RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree in Information and Communication Technology
First Year - Semester II Examination –October/ November 2017

ICT 1306 – OBJECT ORIENTED PROGRAMMING

Answer all questions **Time: Three (3) hours**

1.

a) What are the basic concepts of Object Oriented Programming? (4 marks)

b) Explain the different access specifiers for class members in C++ using suitable examples. (4 marks)

c) What is the technical difference between structures and classes in C++ (4 marks)

d) The atoms of different elements have different numbers of protons, neutrons and electrons. Electrons are negatively charged, protons are positively charged, and neutrons have no charge. In an object oriented programming language of your choice

i. Write a definition for an atom class that contains: fields for storing the numbers of protons, neutrons and electrons with appropriate visibility. (2 marks)

ii. Setter and getter methods for manipulating these fields, ensuring that the minimum value for electrons and protons is 1, and the minimum value for neutrons is 0. (3 marks)

iii. A constructor that initializes new objects of atom to be the smallest element (Hydrogen), for which the number of protons is 1, the number of neutrons is 0, and the number of electrons is 1. (3 marks)

2.

a) Define the terms 'static data member' and 'static member function' using examples. (4 marks)

b) Differentiate method overloading and overriding using examples. (4 marks)

c) What is the purpose of using operator overloading? Show the proper usage of syntax using an example. (4 marks)

d) Create a class called time that has separate integer type member data for hours, minutes and seconds. One constructor should initialize these data to zero, and another should initialize to fixed values which are given by the user. Another member function should display it, in 11.59.59 format. Yet another member function should add two objects of time which are passed as arguments. (8 marks)

3.

a) What are the advantages of using inheritance? (4 marks)

b) What is multiple inheritance? Write a code segment to show multiple inheritance. (5 marks)

c) Define the term 'abstract class'. Write a code segment to show an abstract class. (5 marks)

d) Write a program that derives classes Car and Bus from the class Vehicle. Make vehicle an abstract data type (ADT) with two pure virtual functions. Make Car and Bus not ADTs. (6 marks)

4.

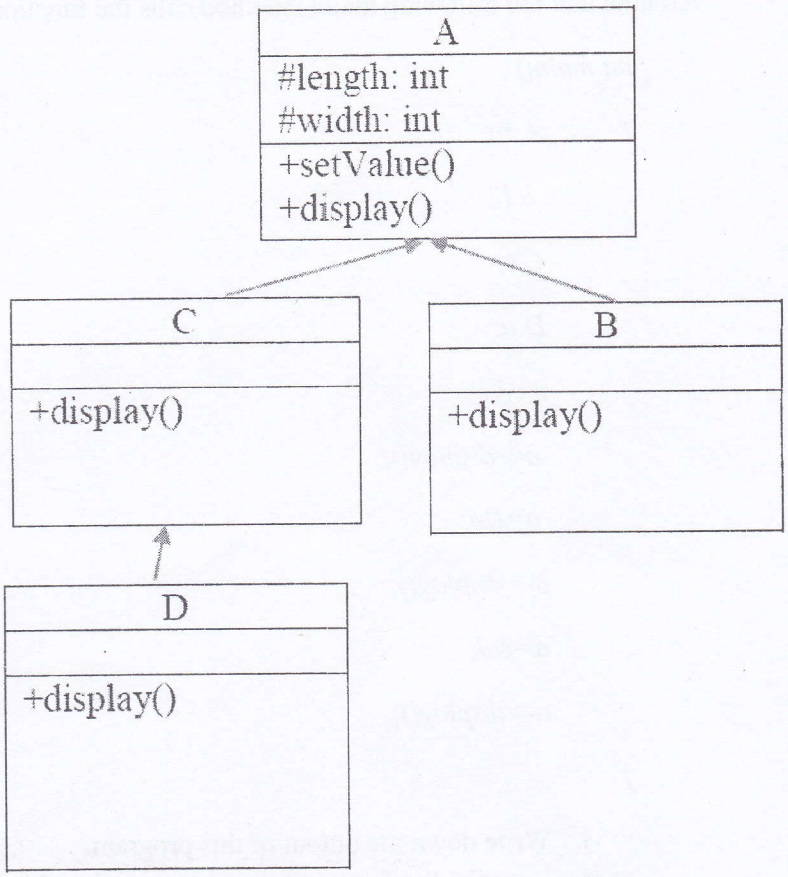
a) What is a friend function? Write a code segment for a friend function. (2 marks)

b) Assume that there is a class named "Square". This class has two variables named "width" and "length". The function of this class is to calculate the area of square when the width and length is given.

i. Write the C++ code for this class observing the encapsulation principle. (6 marks)

ii. Draw the UML class diagram for the C++ class you wrote. (4 marks)

c) Consider the class diagram below and write the C++ code to implement this class structure. (8 marks)



5.

a) Describe why a class is considered an abstraction of its instance. (4 marks)

b) Assume that the display() method is as follows in each class.

display() method in class A *void display()* *{* *std::cout<<"A class area. \n";* *}*	display() method in class B *void display()* *{* *std::cout<<"B class area. \n";* *}*
display() method in class C *void display()* *{* *std::cout<<"C class area. \n";* *}*	display() method in class D *void display()* *{* *std::cout<<"D class area. \n";* *}*

Assume that the following main() method calls the functions in Class A, B, C and D.

```
int main()
{       A *a;
        B b;
        C c;
        D d;
        a=&b;
        a->display();
        a=&c;
        a->display();
        a=&d;
        a->display();
}
```

i. Write down the output of this program. (4 marks)

ii. Describe the format of the output produced in i above. (6 marks)

why the output takes this form

iii. Consider the following output

Change made at 11:10 am
2 students left.

B class area.
C class area.
D class area

There is a way to get this output by adding a certain keyword to the program described above. Write that specific class with the necessary modification which needs to get the output describe here.

(6 marks)

END