

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY  
FACULTY OF APPLIED SCIENCE  
**COMPUTER SCIENCE DEPARTMENT**  
MAY EXAMINATIONS 2000

**SUBJECT:** ADVANCED SOFTWARE ENGINEERING  
**CODE:** SCS 4206

**INSTRUCTION TO CANDIDATES**

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

Maximum Marks: 100  
Time: 3 hours

1. (a) Describe the different forms of inheritance through examples. [5]
- (b) Why is the language called C++? [5]
- (c) The eight Queens problem is to place eight Queens on a chessboard so that no Queen is attacking any other Queen. It was investigated by C. F. Gauss in 1850, but he did not completely solve it. We generalize this problem to the  $n$  Queens problem for an  $n \times n$  board. Write a C++ Program that reads  $n(n \leq 10)$  and print all solutions. [15]

2. What will be the result of the following segments of programs?

(a) for (i = 0.25; i < 1.0; i = i + 0.25)  
{  
    cout.Precision(5);  
    cout.width(7);  
    cout << i;  
    cout.width(10);  
    cout << i\*i << "\n";  
}

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[7]

(b) #include <iostream.h>  
int count = 0  
class alpha  
{  
    public:  
        alpha ()  
        {  
            count ++;  
            cout << "\n No.of.object created" << count;  
        }  
        alpha ()  
        {  
            cout << "\n No.of.object destroyed" << count;

```

        cout --
    };
main ( )
{
    cout << "\n\n Enter Main \n";
    alpha A1, A2, A3, A4;
    {
        cout << "\n\n Enter Block 1 \n";
        alpha A5;
    }
    {
        cout << "\n\n Enter Block 2 \n";
        alpha A6;
    }
    cout << "\n\n Re-enter Main \n";
}

```

[9]

(c) # include <io stream.h>  
 # include <io manip.h>  
 main ( )  
 {  
     cout.set f (ios::showpoint);  
     cout << set w(5) << "\n"  
         << set w(15) << " Inverse-of-n"  
         << set w(15) << " Sum-of-terms \n\n";  
     double term, sum=0;  
     for (int n=1; n<10; n++)  
     {  
         term = 1.0/float (n);  
         sum = sum + term;  
         cout << set w(5) << "\n"  
             << set w(14) << " Set precision (4)  
             << set ios flags (ios:: scientific) << term  
             << set w(13) << " reset ios flags (ios:: scientific)  
             << sum  
             << endl;  
     }  
 }

[9]

3. (a) State whether the following statements are TRUE or FALSE.

1. We can prevent the inheritance of all members of the base class by making base class virtual in the definition of the derived class.
2. It is legal to have an object of one class as a member of another class.
3. Constructors, like other member functions, can be declared anywhere in the class.
4. The `get(void)` function provides a single-character input that does not skip over the while spaces.

5. Wrapping up of data of different types into a single unit is known as encapsulation.
6. Member functions defined inside a class specifier becomes inline functions by default.
7. When a function returns a value, the entire function call can be assigned to a variable.
8. A C++ stream is a file.
9. Distributors never take any argument.
10. A decision table is a pictorial presentation of data flow.

[10]

- (b) Find the errors in the following statements by stating the reason

1. if stream.infile("DATA");
2. cout << set w(s) << set precision(2);
3. void print (float data[ ], size = 20);
4. float \*p=new int[10];
5. cout << "x="x;
6. cin >> x; >>y;

[9]

- (c) Distinguish between the following two statements:

Time  $T_2(T_1)$ ;  
Time  $T_2 = T_1$ ;

Where  $T_1$  and  $T_2$  are objects of time class.

4. (a) Destructors in inheritance lists are almost always virtual functions. Constructors are never made virtual functions. Why?

[5]

- (b) An election is contested by five candidates. The candidates are numbered 1 to 5 and the voting is done by marking the candidate number on the ballot paper. Write a program to read the ballots and count the votes cast for each candidate using an array variable count. In case, a number read is outside the range 1 to 5, the ballot should be considered as a "spoilt ballot" and the program should also count the number of spoilt ballots.

[12]

- (c) Suppose that InFile contains the following:

I think that I shall never see  
A poem lovely as a tree

- JOYCE KILMER (1914)

' LIBRARY USE ONLY'

and that a program begins with

```
#include <io stream.h>
#include <f stream.h>
int main (void)
{
    f stream
        Instream ("InFile", ios: i);
    char
        ch;
```

What output will be produced by the following code fragments?

```

Instream >>ch;
while (! Instream.eof ( ))
{
    cout <<ch;
    Instream >>ch;
}
Instream.close ( );

```

[8]

5. (a) Distinguish between object-oriented systems analysis and systems design. Which of the two requires more creative talents of the system developer? [5]
- (b) Write a C++ program that reads the name of a file and then determines how many lines are in the file. [10]
- (c) The level of air pollution in the city of BULAWAYO is measured by a pollution index. Readings are made at 12:00 p.m. at three locations: the Cement Plant, down town at the corner of Main Street and 7<sup>th</sup> Avenue, and at randomly selected location in a residential area. The average of these three readings is the pollution index, and a value of 50.0 or greater for this index indicates a "hazardous" condition, whereas values lower than 50.0 indicate a "safe" condition. Because this index must be calculated daily, the BULAWAYO environmental statistician would like a program that calculates the pollution index and then determines the appropriate condition, safe or hazardous. Write a program in C++ which reads 3 pollution levels, calculate an air pollution index as their average, and displays an appropriate air-quality message. Give sample run and display the output. [10]

6. (a) Write a program that uses nested for loops to print the following multiplication table:

	1	2	3	4	5	6	7	8	9
1	1								
2	2	4							
3	3	6	9						
4	4	8	12	16					
5	5	10	15	20	25				
6	6	12	18	24	30	36			
7	7	14	21	28	35	42	49		
8	8	16	24	32	40	48	56	64	
9	9	18	27	36	45	54	63	72	81

[12]

- (b) What is the output of the following segment?
- ```

Int
Number = 4;

```

```

while (Number>0)
Number -- ;
cout <<Number<<"\n";

```

[7]

- (c) Write a function whose parameter is the number of a month and whose return value is the corresponding value of type Month Abbrev. [6]

7. (a) Develop a program to allow the user to input a series of positive numbers from the keyboard and calculate the mean and standard deviation of the set of numbers. A negative input number indicates the end of input. [10]

- (b) Consider the following algorithm:

1. Initialize X to 0, Y to 5, Z to 25.
2. while  $X \leq 4$  do the following
  - (a) set  $Y = Z - Y$ ,  $A = X + 1$ , and then increment X by 1
  - (b) If  $A > 1$  then set  $Z = Z - 5$ ,  $A = A^2$ , and then set  $B = Z - Y$ ,  
End if.
- End loop.
3. Display A, B, X, Y and Z.

Complete the following Trace Table for this algorithm, which displays the labels of the statements in the order in which they are executed and the values of the variables at each stage:

| Statement | A  | B  | X  | Y  | Z  |
|-----------|----|----|----|----|----|
| 1         | ?  | ?  | 0  | 5  | 25 |
| 2         | ?? | ?? | ?? | ?? | ?? |
| 2a        | 1  | ?? | 1  | 20 | ?? |
| 2b        | ?? | ?? | ?? | ?? | ?? |
| 2a        | 2  | ?? | 2  | 5  | ?? |
| ..        | .. | .. | .. | .. | .. |
| 3         | ?? | ?? | ?? | ?? | ?? |

(?) →undefined

Generate the C++ program for the above algorithm.

[15]

END OF QUESTION PAPER