Roll No.
रोल नं.

Candidates must write the Code on the title page of the answer-book.

- 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.
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COMPUTER SCIENCE

Time allowed : 3 hours]   *[Maximum marks: 70*

***Instructions*:**   (1)   **All** *questions are compulsory.*

        (2)   *Programming Language : C++*

1.   (a)   Differentiate between a Run Time Error and Syntax Error. Also give suitable examples of each in C++.   2

       (b)   Name the header file(s) that shall be needed for successful compilation of the following C++ code   1

```
void main ( )
{
    char String [20];
    gets (String);
    strcat (String, "CBSE");
    puts (String);
}
```

       (c)   Rewrite the following program after removing the syntactical error(s) if any. Underline each correction.   2

```
# include <iostream.h>
```

```
const int Max 10;
void main ( )
{
    int Numbers [Max];
    Numbers = { 20, 50,10, 30,40 } ;
    for (Loc= Max-1 ; Loc > = 0 ; Loc - -)
        cout>>Numbers [Loc];
}
```

(d) Find the output of the following program :   2

```
# include < iostream.h>
void main ()
{
    intArray[] = {4,6,10,12};
    int *pointer = Array ;
    for (int I=1 ; I<=3 ; I++)
    {
        cout<<*pointer<<#";
        pointer ++;
    }
    cout<<endl;
    for (I=1 ; I<=4 ; I++)
    {
            (*pointer)*=3 ;
            -- pointer;
    }
    for(I=l; I<5; I + + )
        cout << Array [I-1] << "@";
    cout << endl;
}
```

(e) Find the output of the following program :   3

```
# include < iostream.h>
void Withdef (int HisNum = 30)
{
    for (int 1=20 ; I<*= HisNum; I+=5)
        cout<<I<<"";
        cout<<endl;
}
```

```
void Control (int &MyNum)
{
    MyNum+=10;
    Withdef(MyNum);
}
void main ()
{
    int YourNum=20;
    Control (YourNum);
    Withdef();
    cout<<"Number="<<YourNum<<endl;
}
```

(f) In the following C++ program what is the expected value of MyMarks from Options (i) to (iv) given below. Justify answer. 2

```
#include<stdlib.h >
#  include<iostream.h>
void main ()
{
    randomize ();
    int Marks [ ]= {99, 92, 94, 96, 93, 95}, MyMarks;
    MyMarks = Marks [1 + random (2) ];
    cout<<MyMarks<<endl;
}
```
(i)   99   **(ii) 94**

(iii) 96   **(iv) None of the above**

2. (a) Differentiate between Constructor and Destructor function in context of Classes and Objects using **C++** 2

(b) Answer the questions (i) and (ii) after going through the following class 2

```
class Maths
{
    char Chapter [20];
    int Marks;
public:
    Maths ( )                              //Member Function 1
```

```
        {
             strcpy (Chapter, "Geometry");
             Marks = 10;
             cout<<"Chapter  Initialised";
        {
        ~Math ( )                              //Member Function 2
        }
             cout<<"Chapter  Over";
        }
    };
```

(i)   Name the specific features of class shown by Member Function 1 and Member Function 2 in the above example.

(ii) How would Member Function 1 and Member Function 2 get executed?

(c)   Define a class Tour in C++ with the description given below :   3

Private Members :

TCode	of type string
NoofAdults	of type integer
NoofKids	of type integer
Kilometres	of type integer
TotalFare	of type float

Public Members :

- A constructor to assign initial values as follows :

    TCode with the word "NULL"
    NoofAdults as 0
    NoofKids as 0
    Kilometres as 0
    TotalFare as 0

- A function AssignFare ( ) which calculates and assigns the value of the data member TotalFare as follows

    For **each** Adult

Fare(Rs)	For Kilometres
500	>=1000
300	<1000 &>=500
200	<500

    For **each** Kid the above Fare will be 50% of the Fare mentioned in the above table

For example :

If Kilometres is 850, NoofAdults = 2 and NoofKids = 3

Then TotalFare should be calculated as

NumofAdults * 300 + NoofKids * 150

i.e.   2*300 + 3*150=1050

- A function EnterTour( ) to input the values of the data members TCode, NoofAdults, NoofKids and Kilometres; and invoke the AssignFare( ) function.

