COMPUTER SCIENCE

Time allowed : 3 hours   *Maximum Marks : 70*

> ***Instructions:***
>
> *(i)*   **All** *questions are compulsory.*
>
> *(ii)* *Programming Language: C++*

QUESTION PAPER CODE 91/1

1. (a) What is the difference between automatic type conversion and type casting? Also, give a suitable C++ code to illustrate both.   **2**

    (b) Which C++ header file(s) will be essentially required to be included to run/ execute the following C++ code?   **1**

```
void main( )
{
    int Eno=123, char Ename[ ]="Rehan Swamp";
    cout<<setw(5)<<Eno<<setw(25)<<EName<<endl;
}
```

    (c) Rewrite the following c++ program code after removing the syntax error(s) (if any). Underline each correction.   **2**

```
include  <iostream.h>
class  TRAIN
{
    long  TrainNo;
    char  Description[25];
public
    void Entry ( )
    {
```

```
        cin >>TrainNo; gets(Description);

    }

    Void Display ( )

    {

        cout<<TrainNo<<":"<<Description<<endl;

    }

};

void main( )

{

    TRAIN T;

    Entry. T( ); Display. T( );

}
```

(d) Find the output of the following program : **3**

```
#include <iostream.h>

struct POINT

{int X, Y, Z;};

void StepIn(POINT & P, int Step=1)

{

    P.X+=Step;

    P.Y -=Step;

    P.Z+=Step;

}

void StepOut(POINT & P, int Step=1)

{

P.X-=Step;

P.Y+=Step;

P.Z-=Step;
```

```
    }

void main ( )

{

    POINT P1={15, 25, 5}, P2={10, 30, 20};

    StepIn(P1);

    StepOut(P2,4);

    cout<<P1.X<<","<<P1.Y<<","<<P1.Z<<endl;

    cout<<P2.X<<","<<P2.Y<<","<<P2.Z<<endl;

    StepIn(P2,12);

    cout<<P2.X<<","<<P2.Y<<","<<P2.Z<<endl;

}
```

(e)   Find the output of the following program :   **2**

```
#include  <iostream.h>

#include  <ctype.h>

void ChangeIt(char Text[ ], char C)

{

    for  (int  K=0;Text[K]!='\0';K++)

    {

        if  (Text[K]>='F'  &&  Text[K]<='L')

            Text[K]=tolower(Text[K]);

        else

        if  (Text[K]='E'  ||  Text[K]=='e')

            Text[K]=  =C;

        else

        if  (K%2==O)

            Text[K]=toupper(Text[K]);

        else
```

```
                    Text[K]=Text[K-l];

        }

    }

    void main ( )

    {

        char  OldText[  ]="pOwERALone";

        ChangeIt(OldText,'%');

        cout<<"New  TEXT:"<<OldText<<endl;

    }
```

(f)   The following code is from a game, which generates a set of 4 random numbers. Yallav is playing this game, help him to identify the correct option(s) out of the four choices given below as the possible set of such numbers generated from the program code so that he wins the game. Justify your answer.   2

```
#include  <iostream.h>

#include  <stdlib.h>

const  int  LOW=15;

void main ( )

{

    randomize( ) ;

    int  POINT=5,  Number;

    for  (int  1=1;I<=4;I++)

    {

        Number=LOW+random(POINT)  ;

        cout<<Number<<":"  ;

        POINT--;

    }

}
```

```
(i)   19:16:15:18:

(ii)  14:18:15:16:

(iii) 19:16:14:18:

(iv)  19:16:15:16:
```

2. (a) What do you understand by Polymorphism.? Also, give an example in C++
        to illustrate the same.   .   **2**

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

```cpp
class TEST
{
    int Regno, Max, Min, Score;
public:
    TEST()                                  //Function 1
    {
        Regno= 101;Max=100;Min=40;Score=75;
    }
    TEST(int Pregno,int Pscore)       //Function 2
    {
        Regno=Pregno;Max=100;Min=40;Score=Pscore;
    }
    ~TEST()                                 //Function 3
    {
        cout<<"TEST Over"<<endl;
    }
    void Display()                          //Function 4
    {
    cout<<Regno<<":"<<Max<<":"<<Min<<endl;
    cout<<"[Score]"<<Score<<endl;
    }
};
```

(i) As per Object Oriented Programming, which. concept is illustrated by **Function 1 and Function 2** together?

(ii) What is **Function 3** specifically referred as ? When do you think, **Function 3** will be invoked/called?

(c) Define a class ITEM in C++ with following description: **4**

Private Members

- Code of type integer (Item Code)

- Iname of type string (Item Name)

- Price of type float (Price of each item)

- Qty of type integer (Quantity of item in stock)

- Offer of type float (Offer percentage on the item)

- A member function GetOffer() to calculate Offer percentage as per the following rule:

  If Qty<=50   Offer is 0

  If 50<Qty<=100   Offer is 5

  If Qty>100   Offer is 10

Public Members

- A function GetStock() to allow user to enter values for Code, Iname, Price, Qty and call function GetOffer() to calculate the offer

- A function ShowItem() to allow user to view the content of all the data members

(d) Answer the questions (i) to (iv) based on the following: **4**
class Chairperson

```
{
    long CID;        //Chairperson Identification Number
    char CName[20];
protected:
    char Description [40];
    void Allocate();
```

```cpp
    public:
        Chairperson();

        void Assign();

        void Show();

    };

    class Director

    {

        int DID;                  //Director ID

        char Dname[20];

    protected:

        char Profile[30];

    public:

        Director();

        void Input();

        void output();

    };

    class Company: private Chairperson, public Director

    {

        int CID;            //Company ID

        char City[20], Country[20];

    public:

        Company();

        void Enter();

        void Display();

    };
```

(i)   Which type of inheritance out of the following is specifically is illustrated in
      the above C++ code?

(a) Single Level Inheritance

(b) Multi Level Inheritance

(c) Multiple Inheritance

(ii) Write the names of data members, which are accessible by objects of class type Company.

(iii) Write the names of all member functions, which are accessible by objects of class type Company.

(iv) Write the names of all members, which are accessible from member functions of class Director.

3. (a) Write a function CHANGEO in C++, which accepts an array of integer and its size as parameters and divide all those array elements by 7 which are divisible by 7 and multiply other-array elements by 3. **3**

Sample Input Data of the array

A[0]	A[1]	A[2]	A[3]	A[4]
21	12	35	42	18

Content of the array after Calling CHANGE() function

A[0]	A[1]	A[2]	A[3]	A[4]
3	36	5	6	54

(b) An array P[50][60] is stored in the memory along the column with each of the element occupying 2 bytes, find out the memory location for the element P[10][20], if the Base Address of the array is 6800. **3**

(c) Write a complete program in c++ to implement a dynamically allocated Stack containing names of Countries. **4**

(d) Write a function int SKIPSUM(int A[ ] [3], int N,int M) in C++ to find and return the sum of elements from all alternate elements of a two-dimensional array starting from A[0][0]. **2**

Hint:

If the following is the content of the array

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A[0][0]	A[0][1]	A[0][2]
4	5	1
A[1][0]	A[1][1]	A[1][2]
2	8	7
A[2][0]	A[2][1]	A[2][2]
9	6	3

The function SKIPSUM() should add elements A[0][0], A[0][2], A[1][l],
A[2][0] and A[2][2].

