

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.

- Define *logical error* and *compile-time error* giving two examples for each error.
- Define the terms *algorithm*, *pseudo code* and *flowchart*.
- Draw a flowchart to the process of determining prime numbers.
- 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 : $x = \frac{-b + \sqrt{(b^2 - 4ac)}}{2a}$ or $x = \frac{-b - \sqrt{(b^2 - 4ac)}}{2a}$)

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

- $a - b + 10 * 8$
- $(--a) / (++n) + 2$
- $a \% b$
- $a \% (a++)$
- $(a++) - (++a) / (b+1)$

2.

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- a) Describe the uses of break and continue statements.
- b) Consider the following C++ code segment:

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

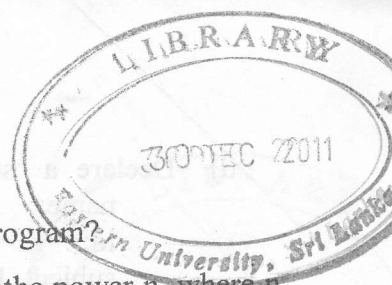
for (i=1; i<=11; i++)
{
    for (spaces=g; spaces>0; spaces--)
    {
        cout << " "
    }
    for (j=0; j<z+1; j++)
    {
        cout << "*" ;
    }
    cout << endl;
    z++;
    g--;
}
}
```

- 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.

```
          *
        * * *
      * * * * *
    * * * * * *
  * * * * * * *
```



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- 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[], int 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's details (name, id, subject_1_marks, subject_2_marks)
- Calculate the total marks for each student
- Display the students' details and total marks.