces>0; spaces--)
      {
          cout << " "
      }
        for (j=0; j<z+1; j++)
        {
            cout << "*";
        }
    cout << endl;
     z=+1;
     g--;
  }
}
```

i. What is wrong with the code segment?

ii. Give the output of the code segment.

iii. Convert the above for loop into a while loop.

c) Write a program in C++ to display the following pattern using loops.

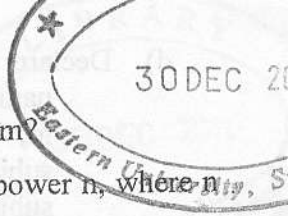i.

1				
3	3			
5	5	5		
7	7	7	7	
9	9	9	9	9

ii.

			*			
		*	*	*		
	*	*	*	*	*	
*	*	*	*	*	*	*

3.

a) What are the advantages of using functions to modularize a program

b) Write the following power() function that returns x raised to the power n, where n can be any integer:

```
double power(double x, int p);
```

c) Write the following *isSquare()* function that determines whether the given integer is a square number:

```
int isSquare(int n)
```

d) Write the following function that returns the minimum value among the first n elements of the given array:

```
float min(float a[],i nt n);
```

e) Write a *function declaration* and *function definition* for a function that converts seconds to minutes and seconds. If **129 seconds** is the input passed in, **2 minutes and 9 seconds** should be the output.

a) Describe the functionalities of *referencing operator (&)* and *dereferencing operator (*)*.

b) List the advantages and disadvantages of the pointers in terms of C++ programming Language

c) What is the output of the following program? Assume that each integer occupies 4 bytes and that m is stored in memory starting at byte 0x3fffd00.

```
#include<iostream.h>
void main()
    {
        int m = 44;
        int* p = &m;
        int& r = m;
        int n = (*p)++;
        int* q = p - 1;
        r = *(--p) + 1;
        ++*q;

            cout<<m<<endl;
            cout<<n<<endl;
            cout<<&m<<endl;
            cout<<*p<<endl;
            cout<<*q<<endl;
            cout<< r;
    }
```

d) Declare a 'structure' for a student record consisting of the following fields:
name;
id;
subject_1_marks;
subject_2_marks;
total_marks.

Write a program to keep records for 5 students including functions to do the following task:
- Insert the student' details (name, id, subject_1_marks, subject_2_marks)
- Calculate the total marks for each student
- Display the students' details and total marks.