(e) Evaluate the following postfix notation of expression: **2**
     (Show status of Stack after each operation)

     False, True, NOT, OR, True, False, AND, OR

4. (a) Observe the program segment given below carefully and fill the blanks mar-
         ked as Statement 1 and Statement 2 using tellg() and seekp() functions for
         performing the required task. **1**

```
#include  <fstream.h>

class Client

{

    long Cno; char Name[20], Email[30] ;

public:

    //Function to allow user to enter the Cno, Name,
    Email
    void Enter() ;

    //Function to allow user to enter (modify) Email
    void Modify() ;

    long ReturnCno() {return Cno;}

};

void ChangeEmail()

{   Client C;

    fstream F;
```

```
        F.open ("INFO.DAT",ios::binary|ios::in|ios::out);

        long Cnoc;//Client's no. whose Email needs to be
        changed

        cin>>Cnoc;

        while (F.read((char*)&C, sizeof(C)))

        {

            if (Cnoc= =C.ReturnCno())

            {

                C.Modify();

                                        //Statement 1

                int Pos =  _____//To find the current
                            position of file pointer

                                        // Statement 2

                _____//To move the file
                                pointer to write the

                                //modified record

                                back onto the file

                                //for the desired Cnoc

            F.write((char*)&C, sizeof(C));

            }

        }

        F.close();

    }
```

(b) Write a function in C++ to count the words "this" and "these" present in a text file "ARTICLE.TXT".   **2**

[Note that the words "this" and "these" are complete words]

(c) Write a function in C++ to search and display details of all flights, whose destination is "Mumbai" from a binary file "FLIGHT.DAT". Assuming the binary file is containing the objects of the following class.   **3**

```
class FLIGHT
{
    int Fno;                //Flight Number
    char From[20];          //Flight Starting Point
    char To[20];            //Flight Destination
public:
    char* GetFrom() {return From;}
    char* GetTo() {return To;}
    void Enter() {cin>>Fno;gets(From);gets(To);}
    void Display(){cout<<Fno<<":"<<From<<":"<<To<<endl;}
};
```

5. (a) What do you understand by Candidate Keys in a table? Give a suitable
         example of Candidate Keys from a table containing some meaningful data.   **2**

    (b) Consider the following tables STORE and SUPPLIERS
         and answer (bl) and (b2) parts of this question:

Table: STORE

ItemNo	Item	Scode	Qty	Rate	LastBuy
2005	Sharpener Classic	23	60	8	31-Jun-09
2003	Ball Pen 0.25	22	50	25	01-Feb-10
2002	Gel Pen Premium	21	150	12	24-Feb-10
2006	Gel Pen Classic	21	250	20	11-Mar-09
2001	Eraser Small	22	220	6	19-Jan-09
2004	Eraser Big	22	110	8	02-Dec-09
2009	Ball Pen 0.5	21	180	18	03-Nov-09

Table: SUPPLIERS

Scode	Sname
21	Premium Stationers
23	Soft Plastics
22	Tetra Supply

(b1) Write SQL commands for the following statements: **4**

   (i)   To display details of all the items in the Store table in ascending order of LastBuy.

   (ii)   To display ItemNo and Item name of those items from Store table whose Rate is more than 15 Rupees.

   (iii) To display the details of those items whose Supplier code (Scode) is 22 or Quantity in Store (Qty) is more than 110 from the table Store.

   (iv)   To display Minimum Rate of items for each Supplier individually as per Scode from the table Store.

(b2) Give the output of the following SQL queries: **2**

   (i)   SELECT COUNT(DISTINCT Scode) FROM Store;

   (ii)   SELECT Rate*Qty FROM Store WHERE ItemNo=2004;

   (iii) SELECT Item,Sname FROM Store S, Suppliers P

          WHERE S.Scode=P.Scode AND ItemNo=2006;

   (iv)   SELECT MAX(LastBuy) FROM Store;

6. (a) Verify the following algebraically.   **2**

    $(A'+B').(A+B)=A'.B+A.B'$

    (b) Write the equivalent Boolean Expression for the following Logic circuit: **2**
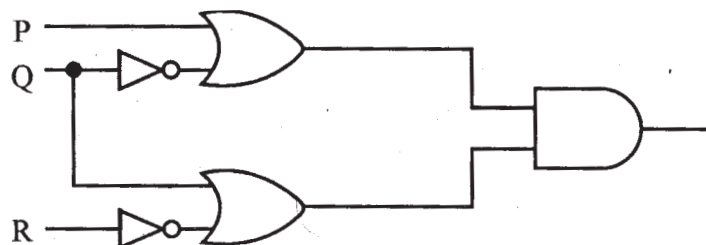
(c) Write the POS form of a Boolean function H, which is represented in a truth table as follows: **1**

X	Y	Z	H
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

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

F (U, V, W, Z) = Σ (3, 5, 7, 10, 11, 13, 15)

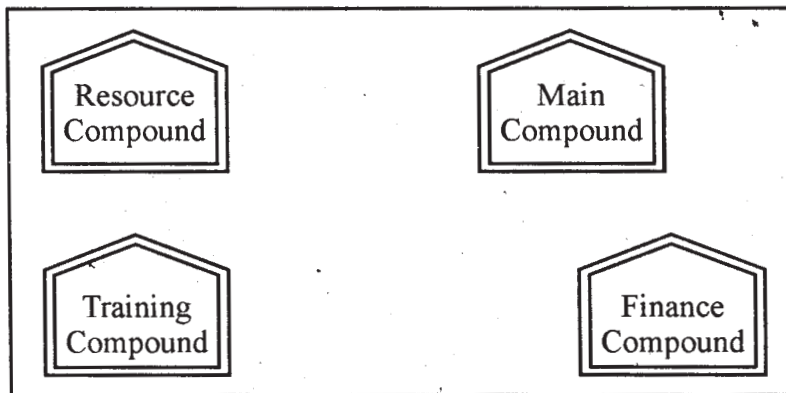7. (a) What was the role of ARPANET in the Computer Network? **1**

(b) Which of the following is not an unit for data transfer rate? **1**

(i) bps

(ii) abps

(iii) gbps

(iv) kbps

(c) What is the difference between Trojan Horse and Virus in terms of computers? **1**

(d) What term we use for a software/hardware device, which is used to block, unauthorized access while permitting authorized communications. This term is also used for a device or set of devices configured to permit, deny, encrypt, decrypt, or proxy all (in and out) computer traffic between different security domains based upon a set of rules and other criteria. **1**

(e) "Learn Together" is an educational NGO. It is setting up its new campus at Jabalpur for its webbased activities. The campus has 4 compounds as shown in the diagram below: **4**

Center to center distances between various Compounds as per architectural drawings (in Metre) is as follows :

Main Compound to Resource Compound	110 m
Main Compound to Training Compound	115 m
Main Compound to Finance Compound	35 m
Resource Compound to Training Compound	25 m
Resource Compound to Finance Compound	135 m
Training Compound to Finance Compound	100 m

Expected Number of Computers in each Compound is as follows :

Main Compound	5
Resource Compound	15
Training Compound	150
Accounts Compound	20

(e1) Suggest a cable layout of connections between the compounds.

(e2) Suggest the most suitable place (i.e. compound) to house the server for this NGO. Also, provide a suitable reason for your suggestion.

(e3) Suggest the placement of the following devices with justification :

   (i) Repeater

   (ii) Hub/Switch

  (e4) The NGO is planning to connect its International office situated in Mumbai, which out of the following wired communication link, you will suggest for a very high speed connectivity?

   (i) Telephone Analog Line

   (ii) Optical Fiber

   (iii) Ethernet Cable

 (f) Write the full forms of the following: **1**

  (f1) GNU

  (f2) XML

 (g) Write one advantage of each for Open Source Software and Proprietary Software.   **1**

QUESTION PAPER CODE 91

1. (a) What is the difference between call by value and call by reference? Also, give a suitable C++ code to illustrate both.   **2**

 (b) Which C++ header file(s) will be essentially required to be included to run/execute the following C++ code: **1**

```
void main()
{
    int Rno=24; char Name[] ="Amen Singhania";
    cout<<setw(lO)<<Rno<<setw(20)<<Name<<endl;
}
```

 (c) Rewrite the following C++ program code after removing the syntax error(s) (if any). Underline each correction.   **2**

```
include <iostream.h>
class FLIGHT
{
```

```
        long  FlightCode;

        char  Description[25];

    public

        void  AddInfo()

        {

            cin>>FlightCode;  gets  (Description)  ;

        {

        void  ShowInfo()

        (

            cout<<FlightCode<<":"<<Description<<endl;

        }

    }  ;

    void  main()

    {

        FLIGHT  F;

        AddInfo.F();  ShowInfo.F();

    }
```

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

```
#include  <iostream.h>

struct  THREE_D

{int  X,Y,Z;};

void  MoveIn(THREE_D  &T,  int  Step=1)

}

    T.X+=Step;

    T.Y-=Step;

    T.Z+=Step;
```

```
}

void MoveOut(THREE_D &T, int Step=l)

{

    T.X-=Step;

    T.Y+=Step;

    T.Z-=Step;

}

void main ()

{

    THREE_D  Tl={lO,20,5},T2={30,lO,40};

    MoveIn(T1);

    MoveOut(T2,5);

    cout<<Tl.X<<","<<Tl.Y<<","<<T1.Z<<endl;

    cout<<T2.X<<","<<T2.Y<<","<<T2.Z<<endl;

    MoveIn(T2,lO);

    cout<<T2.X<<","<<T2.y<<","<<T2.Z<<endl;

}
```

