

- Please check that this question paper contains 12 printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains 7 questions.
- Please write down the serial number of the question before attempting it.

COMPUTER SCIENCE

Time allowed : 3 hours

Maximum Marks : 70

Instructions :

- (i) *All questions are compulsory.*
 - (ii) *Programming Language : C++*
1. (a) Differentiate between a Call by Value 'and Call by Reference, giving suitable examples of each. 2
- (b) Name the header files to which the following belong: 1
- (i) abs()
 - (ii) strcmp()
- (c) Rewrite the following program after removing the syntactical error(s), if any. Underline each correction. 2

```
#include <iostream.h>
const int Multiple 3;
void main ( )
{
    Value=15;
    for (int Counter = 1;Counter=<5;Counter++,Value-=2)
        if (Value%Multiple==0)
            cout<<Value * Multiple;
            cout<<endl;
        else
            cout<<Value+Multiple<<endl;
}
```

(d) Find the output of the following program:

3

```
#include<iostream.h>
struct MyBox
{
    int Length, Breadth, Height;
};
void Dimension (MyBox M)
{
    cout<<M.Length<<"x"<<M.Breadth<<"x";
    cout<<M.Height<<endl;
}
void main ()
{
    MyBox B1={10,15,5}, B2, B3;
    ++B1.Height;
    Dimension(B1);
    B3 = B1;
    ++B3.Length;
    B3.Breadth++;
    Dimension(B3);
    B2 = B3;
    B2.Height+=5;
    B2.Length--;
    Dimension(B2);
}
```

(e) Find the output of the following program:

2

```
#include<iostream.h>
#include<string.h>
#include<ctype.h>
void Convert(char Str[],int Len)
{
    for (int Count =0; Count<Len; Count++ )
    {
        if (isupper (Str [Count] ) )
            Str[Count]= tolower(Str[Count]);
        else if (islower (Str [Count] ) )
            Str[Count]= toupper(Str[Count]);
        else if (isdigit (Str [Count]))
            Str[Count]=. Str[Count] + 1i
        else Str[Count] = '*' ;
    }
}
```

```

void main ()
{
    char Text [] = "CBSE Exam 2005";
    int Size=strlen(Text);
    Convert(Text,Size);
    Cout<<Text<<endl;
    for (int C = 0,R=Size-1;C<=Size/2; C++,R--)
    {
        char Temp = Text[C];
        Text [C] = Text [R] ;
        Text [R] = Temp;
    }
    cout<<Text<<endl;
}

```

- (f) Observe the following program SCORE.CPP carefully, if the value of Num entered by the user is 5, choose the correct possible output(s) from the options from (i) to (iv), and justify your option.

2

```

//program : SCORE.CPP
#include<stdlib.h>
#include<iostream.h>
void main()
{
    randomize ();
    int Num, Rndnum;
    cin>>Num;
    Rndnum = random (Num) + 5;
    for (int N = 1; N<=Rndnum; N++)
        cout<<N<<" ";
}

```

Output Options:

- (i) 1 2 3 4
- (ii) 1 2
- (iii) 1 2 3 4 5 6 7 8 9
- (iv) 1 2 3

2. (a) Define the term Data Hiding in the context of Object Oriented Programming. Give a suitable example using a C++ code to illustrate the same. 2
- (b) Answer the questions (i) and (ii) after going through the following class: 2

```
class Test
{
    char Paper[20];
    int Marks;
public:
    Test () // Function 1
    {
        strcpy (Paper, "Computer")
        Marks = 0;
    }
    Test (char P [] ) // Function 2
    {
        strcpy(Paper,P);
        Marks = 0;
    }
    Test (int M) // Function 3
    {
        strcpy(Paper,"Computer");
        Marks = M;
    }
    Test (char P[], int M) // Function 4
    {
        strcpy (Paper, P);
        Marks = M;
    }
};
```

- (i) Which feature of Object Oriented Programming is demonstrated using Function 1, Function 2, Function 3 and Function 4 in the above class Test?
- (ii) Write statements in C++ that would execute Function 2 and Function 4 of class Test.
- (c) Define a class TravelPlan in C++ with the following descriptions : 4

