THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF ENGINEERING TECHNOLOGY
FINAL EXAMINATION 2010/2011
MEK3170 C PROGRAMMING
OPEN BOOK TEST

LIBRARY
01 NOV 2011
The Open University of Sri Lanka

DATE : 28TH MARCH 2011
TIME : 1400 HRS – 1700 HRS
DURATION : THREE HOURS [3 HOURS]

INSTRUCTIONS:

1. This is an **open book** examination.
2. This paper consists of **6** questions.
3. You should answer **4 questions including Question 1.**
4. **Question 1 is compulsory** and it carries **40 marks.**
5. Select and answer **3 more** questions which carry **20 marks each.**

Question 1 (*Compulsory*) [40 marks]

(a) Write a C++ program to find out the smallest number and the largest number of a given three numbers. Your program should ask user to enter three numbers and display the largest and smallest numbers.

[8 marks]

(b) Write a C++ program to reads 10 numbers and output the sum of all positive numbers and sum of all the negative numbers separately. When you are reading 10 numbers from the user, your program should **not** ask user to enter positive and negative numbers separately.

[8 marks]

(c) Write a C++ program to implement multiplication table of a given number. Allow user to enter a number and display the first twelve multiples of that number.
Hint: Use a loop to find first twelve multiples.

For example, If user entered number is 3 then output will be like this

Multiplication Table
3*1 = 3
3*2 = 6
3*3 = 9
.
.
.
3*12 = 36

[9 marks]

(d) Create a class called ***ComplexNumbers*** to store information of complex numbers. This will store information related to complex numbers. ***ComplexNumbers*** has two data members (instance variables) to store real part and complex part of a complex number. The class has an overloaded constructor to set the data members and a function to display the complex number. The class definition is shown below.

```
class ComplexNumbers{
private:
        double realPart;
        double complexPart;
public:
        ComplexNumbers(double real, double complex);
        void display();
};
```

Considering above information, implement the body of the public constructor (ComplexNumbers(double real, double complex)) and the function (void display()).

[15 marks]

Question 2 [20 marks]

You need to write a C++ program to implement a simple calculator. Your calculator performs five different mathematical operations: addition (+), subtraction (-), multiplication (*), division (/) and modulus (%) of two numbers. Write a program to implement these mathematical operations of two numbers. According to the user entered operator (+, -, *, /, %), your program should perform the necessary mathematical operation of the two numbers, and should display the result. Your program should allow user to enter two numbers and the operator. After displaying the result to the user, ask whether user wants to do another calculation or quit. Until user wants to quit, your program should ask user to enter another two numbers and the operator and display the result.

Question 3 [20 marks]

Write a C++ program to **replace** each **vowel (a, e, i, o, u)** in a string by a special character '**&**'. Your program should ask user to enter the string. Then display the resulted string.

For example, if user entered string is *"The quick brown fox jumps over the lazy dog"*, and then the resulted string after replacing all ***'a', 'e', 'i', 'o', 'u'*** by ***'&'*** is:

"Th& q&&ck br&wn f&x j&mps &v&r th& l&zy d&g"

Question 4 [20 marks]

The formula for computing the number of ways of choosing r different things from a set of n things is the following:

$$C(n,r) = n! \,/\, (r!\,(n-r)!)$$

The factorial of a positive integer n is: $n! = n*(n-1)*(n-2)*\ldots*1$ where **n>=0.** When $n=0$, $n!=0$. Write a function called ***int factorial(int n)*** to implement $n!$. Your function should contain n as a parameter. By using that function, write a program to implement $n! / (r!\,(n-r)!)$. Allow user to enter values for n $(n>=0)$ and r $(r>0)$ and display the result.

Question 5 [20 marks]

There are two types of products: Type A and Type B. Write a C++ program to store information of products in two separate files according to the product type. Your program should allow user to enter product information:

- Product Name
- Product Number
- Product Type (Type A or Type B)
- Price
- Quantity

Type A product information should be stored in a text file called "***Type A.txt*** " and Type B product information should be stored in a text file called "***Type B.txt*** ". Append the product details to the existing files.

Question 6 [20 marks]

Create a class called ***AirFreight***. This will store information related to air freights. ***AirFreight*** has two data members (instance variables) to store weight of the freight in kilograms and cost of the freight. This has a function (***double calculateCost()***) to calculate cost of the air freight. For first 5 kg, it will charge Rs. 4000.00. For each additional kilogram it will charge Rs.1000.00. The class definition is shown below.

```
class AirFreight{
        private:
                double weight;
                double cost;
        public:
                AirFreight();
                void setWeight(double w);
                double getWeight();
                double calculateCost();
                ~ AirFreight();
};
```

The default constructor of above class is to initialize the data members. Write complete program to implement above scenario considering the information given above. Create an object of the type of **AirFreight**. Your program should ask user to enter weight of the freight. Use set and get functions to set and get weight of the freight. Display the cost of the freight to the user.