(e) Find. the output of the following program: 2

```
#include  <iostream.h>

#include  <ctype.h>

void MyCode (char Msg [], char CH)

{

    for (int  (Cnt=O;Msg[Cnt]!='\0';Cnt++)

    {

    if (Msg[Cnt]>='B'  && Msg[Cnt]<='G')

        Msg[Cnt]=tolower(Msg[Cnt]);
```

```
            else
                if (Msg[Cnt]=='A'|| Msg[Cnt]=='a')
                    Msg[Cnt]=CH;
            else
            if (Cnt%2==0)
                    Msg[Cnt]=toupper(Msg[Cnt]);
            else
                    Msg[Cnt]=Msg[Cnt-l];
    }
}
void main ()
{
    char MyText [] =" ApEACeDriVE";
    MyCode(MyText,'@');
    cout<<"NEW  TEXT:"<<MyText<<endl;
}
```

(f)   The following code is from a game, which generates a set of 4 random numbers. Praful is playing this game, help him to identify the correct option(s) out of the four choices given below as the possible set of such numbers generated from the program code so that he wins the game. Justify your answer.   2

```
#include <iostream.h>
#include <stdlib.h>
const int LOW=25;
void main ()
{
    randomize();
    int P01NT=5,Number;
    for (int I=1;I<=4;I++)
```

```
        {
            Number=LOW+random(POINT);

            Cout<<Number<<":";

            POINT--;

        }

    }
```

(i)   29:26:25:28:

(ii)   24:28:25:26:

(iii) 29:26:24:28:

(iv)   29:26:25:26:

2. (a) What do you understand by Data Encapsulation and Data Hiding ?' Also, give an example in C++ to illustrate both.   2

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

```
class Exam

{

    int Rno,MaxMarks,MinMarks,Marks;

public:

    Exam()                               //Module 1

    {

        Rno=101;MaxMarks=l00;MinMarks=40;Marks=75;

    }

    Exam(int Prno, int Pmarks)        //Module 2

    {

    Rno=Prno;MaxMarks=l00;MinMarks=40;Marks=Pmarks;

    }

    ~Exam()                              //Module 3
```

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```
        {
            cout<<"Exam  Over"<<endl;
        }
        void Show ()                            //Module 4
        {
            cout<<Rno<<":"<<MaxMarks<<":"<<MinMarks<<endl;
            cout<<"[Marks  Got]"<<Marks<<endl;
        }
    };
```

(i)   As per Object Oriented Programming, which concept is illustrated by
       Module 1 and **Module 2** together?

(ii)   What is **Module 3** referred as ? When do you think, **Module 3** will be
       invoked/called?

(c)   Define a class STOCK in C++ with following description: **4**

       Private Members

       ●   ICode of type integer (Item Code)

       ●   Item of type string (Item Name)

       ●   Price of type float (Price of each item)

       ●   Qty of type integer (Quantity in stock)

       ●   Discount of type float (Discount percentage on the item)

       ●   A member function FindDisc() to calculate discount as per the following
            rule:

            If Qty<=50   Discount is 0

            If 50<Qty<=100   Discount is 5

            If Qty>100   Discount is 10

       Public Members

       ●   A function Buy() to allow user to enter values for ICode, Item, Price,
            Qty and call function FindDisc() to calculate the Discount.

- A function ShowAll( ) to allow user to view the content of all the data members.

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

```
class  Director
{
    long DID;        //Director Identification Number
    char  Name[20];
protected:
    char  Description[40];
    void  Allocate();
public:
    Director();
    void  Assign();
    void  Show();
} ;
class  Ractory:public  Director
}
    int FID;      //Factory  ID
    char  Address[20];
protected:
    int  NOE;       //No. of Employees
public:
    Factory();
    void  Input();
    void  Output();
};
class  ShowRoom:private  Factory
```

```
{
    int SID;        //Showroom ID

    char City[20];

public:

    ShowRoom();

    void Enter();

    void Display();

};
```

(i)   Which type of inheritance out of the following is illustrated in the above C++ code?

(a)   Single Level Inheritance

(b)   Multi Level Inheritance

(c)   Multiple Inheritance

(ii) Write the names of data members, which are accessible by objects of class type ShowRoom.

(iii) Write the names of all member functions which are accessible by objects of class type ShowRoom.

(iv) Write the names of all members, which are accessible from member functions of class Factory.

3.   (a)   Write a function REASSIGNO in C++, which accepts an array of integers and its size as parameters and divide all those array elements by 5 which are divisible by 5 and multiply other array elements by 2.   3

Sample Input Data of the array

A[0]	A[1]	A[2]	A[3]	A[4]
20	12	15	60	32

Content of the array after calling REASSIGNO function

A[0]	A[1]	A[2]	A[3]	A[4]
4	24	3	12	64

(b) An array T[90][100] is stored in the memory along the column with each of the elements occupying 4 bytes. Find out the memory location for the element T[10][40], if the Base Address of the array is 7200.   3

(c) Write a complete program in C++ to implement a dynamically allocated Queue containing names of Cities.   4

(d) Write a function int ALTERSUM (int B[ ] [5], int N, int M in C++ to find and return the sum of elements from all alternate elements of a two-dimensional array starting from B[0][0].   2

Hint:

If the following is the content of the array

B[0][0]	B[0][1]	B[0][2]
4	5	1
B[1][0]	B[1][1]	B[1][2]
2	8	7
B[2][0]	B[2][1]	B[2][2]
9	6	3

The function should add elements B[0][0], B[0][2], B[1][1], B[2][0] and B[2][2].

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

(Show status of Stack after each operation)

True, False, NOT, OR, False, True, OR, AND

4. (a) Observe the program segment given below carefully and fill the blanks marked as Statement 1 and Statement 2 using tellg() and seekp() functions for performing the required task.   1

```
#include  <fstream.h>

class  Customer

{

    long  Cno;char  Name[20],Mobile[12];

public:
```

```cpp
    //Function to allow user to enter the Cno, Name,
    Mobile
void Enter();
    //Function to allow user to enter (modify) mobile
    number
void Modify();
    //Function to return value of Cno
    long GetCno () {return Cno;}
};
void ChangeMobile()
{
    Customer C;
    fstream F;
    F.open("CONTACT.DAT",ios::binary|ios::in|ios::out);
    long Cnoc; //Customer no. whose mobile number needs
    to be changed
    cin>>Cnoc;
    while (F.read((char*)& C,sizeof(C)))
    {
        if (Choc==C.GetCno())
        {
            C.Modify ();
                                    //Statement 1
            int Pos=_____//To find the current
                    position of file pointer
                                    //Statement 2
        _____//To move the file pointer to write the
            //modified record back onto the file
            //for the desired Cnoc
        F.write((char*)&C,  sizeof(C));
        }
    }
    F. close () ;
}
```

(b) Write a function in C++ to count the words "to" and "the" present in a text file "POEM.TXT". 2

[Note that the words "to" and "the" are complete words]

(c) Write a function in C++ to search and display details. of all trains, whose destination is "Delhi". from a binary file "TRAIN.DAT". Assuming the binary file is containing the objects of the following class. 3