- A function ShowTour( ) which displays the content of all the data members for a Tour.

(d) Answer the questions (i) to (iv) based on the following code : 4

```
class Trainer
{
    char TNo [5], TName [20], Specialisation [10];
    int Days;
protected :
    float Remuneration;
    void AssignRem (float);
public :
    Trainer ( ) ;
    void TEntry ( );
    void TDisplay ( );
};
class Learner
{
    char Regno [10], LName [20], Program [10];
Protected :
    int Attendance, Grade;
public:
    Learner ( );
    void LEntry ( );
    void LDisplay ( );
};
class Institute : public Learner, public Trainer
{
```

```
    char ICode[10], IName [20];
public:
    Institute ( );
    void IEntry ( );
    void IDisplay ( );
};
```

(i) Which type of Inheritance is depicted by the above example?

(ii) Identify the member function(s) that cannot be called directly from the objects of class Institute from the following

TEntry( )

LDisplay()

IEntry()

(iii) Write name of all the member(s) accessible from member functions of class Institute.

(iv) If class Institute was derived privately from class Learner and privately from class Trainer, then, name the member function(s) that could be accessed through Objects of class Institute.

3. (a) Write a function in C++ which accepts an integer array and its size as arguments and replaces elements having odd values with thrice its value and elements having even values with twice its value.

Example : if an array of five elements initially contains the elements as

3, 4, 5, 16, 9

then the function should rearrange the content of the array as

9, 8, 15, 32, 27   4

(b) An array Array[20][15] is stored in the memory along the column with each element occupying 8 bytes. Find out the Base Address and address of the element Array[2][3] if the element Array [4] [5] is stored at the address 1000.   4

(c) Write a function in C++ to delete a node containing Book's information, from a dynamically allocated Stack of Books implemented with the help of the following structure.   4

```
    struct Book
    }
        int BNo;
        char BName[20];
        Book *Next;
    };
```

(d) Write a function in C++ which accepts a 2D array of integers and its size as arguments and displays the elements which lie on diagonals. 2

[Assuming the 2D Array to be a square matrix with odd dimension

i.e.   3×3, 5×5, 7×7 etc.]

Example, if the array content is

5 4 3

6 7 8

1 2 9

Output through the function should be :

Diagonal One : 5 7 9

Diagonal Two : 3 7 1

(e) Evaluate the following postfix notation of expression : 2

25   8   3   -   /   6   *   10   +

4. (a) Observe the program segment given below carefully, and answer the question that follows: 1

```
class PracFile
{
    intPracno;
    char PracName[20];
    int TimeTaken;
    int Marks;
public:
            // function to enter PracFile details
    void EnterPrac( );
            // function to display PracFile details
    void ShowPrac( ):
            // function to return TimeTaken
    int RTime() {return TimeTaken;}
            // function to assign Marks
    void Assignmarks (int M)
    {   Marks = M;}
};
void AllocateMarks( )
{   fstream File;
```

```
        File.open("MARKS.DAT",ios::binary|ios::in|ios::out);
        PracFile P;
        int Record = 0;
        while (File.read(( char*) &P, sizeof(P)))
        {
        if(P.RTime()>50)
            P.Assignmarks(0)
        else
            P.Assignmarks(10)
        _____        //statement 1
        _____        //statement 2
        Record + + ;
        }
        File.close();
    }
```

If the function AllocateMarks () is supposed to Allocate Marks for the records in the file MARKS.DAT based on their value of the member TimeTaken. Write C++ statements for the **statement 1** and **statement 2,** where, **statement 1** is required to position the file write pointer to an appropriate place in the file and **statement 2** is to perform the write operation with the modified record.

(b) Write afunction in C++ to print the count of the word is as an independent word in at text file DIALOGUE.TXT.   2

For example, if the content of the file DIALOGUE. TXT is

    This is his book. Is this book good?