Private Members:

PlanCode	of type long
Place	of type character array (string)
Number_of_travellers	of type integer
Number_of_buses	of type integer

Public Members:

A constructor to assign initial values of Plan Code as 1001, Place as “Agra”, Number_of_travellers as 5, Number_of_buses as 1

A function NewPlan() which allows user to enter PlanCode, Place and Number_of_travellers. Also, assign the value of Number_of_buses as per the following conditions :

Number_of_travellers	Number_of_buses
Less than 20	1
Equal to or more than 20 and less than 40	2
Equal to 40 or more than 40	3

A function ShowPlan() to display the content of all the data members on screen.

(d) Answer the questions (i) to (iv) based on the following code:

4

```
class Medicines
{
    char Category[10];
    char Date_of_manufacture[10];
    char Company[20];
public:
    Medicines();
    void entermedicinedetails();
    void showmedicinedetails();
} ;
class Capsules: public Medicines
{
protected:
    char capsule_name[30];
    char Volume_label[20];
public:
    float Price;
    Capsules();
    void entercapsuledetails();
    void showcapsuledetails();
};
class Antibiotics: public Capsule
{
    int Dosage_units;
    char Side_effects[20];
    int Use_within_days;
public:
    Antibiotics() ;
    void enterdetails();
    void showdetails();
};
```

(i) How many bytes will be required by an object of class Medicines and an object of class Antibiotics respectively?

- (ii) Write names of all the member functions accessible from the object of class Antibiotics.
- (iii) Write names of all the members accessible from member functions of class Capsules.
- (iv) Write names of all the data members, which are accessible from objects of class Antibiotics.
3. (a) Write a function in C++ which accepts an integer array and its size as arguments/parameters and exchanges the values of first half side elements with the second half side elements of the array. 3
- Example:
 If an array of eight elements has initial content as
 2,4,1,6,7,9,23,10
 The function should rearrange the array as
 7,9,23,10,2,4,1,6
- (b) An array Arr[15][35] is stored in the memory along the column with each of its elements occupying 8 bytes. Find out the base address and the address of an element Arr[2][5], if the location Arr[5][10] is stored at the address 4000. 4
- (c) Write a function in C++ to perform a PUSH operation in a dynamically allocated stack considering the following: 4
- ```

struct Node
{
 int X, Y;
 Node *Link;
};
class STACK
{
 Node *Top;
public:
 STACK() {Top=NULL;}
 void PUSH();
 void POP() ;
 ~STACK();
};

```
- (d) Write a function in C++ to print the sum of all the values which are either divisible by 2 or are divisible by 3 present in a two-dimensional array passed as the argument to the function. 3
- (e) Evaluate the following postfix notation of expression: 2
- 10 20 + 25 15 - \* 30 /

4. (a) Observe the program segment given below carefully, and answer the question that follows:

1

```
class Book
{
 int Book no;
 char Book_name[20];
public:
 //function to enter Book details
 void enterdetails();
 // function to display Book details
 void showdetails();
 //function to return Book_no
 int Rbook_no () {return Book_no;}
} ;
void Modify(Book NEW)
{
 fstream File;
 File.open("BOOK.DAT", ios::binary|ios::in|ios::out);
 Book OB;
 int Recordsread = 0, Found = 0;
 while (!Found && File.read((char*)&OB, sizeof (OB)))
 {
 Recordsread ++ ;
 if (NEW.RBook_no() == OB.RBook_no())
 {
 _____ //Missing Statement
 File.write((char*)&NEW, sizeof (NEW));
 Found = 1;
 }
 else
 File.write((char*)&OB, sizeof(OB));
 }
 if (! Found)
 cout<<" Record for modification does not exist";
 File.close();
}
```

If the function Modify() is supposed to modify a record in file BOOK.DAT with the values of Book NEW passed to its argument, write the appropriate statement for **Missing Statement** using seekp( ) or seekg( ), whichever needed, in the above code that would write the modified record at its proper place.