```
class  TRAIN
{
    int  Tno;                       // Train Number
    char From[20];          // Train Starting Point
    char To [20];               // Train Destination
public:
    char*   GetFrom(){return  From;}
    char*   GetTo(){return  To;}
    void  Input(){cin>>Tno;gets(From);gets(To);}
    void  Show(){cout<<Tno<<":"<<From<<":"<<To<<endl;}
};
```

5. (a) What do you understand by Primary Key? Give a suitable example of Primary Key from a table containing some meaningful data. 2

(b) Consider the following tables STOCK and DEALERS and answer (b1) and (b2) parts of this question:

Table: STOCK

ItemNo	Item	Dcode	Qty	UnitPrice	StockDate
5005	Ball Pen 0.5	102	100	16	31-Mar-10
5003	Ball Pen 0.25	102	150	20	01-Jan-10
5002	Gel Pen Premium	101	125	14	14-Feb-10
5006	Gel Pen Classic	101	200	22	01-Jan-09
5001	Eraser Small	102	210	5	19-Mar-09
5004	Eraser Big	102	60	10	12-Dec-09
5009	Sharpener Classic	103	160	8	23-Jan-09

Table: DEALERS

Dcode	Dname
101	Reliable Stationers
103	Classic Plastics
102	Clear Deals

(b1) Write SQL commands for the following statements: 4

  (i) To display details of all Items in the Stock table in ascending order of StockDate.

  (ii) To display ItemNo and Item name of those items from Stock table whose UnitPrice is more than Rupees 10.

  (iii) To display the details of those items whose dealer code (Dcode) is 102 or Quantity in Stock (Qty) is more than 100 from the table Stock.

  (iv) To display Maximum UnitPrice of items for each dealer individually as per Dcode from the table Stock.

(b2) Give the output of the following SQL queries: 2

  (i) SELECT COUNT(DISTINCT Dcode) FROM Stock;

  (ii) SELECT Qty*UnitPrice FROM Stock WHERE ItemNo=5006;

  (iii) SELECT Item,Dname FROM Stock S, Dealers D
      WHERE S.Dcode=D.Dcode AND ItemNo=5004;

  (iv) SELECT MIN(StockDate) FROM Stock;

6. (a) Verify the following algebraically : 2

  X'.Y + X.Y' = (X'+Y').(X+Y)

  (b) Write the equivalent Boolean Expression for the following Logic Circuit: 2
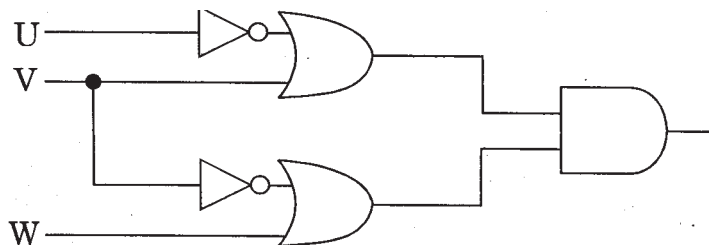
(c) Write the SOP form of a Boolean function G, which is represented in a truth table as follows: 1

P	Q	R	G
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

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

$F(A,B,C,D)= \Sigma(3,4,5,6,7,13,15)$

7. (a) What was the role of ARPANET in the Computer Network?   1

(b) Which of the following is not a unit for data transfer rate?   1

   (i)   mbps

   (ii) kbps

   (iii) sbps

   (iv) gbps

(c) What is the difference between Virus and Worms in the computers?   1

(d) What term do we use for a software/hardware device, which is used to block unauthorized access while permitting authorized communications? This term is also used for a device or set of devices configured to permit, deny, encrypt, decrypt, or proxy all (in and out) computer traffic between different security domains based upon a set of rules and other criteria.   1

(e) "Vidya for All" is an educational NGO. It is setting up its new campus at Jaipur for its web-based activities. The campus has four buildings as shown in the diagram below: 4

Center to center distances between various buildings as per architectural drawings (in meters) is as follows:

Main Building to Resource Building	120 m
Main Building to Training Building	40 m
Main Building to Accounts Building	135 m
Resource Building to Training Building	125 m
Resource Building to Accounts Building	45 m
Training Building to Accounts Building	110 m

Expected Number of Computers in each Building is as follows:

Main Building	15
Resource Building	25
Training Building	250
Accounts Building	10

(el)   Suggest a cable layout of connections between the buildings.

(e2)   Suggest the most suitable place (i.e. building) to house the server for this NGO. Also, provide a suitable reason for your suggestion.

(e3)   Suggest the placement of the following devices with justification:

(i)   Repeater

(ii)   Hub/Switch

(e4) The NGO is planning to connect its International office situated in Delhi. Which out of the following wired communication links, will you suggest for a very high speed connectivity ?

   (i)   Telephone Analog Line

   (ii) Optical Fiber

   (iii) Ethernet Cable

(f) Write the full forms of the following: 1

   (f1) FTP

   (f2) FSF

(g) Name any two common Web browsers.   1

Marking Scheme — Computer Science

QUESTION PAPER CODE 91/1
EXPECTED ANSWERS

1. (a) What is the difference between automatic type conversion and type casting?
   Also, give a suitable C++ code to illustrate both.   **2**

   Ans. Automatic Type Conversion: it is an implicit process of conversion of a data
   from one type to another. For example

   ```
   int N = 65;
   char C = N; // Automatic type conversion
   cout<<C;
   ```

   OUTPUT:

   A

   Type Casting: It is an explicit process of conversion of a data from one type
   to another. For example

```
int A=1, B=2;

float C = (float)A/B; //Type Casting

cout<<C;
```
OUTPUT:

0.5

(½ Mark for each correct explanation of Automatic Type Conversion and Type Casting)

(½ Mark for each correct example of Automatic Type Conversion and Type Casting)

OR

(Full 2 Marks for correct example(s) demonstrating the meaning of / difference between Automatic Type Conversion and Type Casting)

OR

(Only 1 Mack to be awarded if Explanation without supporting examples)

Note: Output is optional

(b)   Which C++ header file(s) will be essentially required to be included to run/execute the following C++ code?   **1**

```
void main( )
{
    int Eno=123, char Ename[ ]="Rehan Swamp";
    cout<<setw(5)<<Eno<<setw(25)<<EName<<endl;
}
```
Ans. (i) iostream.h   (ii) iomanip.h

OR

iomanip.h - (As iostream.h is included in iomanip.h)

(½ Mark for writing each correct header file)

OR

(Full 1 Mark for mentioning only iomanip.h)
Note: Ignore any other header files, if mentioned.

(c) Rewrite the following c++ program code after removing the syntax error(s) (if any). Underline each correction. **2**

```
include  <iostream.h>

class  TRAIN

{

    long  TrainNo;

    char  Description[25];

public

    void Entry ( )

    {

        cin  >>TrainNo;  gets(Description);

    }

    Void Display ( )

    {

        cout<<TrainNo<<":"<<Description<<endl;

    }

};

void main( )

{

    TRAIN T;

    Entry. T( ); Display. T( );

}
```

Ans. `#include<iostream.h>`

`#include<stdio.h>`

```
class  TRAIN

{

    long  TrainNo;
```

```
        char Description [25];

public:

    void Entry  ()

    {

        cin>>TrainNo; gets (Description);

    }

    void Display ()

    {

        cout<<TrainNo<<":"<<Description<<end1;

    }

};

void main ()

{

    TRAIN T;

    T.Entry();    T.Display();

}
```

(½ Mark for writing # before include<iostream.h>

(½ Mark for writing # include <stdio.h>

(½ Mark for writing: after public)

(½ Mark for writing T.Entry(); and T.Display(); correctly)

(d) Find the output of the following program :   **3**

```
#include  <iostream.h>

struct  POINT

{int X, Y, Z;};

void StepIn(POINT & P, int Step=1)

{
```

```
        P.X+=Step;

        P.Y-=Step;

        P.Z+=Step;

    }

    void StepOut(POINT & P, int Step=1)

    {

        P.X-=Step;

        P.Y+=Step;

        P.Z-=Step;

    }

    void main ( )

    {

        POINT P1={15, 25, 5}, P2={10, 30, 20};

        StepIn(P1);

        StepOut(P2,4);

        cout<<P1.X<<","<<P1.Y<<","<<P1.Z<<endl;

        cout<<P2.X<<","<<P2.Y<<","<<P2.Z<<endl;

        StepIn(P2,12);

        cout<<P2.X<<","<<P2.Y<<","<<P2.Z<<endl;

    }
```

Ans.   16, 24, 6

        6, 34, 16

        18, 22, 28

(1 Mark for each line with -correct values)

OR

(½ Mark for any two correct values in each line)

(e) Find the output of the following program :   **2**

```
#include  <iostream.h>

#include  <ctype.h>

void ChangeIt(char Text[ ], char C)

{

    for  (int  K=0;Text[K]!='\0';K++)

    {

        if  (Text[K]>='F'  &&  Text[K]<='L')

            Text[K]=tolower  (Text[K]);

        else

        if  (Text[K]='E'  ||  Text[K]=='e')

            Text[K]==C;

        else

        if  (K%2==O)

            Text[K]=toupper(Text[K]);

        else

            Text[K]=Text[K-l];

    }

}

void main ( )

{

    char  OldText[  ]="pOwERALone";

    ChangeIt(OldText,'%');

    cout<<"New  TEXT:"<<OldText<<endl;

}
```

Ans. New TEXT : PPW % RR11N%

(½ Mark for writing PPW as the first three characters)

(½ Mark for writing %RR as the next three characters)

(½ Mark for writing 11 as the next two characters)

(½ Mark for writing N% as the next two characters)

Note: Deduct X Mark for not mentioning New TEXT :

(f) The following code is from a game, which generates a set of 4 random numbers. Yallav is playing this game, help him to identify the correct option(s) out of the four choices given below as the possible set of such numbers generated from the program code so that he wins the game. Justify your answer. 2