Then the output of the program should be 2.

(c) Given a binary file GAME.DAT, containing records of the following structure type   3

```
    struct Game
    {
        char GameName [20];
        char Participant [10] [30];
    };
```

Write a function in C++ that would read contents from the file GAME.DAT and creates a file named BASKET.DAT copying only those records from GAME.DAT where the game name is "Basket Ball"

5. (a) Differentiate between primary key and alternate key.   2

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

TABLE:SENDER

SenderlD	SenderName	SenderAddress	SenderCiry
ND01	R Jain	2, ABC Appts	New Delhi
MU02	H Sinha	12, Newtown	Mumbai
MU15	S Jha	27/A, Park Street	Mumbai
ND50	T Prasad	122-K, SDA	New Delhi

TABLE : RECIPIENT

| RecID	SenderlD	RecName	RecAddress	RecCiry
KO05	ND01	R Bajpayee	5, Central Avenue	Kolkata
ND08	MU02	S Mahajan	116, A Vihar	New Delhi
MU19	ND01	H Singh	2A, Andheri East	Mumbai
MU32	MU15	P K Swamy	B5, C S Terminus	Mumbai
ND48	ND50	S Tripathi	13, B1 D, Mayur Vihar	New Delhi

(i) To display the names of all Senders from Mumbai

(ii) To display the RecID), SenderName, SenderAddress, RecName, RecAddress for every Recipient

(iii) To display Recipient details in ascending order of RecName

(iv) To display number of Recipients from each city

(v) SELECT DISTINCT SenderCity FROM Sender;

(vi) SELECT A. SenderName, B.RecName
FROM Sender A, Recipient B
WHERE A. SenderID = B.SenderlD AND B.RecCity = 'Mumbai';

(vii) SELECT RecName, RecAddress
FROM Recipient
WHERE RecCity NOT IN ('Mumbai', 'Kolkata');

(viii) SELECT RecID, RecName
FROM Recipient
WHERE SenderID='MU02' ORSenderID='ND50';

6. (a) State Distributive law and verify the same using truth table. 2

(b) Write the equivalent Canonical Sum of Product expression for the following Product of Sum Expression 2

$$F(X,Y,Z) = \pi\ (1,3,6,7)$$

(c) Write the equivalent Boolean Expression for the following Logic Circuit. 2
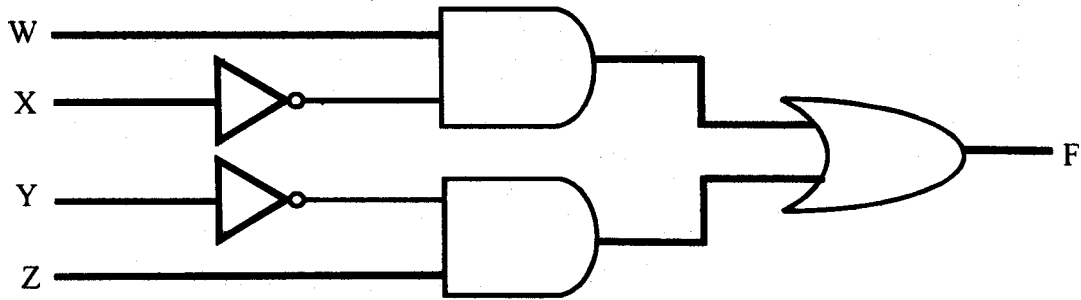
(d) Reduce the following Boolean expression using K-Map 2

$$F(U,V,W,Z) = \Sigma\ (0, 1, 2, 3, 4, 10, 11)$$

7. (a) What is the significance of Cyber law ? 1

(b) Expand the following terms with respect to Networking : 2

   (i)   CDMA   (iii) FTP

    (ii)   WLL   (iv) HTML

(c) Which of the following unit measures the speed with which data can be transmitted from one node to another node of a network? Also, give the expansion of the suggested unit. 1

