NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF APPLIED SCIENCES
COMPUTER SCIENCE DEPARTMENT
MAY 2001 EXAMINATIONS

SUBJECT: ADVANCED SOFTWARE ENGINEERING
CODE: SCS4206

INSTRUCTIONS TO CANDIDATES

1. Answer any four questions.
2. Marks are indicated in brackets [ ]

Maximum marks: 100
Time: 3 HOURS

QUESTION 1

a) How are the data functions organized in an object-oriented program? [5]

b) Distinguish between the following terms:

   i) Objects and classes.
   ii) Data abstraction and data encapsulation
   iii) Inheritance and polymorphism
   iv) Dynamic binding and message passing. [8]

c) Consider the long-term deposit scheme working in the commercial banks. The banks provide different interest rates for different schemes as well as for different periods of investment. Write a C++ program to use the class variables for holding account details and to construct these variables at run time using dynamic initialization. [12]

QUESTION 2

a) When will you make a function _inline?_ Why? Illustrate the use of _inline_ functions. [7]

b) Why is X(X) not as sensible constructor? [5]

c) Consider a shopping list of items for which an order is placed with a dealer every month. The list includes details such as code number and price of each item. Write a program, which perform operations like adding an item in the list, deleting an item from the list and printing the total value of order. Use a class with arrays as data members. [13]

QUESTION 3

a)   What is object-oriented programming? How is it different from Procedure-oriented Programming? List the benefits of object-oriented programming. [7]

b)   Write a program which reads the positive integer n and generates all Permutations of the sequence 1,2,..., n in increasing order. For example, with $n = 3$ the required output is:

1	2	3
1	3	2
2	1	3
2	3	1
3	1	2
3	2	1

If we regard each of these lines as a three-digit integer, we obtain 123, 132, 213, 231, 312, 321 in that order. As these numbers form monotonic increasing sequence, we say that the above permutations are in increasing order.
[13]

c)   Discuss the different ways by which we can access public member functions of an object. [5]

QUESTION 4

a)   When do we use the protected visibility specifier to a class member?

What are the implications of the following two definitions?

i)   class A: public B,   public C, {//....};

ii)   class A: public C,   public B, {//....}; [5]

b)   Assume that a bank maintains two kinds of accounts for customers, one called as savings account and the other as current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides a cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed.

Create a class **account** that stores customer name, account number, and type of account. From this derive classes **cur_acct** and **sav_acct** to make them more specific to their requirements. Include necessary member functions in order to achieve the following tasks:

i)   Accept deposit from a customer and update the balance.
ii) Display the balance.
iii) Compute and deposit interest
iv) Permit withdrawal and update the balance
v)   Check for minimum balance, impose penalty, if necessary and update the balance.

Write a C++ program, which does not use any constructors. Use member functions to initialize to class members.   [12]

c)   Modify the above program of part (b) to include constructions for all the three classes.   [8]

QUESTION 5

a)   Write a C++ program to alter the values for the private members to two classes class_1 and class_2.   [8]

b)   Write a C++ program that reads the name of a file and then determines how many words are in the file, where a "word" is any string of characters delimited by white Space but containing no white-space characters.   [12]

c)   Write different forms of inheritance quoting examples, if possible.   [5]

QUESTION 6

a)   State whether the following statements are TRUE OR FALSE:

i)   Data items in a class must always be private.
ii)   Since C is a subset of C++, all C programs will run under C++ compilers.
iii) Looking at one or two lines of code, we can easily recognize whether a program is written in C or C++.
iv)   When an argument is passed by reference, a temporary variable is created in the calling program to hold the argument value.
v)   In Procedure-oriented programming all data are sorted by all functions.
vi)   One problem with object –oriented programming is that once a class is created it can never be changed.
vii) The concept of using one operator for different purposes is known as operator overloading.
viii) Object-oriented approach cannot be used to create Databases.
ix)   When a function returns a value, the entire function call can be assigned to a variable.
x)   A function designed as public can be accessed like any other ordinary functions.   [10]

b)   Find errors, if any, in the following function definition for displaying a matrix:

```
void display (int A[ ] [ ], int m, int n)
{
        for (i= 0;       i < n,  i + +)
          for ( j = 0;  j<n;    j + +)
                cout<< "   " << A[ i ] [ j ];
}               cout << "\n";                                    [8]
```

c)   consider the following function G ( );

```
void G (int Num 1, int Num 2)
{
        if (Num 2 < = 0
                cout << endl;
        else
        {
                G(Num 1 – 1, Num 2 – 1);
                cout << Num 1;
                G(Num 1 + 1, Num 2 –1 ) ;
        }
}
```

what output is produced by the functional call G (14, 4)?

[Hint; first try G(14,2); then try G(14,3)].   [7]

QUESTION 7

a)   Create two classes DM and DB which store the value of distances. DM stores n
      meters and centimeters, and DB in feet and inches. Write a C++ program that can
      read values for the class objects and add one DM with another object of DB. Use
      a friend function to carry out the addition operation. The object that stores the
      results may be a DM object or DB object, depending on the units in which the
      results are required. The display should be in the format of feet and inches or
      meters and centimeters depending on the object on display.   [13]

b)   Write a C++ program code that, given a number representing a TV channel, uses
      a <u>switch</u> statement to display the call letters of the station that corresponds to that
      number or displays some message indicating that the channel is not used. Use the
      following channel numbers and call letters or use those that are available in your
      local stations:

2	:	WCBS
4	:	WNBC
5	:	WNEW
7	:	WABC
9	:	WOR
11	:	PIX
13	:	WNET

[7]

c) Destructions in inheritance lists are almost always, virtual functions. Constructors are never made virtual functions. Why? [5]

END OF QUESTION PAPER