```
#include  <iostream.h>
#include  <stdlib.h>
const  int  LOW=15;
void main ( )
{
    randomize( ) ;
    int  POINT=5, Number;
    for  (int  1=1;I<=4;I++)
    {
        Number=LOW+random(POINT)  ;
        cout<<Number<<":"  ;
        POINT--;
    }
}
(i)   19:16:15:18:
(ii)  14:18:15:16:
(iii) 19:16:14:18:
(iv)  19:16:15:16:
```

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Ans. (iv)   19:16:15:16:

Justification is as follows:

I	POINT	Number	
		Minimum	Maximum
1	5	15	19
2	4	15	18
3	3	15	17
4	2	15	16

The only option that satisfies these values is option (iv).

(1 Mark for mentioning correct option)

(1 Mark for any valid justification)

Note: Only ½ Mark to be given if only options (i) & (iv) are mentioned as correct options; no other combination of options is acceptable;

2. (a) What do you understand by Polymorphism? Also, give an example in C++ to illustrate the same.   **2**

Ans. The process of using an -operator or a function in different ways for different set of inputs given is known- as polymorphism. Function overloading is- an example of polymorphism, where the functions having same name with different set of parameters perform different operations.

Example:

```
void Disp ( )            //Function 1

{

    cout<<"Hello"<<endl;

}

void Disp(int N)        //Function 2

{

    for(int  I=1;I<=N;I++)

        cout<<I<<endl;

}
```

```
void Disp (int N,int M)   //Function 3

{

    for (int I=N;I<=M;  I++)

        cout<<N<<"x"<<I<<"="<<N*I<<endl;

}

void main ( )

{

    int x=5,  y=10;

    Disp(x);      //Function 2 called-Prints numbers from 1 to 5

    Disp(x,y) ; //Function 3 called- Prints from multiples of 5

                //ranging from 5 to 10

    Disp () ;   //Function 1 called- Prints Hello

  }
```

(1 Mark for correct explanation of Polymorphism)

(1 Mark for a valid example of Polymorphism)

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

```
class TEST

{

    int Regno, Max, Min, Score;

public:

    TEST()                            //Function 1

    {

        Regno=  101;Max=100;Min=40;Score=75;

    }

    TEST(int  Pregno,int  Pscore)     //Function 2

    {

        Regno=Pregno;Max=100;Min=40;Score=Pscore;

    }
```

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```
        ~TEST()                                //Function 3
        {
            cout<<"TEST Over"<<endl;
        }
        void Display()                         //Function 4
        {
        cout<<Regno<<":"<<Max<<":"<<Min<<endl;
        cout<<"[Score]"<<Score<<endl;
        }
    };
```

(i)   As per Object Oriented Programming, which. concept is illustrated by **Function 1 and Function 2** together?

Ans.   Polymorphism

    OR

Function Overloading

    OR

Constructor Overloading

(1 Mark for naming the concept correctly)

(ii)   What is **Function 3** specifically referred as ? When do you think, **Function 3** will be invoked/called?

Ans.   Destructor, invoked or called when scope of an Object gets over.

(½ Mark for naming Destructor correctly)

(½ Mark for mentioning correctly when it is invoked)

(c)   Define a class ITEM in C++ with following description: **4**

Private Members

●   Code of type integer (Item Code)

●   Iname of type string (Item Name)

●   Price of type float (Price of each item)

- Qty of type integer (Quantity of item in stock)

- Offer of type float (Offer percentage on the item)

- A member function GetOffer() to calculate Offer percentage as per the following rule:

  If Qty<=50   Offer is 0

  If 50<Qty<=100   Offer is 5

  If Qty>100   Offer is 10

Public Members

- A function GetStock() to allow user to enter values for Code, Iname, Price, Qty and call function GetOffer() to calculate the offer

- A function ShowItem() to allow user to view the content of all the data members

Ans. class ITEM

{

  int Code;

  char Iname [20] ;

  float Price;

  int Qty;

  float Offer;

  void GetOffer() ;

public:

  void GetStock ()

  {

    cin>>Code;

    gets (Iname) ; // OR cin.getline (Iname, 80) ;   OR cin>>Iname;

    cin>>Price>>Qty;

    GetOffer() ;

```
        }

        void ShowItern ( )

        {

                cout<<Code<<Iname<<Price<<Qty<<Offer;

        };

        void ITEM: : GetOffer ()

        {

                if (Qty<=50)

                        Offer = 0;

                else if (Qty <=100)

                        Offer = 5;   / /OR Offer = 0.05;

                else

                        Offer = 10;  / /OR Offer = 0.1;

         }
```

(½ Mark for correct syntax for class header)

(½ Mark for correct declaration of data members)

(1 Mark for correct definition of GetOffer())

(1 Mark for correct definition of GetStock () with proper invocation of GetOffer() function)

(1 Mark for correct definition of Showltem())

NOTE:

Deduct ½ Mark if GetOffer() is not invoked properly inside GetStock()function

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

```
class Chairperson

{

    long CID;        //Chairperson Identification Number

    char  CName[20];

protected:

    char Description [40];
```

```cpp
        void  Allocate();
public:
        Chairperson();
        void  Assign();
        void  Show();
};
class  Director
{
        int  DID;                //Director ID
        char  Dname[20];
protected:
        char  Profile[30];
public:
        Director();
        void  Input();
        void  output();
};
class  Company: private  Chairperson, public  Director
{
        int  CID;            //Company ID
        char  City[20],  Country[20];
public:
        Company();
        void  Enter();
        void  Display();
};
```

(i) Which type of inheritance out of the following is specifically is illustrated in the above C++ code?

    (a)   Single Level Inheritance

    (b)   Multi Level Inheritance

    (c)   Multiple Inheritance

Ans. (c)   Multiple Inheritance

    (1 Mark for writing correct inheritance type)

(ii) Write the names of data members, which are accessible by objects of class type Company.

Ans   None

    (1 Mark for writing None or No data members)

(iii) Write the names of all member functions, which are accessible by objects of class type Company.

Ans.   Enter(), Display(), Input(), output()

    (1 Mark for writing correct member functions)

    Note:

- *Both output( ) or Output( ) are acceptable as correct answer since differentiation between small and capital O is very difficult.*
- *No marks to be awarded for any other alternative answer*
- *Ignore mention of Constructor(s)*

(iv) Write the names of all members, which are accessible from member functions of class Director.

Ans.   Input(), output(), Profile, Dname, DID

    (1 Mark for writing correct members)

    Note:

- *Both output( ) or Output( ) are acceptable as correct answer since differentiation between small and capital O is very difficult.*
- *No marks to be awarded for any other alternative answer*
- *Ignore mention of Constructor(s)*

3.   (a)   Write a function CHANGEO in C++, which accepts an array of integer and its size as parameters and divide all those array elements by 7 which are divisible by 7 and multiply other-array elements by 3.   **3**

Sample Input Data of the array

A[0]	A[1]	A[2]	A[3]	A[4]
21	12	35	42	18

Content of the array after Calling CHANGE() function

A[0]	A[1]	A[2]	A[3]	A[4]
3	36	5	6	54

Ans.
```
void CHANGE (int A[ ], int N)
{
     for(int I = 0; I<N; I++)
     {
        if (A[I]%7 = = 0)
            A [I] = A [I] /7;
        else
            A[I] = A[I] * 3;
     }
}
```

            OR

Any other correct equivalent function definition

(½ Mark for correct Function Header)

(½ Mark for correct loop)

(½ Mark for correct checking of divisibility of array elements by 7)

(½ Mark for correct else OR correct checking of non divisibility of array elements by 7)

(½ Mark for each correct assignment)

(b)   An array P[50] [60] is stored in the memory along the column with each of the element occupying 2 bytes, find out the memory location for the element P[10] [20], if the Base Address of the array is 6800.   **3**

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```
Ans.Loc(P[I] [J])    = Base(P)+W(I+J*M)

    i Loc(P[10][20]) = Base(P)+ 2(10+20*50)

    Loc(P[10] [20])  = 68OO + 2(10+20*50)

                     = 6800 + 2 (10+1000)

                     = 6800 + 2*1010

                     = 6800 + 2020

                     = 8820

                       OR

    Address of P[i] [j] = BaseAddress + W((i-L1)+(j-L2)*M)