    (i)   Mbps

    (ii)   KMph

    (iii) MGps

(d) "Bhartiya Connectivity Association" is planning to spread their offices in four major cities in India to provide regional IT infrastructure support in the field of Education & Culture. The company has planned to setup their head office in New Delhi in three locations and have named their New Delhi offices as "Front Office", "Back Office" and "Work Office". The company has three more regional offices as "South Office", "East Office" and "West Office" located in other three major cities of India. A rough layout of the same is as follows : 4
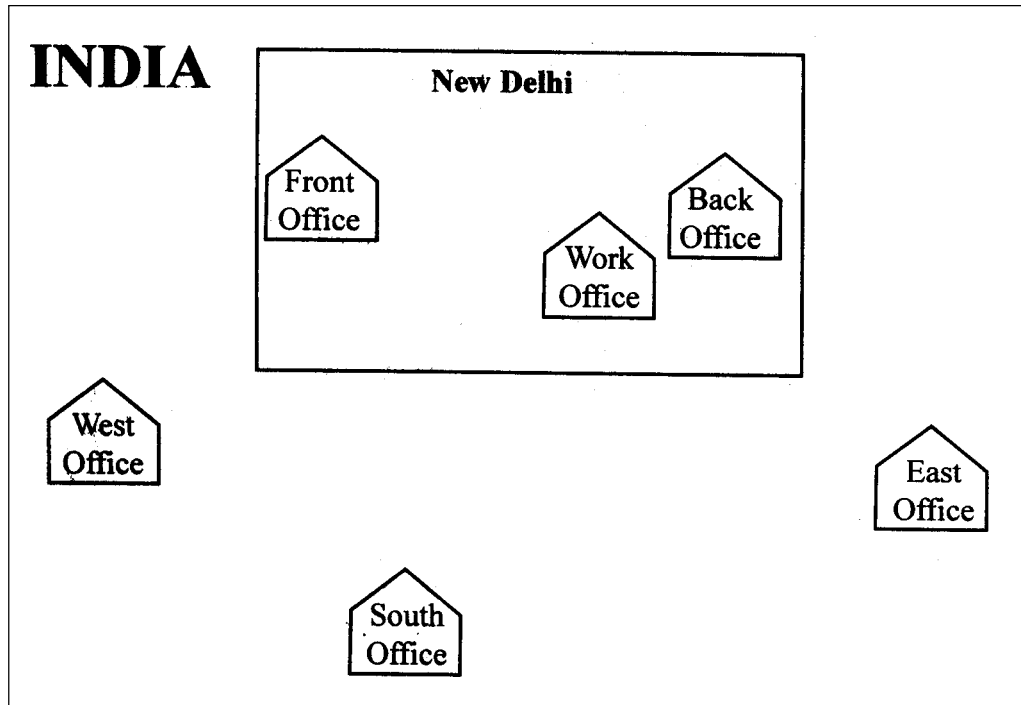
Approximate distances between these offices as per network survey team is as follows:

Place From	Place To	Distance
BackOffice	Front Office	10KM
Back Office	Work Office	70 Meter
Back Office	East Office	1291 KM
BackOffice	West Office	790 KM
Back Office	South Office	1952 KM

In continuation of the above, the company experts have planned to install the following number of computers in each of their offices :

Back Office	100
Front Office	20
Work Office	50
East Office	50
West Office	50
South Office	50

(i) Suggest network type (out of LAN, MAN, WAN) for connecting each of the following set of their offices :

- Back Office and Work Office
- Back Office and South Office

(ii) Which device you will suggest to be procured by the company for connecting all the computers with in each of their offices out of the following devices?

- Switch/Hub
- Modem
- Telephone

(iii) Which of the following communication medium, you will suggest to be procured by the company for connecting their local offices in New Delhi for very effective and fast communication?

- Telephone Cable
- Optical Fiber
- Ethernet Cable

(iv) Suggest a cable/wiring layout for connecting the company's local offices located in New Delhi. Also, suggest an effective method/technology for connecting the company's regional offices-"East Office", "West Office" and "South Office" with offices located in New Delhi.