



EASTERN UNIVERSITY, SRI LANKA
DEPARTMENT OF MATHEMATICS

FIRST YEAR EXAMINATION IN SCIENCE - 2015/2016

FIRST SEMESTER (July/Aug., 2017)

CS 103 – INTRODUCTION TO PROGRAM DESIGN AND PROGRAMMING

Answer all questions

Time allowed: 2 Hours

Q1. Machine language is the basic language of the computer, which provides instructions in bits.

- a. What is meant by computer programming?
- b. Briefly explain the differences between Flowchart and Pseudocode.
- c. A student spends a majority of his weekend playing and watching sports, thereby tiring him out and leading him to oversleep and often miss his Monday 8 AM mathematics class. Suppose that the tuition fee per semester is Rs. 30,000 and the average semester consists of 15 units. If the mathematics class meets three days a week, one hour each day for 15 weeks, and is a four-unit course, how much does each hour of mathematics class cost the student? Design an algorithm that computes the cost of each course per hour in a semester.
- d. Write C++ statement(s) that accomplish the following.
 - i. Declare and initialize the following named constants: **SECRET** of type integer initialized to 11, and **RATE** of type double initialized to 12.50.
 - ii. Declare the following variables: **number1**, **number2** of type integer and **newNumber** of type integer initialized to 10; and **hoursWorked** and **wages** of type double.
 - iii. Prompt the user to input two integers and store the first number in **number1** and the second number in **number2**.
 - iv. Outputs the values of **number1** and **number2**, indicating which is **number1** and which is **number2**. For example, if number1 is 8 and number2 is 5, then the output is: The value of number1 = 8 and the value of number2 = 5.
 - v. Updates the value of **newNumber** by adding the value of the named constant **SECRET** to it. Then, outputs the value of **newNumber** with an appropriate message.
 - vi. Prompt the user to enter a decimal number between 0 and 70, and then store the number entered into **hoursWorked**.

- vii. Multiplies the value of the named constant **RATE** with the value of **hoursWorked** and then stores the result into the variable **wages**.

Q2. Control structures provide alternatives to sequential program execution and are used to alter the sequential flow of execution.

- a. Briefly explain the types of control structures with the aid of flowchart.
b. What is the output when the following code fragment is executed?

```
int x = 5;
int y = 12;
if (x + y > 20 || y - x < 10)
{
    x = y + 6;
    y = 2 * (x + y);
    cout << x << " " << y << " " << x - y << " " << x + y << endl;
}
else
{
    y = (5 * x + 20) % y;
    cout << x << " " << y << " " << x * x + y * y << endl;
}
```

- c. Define the terms *break* and *continue* in the looping structure.
d. Consider the following code segment.

```
#include <iostream>
main()
{
    int num, f3=0
    int f1=1, f2=1;
    cout << "Enter a number : ";
    cin >> num;

    if num==0
        cout << "value of 0 = " << 1;

    else (num==1)
        cout << "value of 1 = " << 1;

    else if (num >= 2) {
        for (int i=2, i <= num, i++) {
            f3=f1+f2;
            f1=f2;
            f2=f3;
        }
        cout << "value of " << num << " = " << f3;
    }
    getch();
}
```

- i. Correct any errors that would prevent the above program from compiling or running.
- ii. Write the output when the input is 5 (Show the appropriate steps).
- iii. Write the output when the input is 10 (Show the appropriate steps).

Q3. Loops cause a section of your program to be repeated a certain number of times.

a. Briefly explain the difference between *while loop* and *do-while loop* with a suitable example.

b. Write the code segment using looping structure that accomplish the following tasks:

i. Reverse the number entered by the user,

eg : Enter the number : 2456
Reverse number is : 6542

ii. Print the following pattern for a given number,

eg : Enter the number : 5

```

+ + + + +
# # # # #
+ + + + +
# # # # #
+ + + + +

```

c. Explain the concept of *Arrays* in computer programming.

d. Consider the following declarations:

```

const int CAR_TYPES = 5;
const int COLOR_TYPES = 6;
double sales[CAR_TYPES][COLOR_TYPES];

```

- i. How many components does the array sales have?
- ii. How many number of rows and number of columns in the array sales?
- iii. Write C++ statements to prompt the user to enter the array values,
- iv. Write C++ statement to find the sum of sales by CAR_TYPES,
- v. Write C++ statement to find the sum of sales by COLOR_TYPES.

Q4. A function is a group of statements that together perform a task. Some functions are called predefined and others are called user-defined functions.

a. Briefly explain the differences between the passing a parameter passed by value and by reference with suitable example.

b. Write C++ functions that accomplish the following tasks:

- i. Function with the name of **sum** which accept two integers as an argument and return its **sum**.
- ii. Function with the name of **swap** which accept two values as an argument and **swap** values of two variables.

iii. Function with the name of **trignum** which accept an integer as an argument and find the triangle number for the argument value.

c. What is meant by pointer? Explain the differences between pointer and variable.

d. Write the output when the following code fragment is executed?

```
int q=3;
int A[8] = {2,4,5,7,9,8,12,11};
int *x = &A[2];
int* y = &q;
int** z = &y;
cout << *y<<endl;
cout << **z<<endl;
cout << *x<<endl;
cout << A[4]<<endl;
cout << *x-3<<endl;
cout << A[*x+*y-4]<<endl;
cout << A[**z]<<endl;
cout << A[*x-**z+3]<<endl;
```

e. Declare a structure for a student record consisting of the following fields:

Name, Id, Marks1, Marks2, Total_marks, and Average_marks.