    Address of P[10] [20]= 6800 + 2((10-0)+(20-0)x50)

                     = 6800 + 2 x 1010

                     = 6800 + 2020

                     = 8820

                       OR

    Address of P[I] [J] along the column

                     = BaseAddress + W((I-LBR)+(J-LBC)*M)

      (where N is the number of rows, LBR = LBC = 1)

    Address of  P[10][20]=6800+2((10-1)+(20-l)x50)

                     = 6800 + 2 ( 9 + 19 x 50 )

                     = 6800 + 2 x 959

                     = 6800 + 1918

                     = 8718
```

(1 Mark for writing correct formula (for column major) OR substituting formula with correct values for calculating Address)

(2 marks for calculating correct address)

(c)   Write a complete program in c++ to implement a dynamically allocated Stack containing names of Countries.   **4**

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

      #include<stdio.h>

      struct Node

      {

          char Country [20] ;

          Node *Link;

      };

      class Stack

      {

          Node *Top;

      public:

          Stack() {Top = NULL;}

          void Push() ;

          void Pop() ;

          void Display() ;

          ~Stack () ;

      };

      void Stack::Push()

      {

          Node *Temp = new Node;

          gets(Temp -> Country);

          Temp -> Link = Top;

          Top = Temp;

      }

      void Stack::Pop()

      {

          if (Top !=NULL)
```

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```cpp
    {
        Node *Temp = Top;

        Top = Top -> Link;

        delete  Temp;

    }

    else

        cout<<"stack  Empty";

}

void  Stack::Display()

{

    Node  *Temp = Top;

    while  (Temp! = NULL)

    {

        cout<<Temp -> Country <<endl;

        Temp = Temp -> Link;

    }

}

Stack::~Stack ()

{

    while  (Top!=NULL)

    {

        NODE  *Temp=Top;

        Top=Top->Link;

        delete  Temp;

    }

}
```

```
void main ( )

{

    Stack ST; char Ch;

    do

    {

        cout<<"p/O/D/Q"  ;

        cin>>Ch;

        switch  (Ch)

        {

            case  'P'  :  ST.Push(); break;

            case  'O'  :ST.Pop();  break;

            case  'D'  :ST.Disp();

        }

    } while  (Ch!='Q');

}
```

(d) Write a function int SKIPSUM(int A[ ] [3], int N,int M) in C++ to find and return the sum of elements from all alternate elements of a two-dimensional array starting from A[0][0]. **2**

Hint:

If the following is the content of the array

A[0][0]	A[0][1]	A[0][2]
4	5	1
A[1][0]	A[1][1]	A[1][2]
2	8	7
A[2][0]	A[2][1]	A[2][2]
9	6	3

The function SKIPSUM() should add elements A[0][0], A[0][2], A[1][l],
A[2][0] and A[2][2].

Ans.
```
int SKIPSUM(int A[ ][ 3 ],   int N,int M)

    {

        int S=0:

        for(int I = 0; 1< N; 1++)

            for (int J = (I%2)?1:0; J<M; J = J+2)

                S = S + A [I][J];

        return  S;

    }

    OR

    int SKIPSlJM(int A[ ][3], int N, int M)

    {

        int S=0;

        for (int I = 0; 1< N; I++)

            for (int J = (I%2==0)? 0:1 ; J<M; J = J+2)

                S = S + A [I][J];

        return S;

    }

    OR

    int SKIPSUM(int A[][3], int N, int M)

    {

        int I,J, S=O;

        for (I = 0; 1 < N; 1++)

        {

            if (I%2)           //OR (1%2 !=0 ) OR (I%2 == 1)

                J = l;
```

```
            else

                J = 0;

            for (  ; J<M; J = J+2)

                S = S + A[I][J];

        }

        return S;

}

OR

int SKIPSUM(int A[][3], int N, int M)

{

        int S=0, C=0;

        for(int I = 0; 1< N; 1++)

                for (int J = 0; J<M; J++ )

                {

                        if (C%2 == 0)

                                S = S + A[I][J];

                        C++;

                }

        return S;

}

OR

int SKIPSUM(int A[][3], int N, int M)

{

        int S=0, C=l;

        for(int I = 0; I<N; I++)

                for (int J = 0; J<M; J++ )
```

```
        {
            if (C%2 != 0)

                S = S + A[I][J];

            C++;

        }

    return S;

}

OR

int SKIPSUM (int A[][3], int N, int M)

{

    int S=0;

    for(int I = 0; l< N; l++)

        for (int J = 0; J<M; J++ )

        {

            if ((I+J)%2 == 0)

                S = S + A[I][J];

        }

    return S;

}
```

OR

Any other correct equivalent function definition

(½ Mark for correct function header)

(½ Mark for each correct loop)

(½ Mark for checking alternate cells)

(½ Mark for finding Sum of elements)

(½ Mark for returning the Sum)

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

(Show status of Stack after each operation)

False, True, NOT, OR, True, False, AND, OR

Ans.

Element Scanned	Stack
False	False
True	False, True
NOT	False, False
OR	False
True	False, True
False	False, True, False
and	False, False
OR	False

RESULT = False

OR

Step 1: Push

False

Step 2: Push

True
False

Step 3: NOT

False

Pop
Op2=True
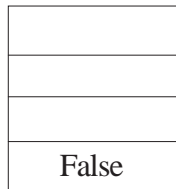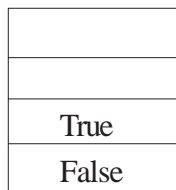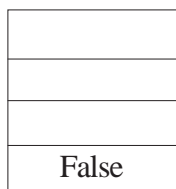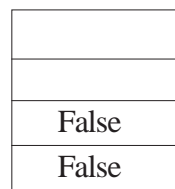
Push

False
False

Step 4 OR

False
False

Pop
Op2=False

False

Pop
Op1 =False
Op2=False

Push

False

Step 5: Push

True
False

Step 6: Push

False
True
False

Step 7: AND

True
False

Pop
Op2=False

False

Pop
Op1=False
Op2=False

Push

False
False

Step 8: OR

False

Pop
Op2=False

False

Pop
Op1=False
Op2=False

Push

False

Step 9: Pop

Result
False

OR

Any other method for evaluating the given postfix expression showing the Stack Status.

(½ Mark for correctly evaluating expression up to each operator
(1 Mark only to be given for writing correct answer without showing the Stack Status)

4. (a) Observe the program segment given below carefully and fill the blanks marked as Statement 1 and Statement 2 using tellg() and seekp() functions for performing the required task. **1**

```cpp
#include <fstream.h>

class Client

{

    long Cno; char Name[20], Email[30] ;

public:

    //Function to allow user to enter the Cno, Name,
    Email void Enter() ;

    //Function to allow user to enter (modify) Email
    void Modify() ;

    long ReturnCno() {return Cno;}

};

void ChangeEmail()

{   Client C;

    fstream F;

    F.open ("INFO.DAT",ios::binary|ios::in|ios::out);

    long Cnoc;//Client's no. whose Email needs to be
    changed cin>>Cnoc;

    while (F.read((char*)&C, sizeof(C)))

    {

        if (Cnoc==C.ReturnCno())

        {

            C.Modify();

                                    //Statement 1

            int Pos =  _____//To find the current
                       position of file pointer
```

```
                                         // Statement 2

                    _____//To move the file
                                      pointer to write the

                                      //modified record

                                      back onto the file

                                       //for the desired Cnoc

                F.write((char*)&C, sizeof(C));

            }

        }

        F.close();

}
```

Ans. Statement 1:

```
F. tellg ();
```

Statement 2:

```
F. seekp(Pos-sizeof(C)) ;
```

    OR

```
F.seekp(-sizeof(C), ios::cur);
```

    OR

Any equivalent correct method

(½ Mark for each correct statement)

(b)   Write a function in C++ to count the words "this" and "these" present in a text file "ARTICLE.TXT".   **2**

[Note that the words "this" and "these" are complete words]

Ans.
```
void COUNT ( )

{

    ifstream Fil;                      OR ifstream Fil("ARTICLE.TXT");

    Fil.open("ARTICLE.TXT");

    char Word [80]
```

```cpp
    int C1 = 0, C2 = 0

    while (!Fil.eop())

    {

        Fil>>Word;

        if (strcmp(Word,"this") ==0)

            C1++;

        else if (strcmp(Word,"these") ==0)

