



EASTERN UNIVERSITY, SRILANKA

FIRST YEAR FIRST SEMESTER EXAMINATION IN SCIENCE-

2005/2006 & 2006/2007 (August/September, 2007)

CS 103 –Introduction to Program Design and Programming

Proper and Repeat

Answer all questions

Time: 2 hours

Q1. a) Define the terms *Algorithm* and *Structure chart*.

Draw the structure chart and write algorithms for each modules of the structure chart for the problem given below.

Suppose that Eastern University wants to send warning notices to first year students who are in danger of failing a subject. Write a program to calculate the average of three test scores and print out a student's Index number, average, and whether or not the student is passing. Passing is a 60-point average or better. If the student is passing with less than a 70 average, the program should indicate that he or she is marginal.

- b) For the following C++ features write a very short fragment of code that illustrates the syntax involved. In each case explain very briefly what your example achieves.**
- (i) defined constant declaration
 - (ii) type casting that convert from one pointer type to another
 - (iii) function definition
 - (iv) prototype declaration of a function
 - (v) the switch statement, including a default label

[25 marks]

Q2. a) (i) Explain the following controlled loops *While loop* and *For loop* in C++.

(ii) Write down the equivalent *for* loop statement for the *while* loop statement given below. Equivalent here means that the value of each of the variables would be the same when the code has completed execution.

```
int count = -5, sum = 0;
while (count <= 15)
{
    sum += count;
    count++;
}
```

(iii) $U(n)$ is defined with:

- $U(0) = b$ (b is an integer)
- If $U(n)$ is even then $U(n+1) = U(n)/2$, else $U(n+1) = 3 * U(n) + 1$, for all $n \geq 0$.

Conjecture: For all values of b , there exists a value N such that $U(N) = 1$.

Write a program that asks the user to input the value of an integer “ b ” and output all the values of $U(n)$ from $n=1$ to $n=N$.

b) (i) Using a suitable example explain what do you mean by recursion

(ii) Fibonacci number is a member of a set in which each number is the sum of the previous two numbers. The Fibonacci series begins with, 0,1,1,2,3,5,8,13,.... Write a program to display the Fibonacci series. The number of elements need to be displayed in the series should be given by the user.

[25 marks]

Q3. a) Using suitable examples explain the parameter passing techniques.

b) Differentiate the array passing techniques in functions: **passing array as individual elements** and **passing array as whole**, with suitable example.

c) Suppose that a program is required to read 2 integers from the user and then print the quotient and remainder of the first number divided by the second number. Write a void function named **divide()**, which will find the quotient and remainder of the 2 integers.

d) Write a program to multiply a 3×3 matrix by a scalar. Your program should contain the following functions:

- ReadMatrix()
- multiplyByScalar()
- WriteMatrix()

[25 marks]

Q4. a) Describe the difference between $\text{int}^* a = b$ and $z = *x$

b) Describe the difference between $\text{int}\& a = b$ and $z = \&x$

c) What are the differences between a statically declared and a dynamically declared variable in C++? (Give examples)

d) Write a declaration for each of the following:

(i) a pointer to an array of 8 floats;

(ii) a pointer variable pointing to pointer to an integer;

(iii) a function that returns a pointer to a float.

(iv) a pointer to a function that returns a float

e). Write a function that is passed an array of n pointers to floats and returns a pointer to the maximum of the n floats.

[25 marks]