- (b) Write a function in C++ to count and display the number of lines starting with alphabet 'A' present in a text file "LINES.TXT".

2

Example:

If the file "LINES.TXT" contains the following lines,

A boy is playing there.

There is a playground.

An aeroplane is in the sky.

Alphabets and numbers are allowed in the password.

The function should display the output as 3

- (c) Given a binary file STUDENT.DAT, containing records of the following class Student type

3

```
class Student
{
 char S_Adjno[10]; //Admission number of student
 char S_Name[30]; //Name of student
 int Percentage; //Marks Percentage of student
public:
 void EnterData()
 {
 gets(S_Adjno); gets(S_Name); cin>>Percentage;
 }
 void DisplayData()
 {
 cout<<setw(12)<<S_Adjno;
 cout<<setw(32)<<S_Name;
 cout<<setw(3)<<Percentage<<endl;
 }
 int ReturnPercentage(){return Percentage;}
};
```

Write a function in C++, that would read contents of file STUDENT.DAT and display the details of those Students whose Percentage is above 75.

5. (a) What do you understand by the terms **Primary Key** and **Degree of a relation** in relational database?

2

- (b) Consider the following tables EMPLOYEES and EMPSALARY. Write SQL commands for the statements (i) to (iv) and give outputs for SQL queries (v) to (viii). 6

**EMPLOYEES**

| EMPID | FIRSTNAME | LASTNAME | ADDRESS           | CITY         |
|-------|-----------|----------|-------------------|--------------|
| 010   | George    | Smith    | 83 First Street   | Howard       |
| 105   | Mary      | Jones    | 842 Vine Ave.     | Losantiville |
| 152   | Sam       | Tones    | 33 Elm St.        | Paris        |
| 215   | Sarah     | Ackerman | 440 U.S. 110      | Upton        |
| 244   | Manila    | Sengupta | 24 Friends Street | New Delhi    |
| 300   | Robert    | Samuel   | 9 Fifth Cross     | Washington   |
| 335   | Henry     | Williams | 12 Moore Street   | Boston       |
| 400   | Rachel    | Lee      | 121 Harrison St.  | New York     |
| 441   | Peter     | Thompson | 11 Red Road       | Paris        |

**EMPSALARY**

| EMPID | SALARY | BENEFITS | DESIGNATION |
|-------|--------|----------|-------------|
| 010   | 75000  | 15000    | Manager     |
| 105   | 65000  | 15000    | Manager     |
| 152   | 80000  | 25000    | Director    |
| 215   | 75000  | 12500    | Manager     |
| 244   | 50000  | 12000    | Clerk       |
| 300   | 45000  | 10000    | Clerk       |
| 335   | 40000  | 10000    | Clerk       |
| 400   | 32000  | 7500     | Salesman    |
| 441   | 28000  | 7500     | Salesman    |

- (i) To display Firstname, Lastname, Address and City of all employees living in Paris from the table EMPLOYEES.
- (ii) To display the content of EMPLOYEES table in descending order of FIRSTNAME.
- (iii) To display the Firstname, Lastname, and Total Salary of all Managers from the tables EMPLOYEES and EMPSALARY, where Total Salary is calculated as Salary + Benefits.

(iv) To display the Maximum salary among Managers and Clerks from the table EMPLOYEE.

(v) `SELECT FIRSTNAME, SALARY  
FROM EMPLOYEES, EMPLOYEE  
WHERE DESIGNATION = 'Salesman' AND  
EMPLOYEES.EMPID=EMPLOYEE.EMPID;`

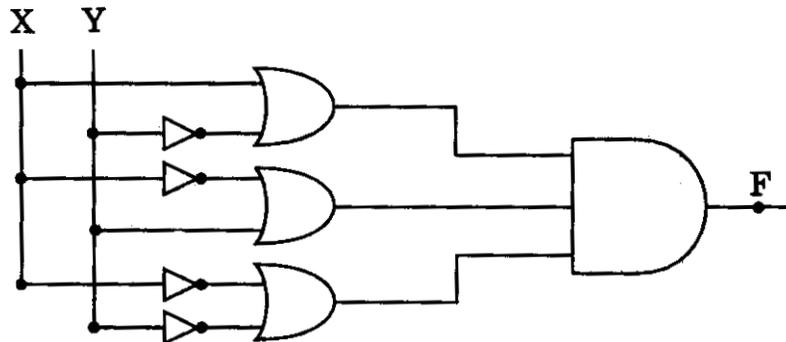
(vi) `SELECT COUNT (DISTINCT DESIGNATION)FROM EMPLOYEE;`