            C2++;

    }

    cout<<"Count of -this- in file:"<<C1;

    cout<<"Count of -these- in file:"<<C2;

    OR cout<<"Count of -this- and —these- -in file:"<<C1+C2;

    Fil.close(); //gnore

}

OR

void COUNT( )

{

if stream Fil("ARTICLE.TXT");          OR

char Word[80] ;                         ifstream Fil;

                                        Fil.open("ARTICLE. TXT") ;

int C = 0;

while(!Fil.eof())

{   Fil>>Word;

    if (strcmp(Word,"this")==0||strcmp(Word,"these") ==0)

        C++;

}

cout<<"Count of -this- and -these- in file:"<<C;

Fil.close(); //Ignore
```

```
}

OR

void COUNT( )

{

    ifstream Fil("ARTICLE.TXT");

    //OR fstream Fil;

    // Fil. open("ARTICLE. TXT", ios: : in);

    char STR[l0];

    int Cl=0, C2=0;

    while (Fil.getline (STR,l0, ''))

    {

        if (strcmp(STR,"this")==0)

            Cl++;

        else if (strcmp(STR,"these")==0)

            C2++;

    }

}
cout<<"Count of -this- in file:"<<Cl;
cout<<"Count of -these- in file:"<<C2;
Fil.close() ;//Ignore

}   OR cout<<"Count of -this- and -these- in file:"<<Cl+C2;

OR

void COUNT ( )

{

    ifstream Fil;
                                OR ifstreamFil("ARTICLE.TXT");
    Fil. open("ARTICLE.TXT");

    char Word[80] ,Ch;
```

```
    int Cl =0, C2 = 0, I=O;

    while(Fil.get(Ch))

    {

        if (Ch! = ' ')

            Word[I++] = Ch;

        else

        {

            Word[I] = '\0';

            if (strcmp (Word,"this")==0)

                Cl++;

            else if (strcmp(Word,"these")==0)

                C2++;

            I=0,

        }

    }

    cout<<"Count of -this- in file:" <<Cl;

    cout<<"Count of -these- in file:" <<C2;

    OR
    cout<<"Count of -this- and -these- in file: "<<Cl+C2;

    Fil.close(); //Ignore

}
```

OR

Any other correct function definition

(½ Mark for opening ARTICLE. TXT correctly)

(½ Mark for reading each word (Whichever method adopted) from the file)

(½ Mark for comparing the word with 'this' and 'these' and incrementing counter(s)

(½ Mark for displaying the individual count of 'this' and 'these' or the total count of 'this' and 'these' with/without the Text Message)

(c)   Write a function in C++ to search and display details of all flights, whose destination is "Mumbai" from a binary file "FLIGHT.DAT". Assuming the binary file is containing the objects of the following class.   **3**

```cpp
class FLIGHT
{
    int Fno;                 //Flight Number
    char From[20];           //Flight Starting Point
    char To[20];             //Flight Destination
public:
    char* GetFrom() {return From;}
    char* GetTo() {return To;}
    void Enter() {cin>>Fno;gets(From);gets(To);}
    void Display(){cout<<Fno<<":"<<From<<":"<<To<<endl;}
};
```

Ans.
```cpp
void Read ()
{
    FLIGHT F;
    ifstream fin;
    fin.open("FLIGHT.DAT", ios::binary) ;
```
┌──┐
│ OR ifstream fin ("FLIGHT. DAT", iC;s: :binary) ;   │
└──┘
```cpp
    while(fin.read((char*)&F, sizeof(F)))
    {
        if (strcmp(F. GetTo(),"Mumbai"))
                F.Display() ;
    }
    fin.close(); //Ignore
}
```

```
OR

void Read ()

{

    FLIGHT F;

    ifstream fin;

    fin" open ("FLIGHT. DAT", ios:: binary) ;
                    ┌──────────────────────────────────────────────┐
                    │ OR ifstream fin ("FLIGHT. DAT" , ios:: binary; │
                    └──────────────────────────────────────────────┘
    if (fin)

    {

    fin.read((char*)&F, sizeof (F));

    while(!fin.eof())

    {

        if (strcmp(F. GetTo(),"Mumbai"))

                F.Display();

        fin.read((char*)&F,sizeof(F))

    }

    fin.close(); //Ignore

}

OR
```

Any other correct function definition

(½ Mark for opening FLIGHT DAT correctly)

(½ Mark for reading each record from FLlGHT.DAT)

(½ Mark for correct loop / checking end of file)

(1 Mark for comparing value returned by GetTo() with "Mumbai"}

(½ Mark for displaying the matching record)

5.　(a)　What do you understand by Candidate Keys in a table? Give a suitable example of Candidate Keys from a table containing some meaningful data.　**2**

Ans. A table may have more than one such attribute/group of attribute that identifies a tuple uniquely, all such attribute(s) are known as Candidate Keys.

Table: Item

Ino	Item	Qty
I01	Pen	560
I02	Pencil	780
I04	CD	450
I09	Floppy	700
I05	Eraser	300
I03	Duster	200
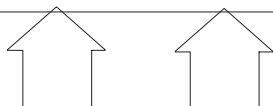
(1 Mark for writing correct definition of Candidate Key)

(1 Mark for giving suitable example)

(b) Consider the following tables STORE and SUPPLIERS

and answer (bl) and (b2) parts of this question:

Table: STORE

ItemNo	Item	Scode	Qty	Rate	LastBuy
2005	Sharpener Classic	23	60	8	31-Jun-09
2003	Ball Pen 0.25	22	50	25	01-Feb-10
2002	Gel Pen Premium	21	150	12	24-Feb-10
2006	Gel Pen Classic	21	250	20	11-Mar-09
2001	Eraser Small	22	220	6	19-Jan-09
2004	Eraser Big	22	110	8	02-Dec-09
2009	Ball Pen 0.5	21	180	18	03-Nov-09

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Table: SUPPLIERS

Scode	Sname
21	Premium Stationers
23	Soft Plastics
22	Tetra Supply

(b1) Write SQL commands for the following statements: **4**

(i) To display details of all the items in the Store table in ascending order of LastBuy.

Ans. SELECT * FROM STORE ORDER BY LastBuy;

(1 Mark for correct query)

(½ Mark for partially correct answer,

(ii) To display ItemNo and Item name of those items from Store table whose Rate is more than 15 Rupees.

Ans. SELECT ItemNo, Item..In FROM STORE WHERE Rate >15;

(1 Mark for correct query)

(½ Mark for partially correct answer,

(iii) To display the details of those items whose Supplier code (Scode) is 22 or Quantity in Store (Qty) is more than 110 from the table Store.

Ans. SELECT * FROM STORE WHERE Scode = 22 OR Qty >110;

(1 Mark for correct query)

(½ Mark for partially correct answer,

(iv) To display Minimum Rate of items for each Supplier individually as per Scode from the table Store.

Ans. SELECT Scode, MIN(Rate) FROM STORE GROUP BY Scode;

(1 Mark for correct query)

(½ Mark for partially correct answer,

(b2) Give the output of the following SQL queries: **2**

Note: In all output Questions ignore Column Headings

(i)   SELECT COUNT(DISTINCT Scode) FROM Store;

Ans.   COUNT(DISTINCT Scode)

     (½ Mark for correct Output)

(ii)   SELECT Rate*Qty FROM Store WHERE ItemNo=2004;

Ans.   RATE*QTY

      880

     (½ Mark for correct Output)

(iii)   SELECT Item,Sname FROM Store S, Suppliers P WHERE
        S.Scode=P.Scode AND ItemNo=2006;

Ans.   ITEM   SNAME

     Gel Pen Classic   Premium Stationers

     (½ Mark for correct Output)

(iv)   SELECT MAX(LastBuy) FROM Store;

Ans.   MAX (LASTBUY)

      24-Feb-10

     (½ Mark for correct Output)

6. (a) Verify the following algebraically.   **2**

        (A'+B').(A+B)=A'.B+A.B'

Ans.   LHS

     (A' +B') . (A+B)

     = A'.A + A'.B + A.B' + B'.B

     = 0 + A'.B + A.B'+ 0

     = A'.B + A.B'

     = RHS   (Verified)

     OR

     Any other valid algebraic verification

     (2 Marks for verifying LHS = RHS OR RHS = LHS)

(b) Write the equivalent Boolean Expression for the following Logic circuit: **2**
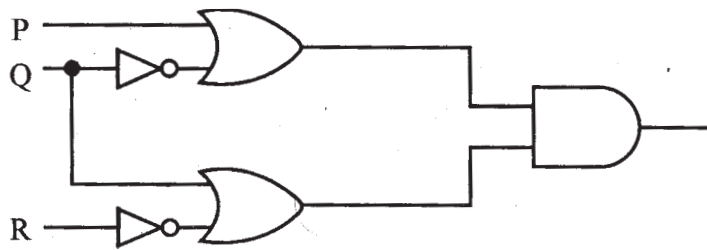
Ans. (P + Q') . (Q + R')

(2 Marks for the final expression (P + Q') . (Q + R'))

OR

(1 Mark for any of the correct terms out of (P + Q') or (Q + R'))

(c) Write the POS form of a Boolean function H, which is represented in a truth table as follows: **1**

X	Y	Z	H
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

Ans. (X + Y + Z').(X'+ Y + Z') . (X'+ Y'+ Z)

OR

H(X,Y,Z) = Π (1, 5, 6)

(1 Mark for the correct POS form)

Note:

Deduct ½ mark if wrong variable names are used

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

Ans. F(U, V, W, Z) = Σ (3, 5, 7, 10, 11, 13, 15)

	U'V'	U'V	UV	UV'
W' Z'	0	4	12	8
W' Z	1	1 5	1 13	9
W' Z	1 3	1 7	1 15	1 11
W Z'	2	6	14	1 10

OR

	W'Z'	W'Z	WZ	WZ'
U'V'	0	1	1 3	2
U'V	4	1 5	1 7	6
U V	12	1 13	1 15	14
U V'	8	9	1 11	1 10