(vii) `SELECT DESIGNATION, SUM(SALARY)  
FROM EMPLOYEE  
GROUP BY DESIGNATION HAVING COUNT (*)>2;`

(viii) `SELECT SUM (BENEFITS)  
FROM EMPLOYEES  
WHERE DESIGNATION = 'Clerk';`

6. (a) State and verify Associative law in Boolean Algebra. 2

(b) Write the equivalent Boolean expression for the following Logic Circuit : 2



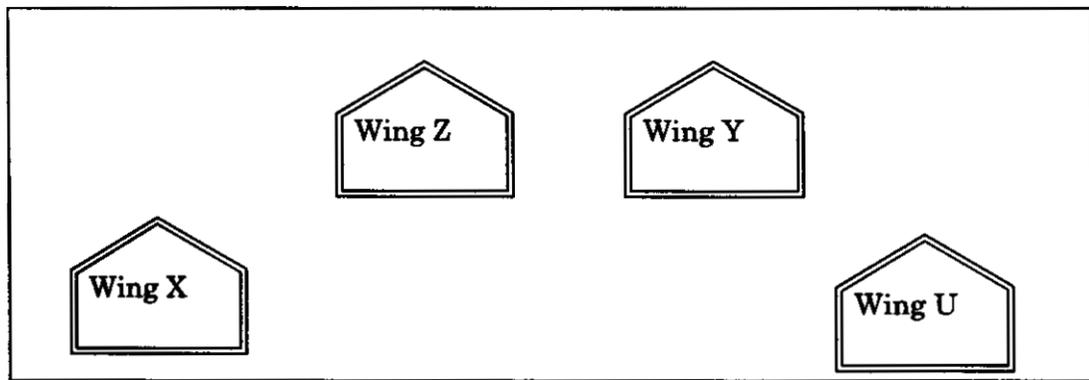
(c) Write the SOP form of a Boolean Function F, which is represented by the following truth table: 1

| A | B | C | F |
|---|---|---|---|
| 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 |

(d) Reduce the following Boolean expression using K - Map: 3

$$F(A, B, C, D) = \prod (0, 1, 2, 3, 4, 5, 10, 11, 15)$$

7. (a) What is the difference between Message Switching technique and Packet Switching technique? 1
- (b) Expand the following terminologies : 2
- (i) TCP/IP
  - (ii) XML
  - (iii) CDMA
  - (iv) WLL
- (c) Write two application of Cyber Law. 1
- (d) The Great Brain Organisation has set up its new Branch at Srinagar for its office and web based activities. It has 4 Wings of buildings as shown in the diagram :



Center to center distances between various blocks

|                  |      |
|------------------|------|
| Wing X to Wing Z | 50m  |
| Wing Z to Wing Y | 70m  |
| Wing Y to Wing X | 125m |
| Wing Y to Wing U | 80m  |
| Wing X to Wing U | 175m |
| Wing Z to Wing U | 90m  |

Number of Computers

|        |     |
|--------|-----|
| Wing X | 50  |
| Wing Z | 30  |
| Wing Y | 150 |
| Wing U | 15  |

- (i) Suggest a most suitable cable layout of connections between the Wings, and topology. 1

- (ii) Suggest the most suitable place (i.e. Wing) to house the server of this organisation with a suitable reason, with justification. 1
- (iii) Suggest the placement of the following devices with justification: 1
- (1) Repeater
  - (2) Hub/Switch
- (iv) The organization is planning to link its head office situated in Delhi with the offices at Srinagar. Suggest an economic way to connect it; the company is ready to compromise on the speed of connectivity. Justify your answer. 1