```
F(U,V,W,Z)  =  WZ  +  VZ  +  UV'W
```
(½ Mark for drawing K-Map with correct variable names)
(½ Mark for placing all 1s at correct positions in K-Map)
(½ Mark for each grouping)
(½ Mark for writing final expression in reduced/minimal form)

7. (a) What was the role of ARPANET in the Computer Network? **1**

Ans. The first computer network was jointly designed by The Advanced-Research Projects Agency (ARPA) and Department of Defence (DoD) of United States in 1969 and was called ARPANET. It was an experimental project, which connected a few computers from some of the reputed universities of USA and DoD. ARPANET allowed access to computer resource sharing projects. This ARPANET was handed over to Defence Communication Agency (DCA) for further development.

(1 Mark for mentioning that ARPANET was the first computer network)
OR
(½ Mark if only the expansion of ARPANET is mentioned)

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(b)   Which of the following is not an unit for data transfer rate?   **1**

   (i)   bps

   (ii)   abps

   (iii) gbps

   (iv)   kbps

Ans. (ii)abps

   (1 Mark for writing correct option)

(c)   What is the difference between Trojan Horse and Virus in terms of computers?   **1**

Ans. TROJAN HORSE: "Malware" computer programs presented as useful or harmless in order to induce the user to install and run them.

   VIRUS: Virus is a malicious program that damages data and files and causes harm to computer system.

   (1 Mark for mentioning anyone valid difference)

   OR

   (½ Mark for correct definition of each term)

(d)   What term we use for a software/hardware device, which is used to block, unauthorized access while permitting authorized communications. This term is also used for a device or set of devices configured to permit, deny, encrypt, decrypt, or proxy all (in and out) computer traffic between different security domains based upon a set of rules and other criteria.   **1**

Ans. Firewall

   (1 Mark for writing £orrect term)

(e)   "Learn Together" is an educational NGO. It is setting up its new campus at Jabalpur for its webbased activities. The campus has 4 compounds as shown in the diagram below: **4**

Center to center distances between various Compounds as per architectural drawings (in Metre) is as follows :

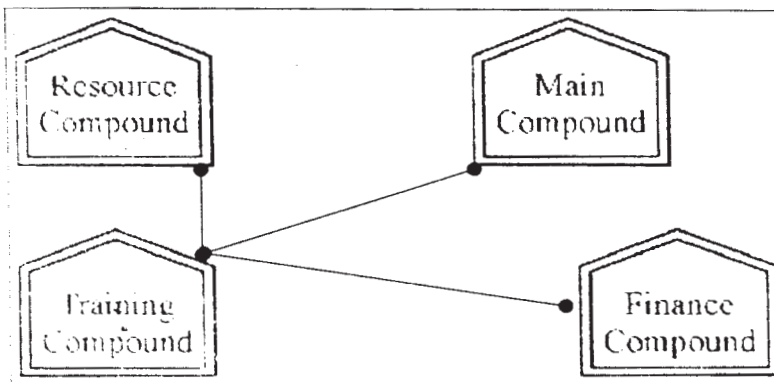| Main Compound to Resource Compound	110 m
Main Compound to Training Compound	115 m
Main Compound to Finance Compound	35 m
Resource Compound to Training Compound	25 m
Resource Compound to Finance Compound	135 m
Training Compound to Finance Compound	100 m

Expected Number of Computers in each Compound is as follows :

Main Compound	5
Resource Compound	15
Training Compound	150
Accounts Compound	20

(e1) Suggest a cable layout of connections between the compounds.   1

Ans.

OR

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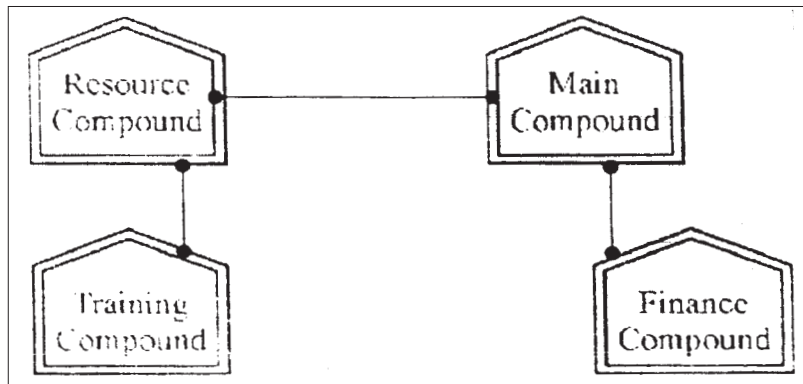
(1 Mark for mentioning any valid connectivity or topology or diagram connecting various compounds inside the campus)

(e2) Suggest the most suitable place (i.e. compound) to house the server for this NGO. Also, provide a suitable reason for your suggestion.   1

Ans. Training Compound as it contains maximum number of computers.

(½ Mark for mentioning the correct compound)
(½ Mark for correct justification)
OR
(1 Mark for any other location with a valid justification)

(e3) Suggest the placement of the following devices with justification :   1

       (i)   Repeater

       (ii)   Hub/Switch

Ans. (i)   A Repeater should be placed when the distance between any two connecting compounds exceeds 70 m.

       (ii)   Every compound will need one Hub I Switch, to send signals to all of the workstations connected to it

           OR

           Any diagrammatic representation with valid justification

           (½ Mark for each correct placement of Devices with valid justifications)

(e4) The NGO is planning to connect its International office situated in Mumbai, which out of the following wired communication link, you will suggest for a very high speed connectivity?   1

(i)   Telephone Analog Line

(ii)   Optical Fiber

(iii) Ethernet Cable

Ans. (ii) Optical Fiber

(1 Mark for correct option /answer)

(f)   Write the full forms of the following: **1**

(f1) GNU

(f2) XML

Ans   (f1) GNU's not Unix

(f2) eXtensible Markup Language

(½ Mark for each full form)

(g)   Write one advantage of each for Open Source Software and Proprietary
Software.   **1**

Ans. An Open Source Software is freely and liberally licensed because of which
users have right to study, change. and improve its design and source code.

A Proprietary Software has a copyright owner, who can restrict the user's
control over the software, its modification, or restrictions in publishing of
modified or unmodified versions.

(½ Mark for writing correct advantage / definition for Open Source Software)
(½ Mark for writing correct advantage / definition for Proprietary Software)

QUESTION PAPER CODE 91
EXPECTED ANSWERS

1.   (a) What is the difference between call by value and call by reference? Also,
give a suitable C++ code to illustrate both.   **2**

Ans. Call by value: The formal parameter makes a copy of actual parameter. It
does not make the changes In actual parameter If the changes are done In
formal parameters.

Call by reference: The formal parameter Is an alias of actual parameter. The
changes made In the formal parameter are reflected In actual parameter. It is
preceded by &.

```
vcid Caloulato(int A,int & B )// A is oall by value,
{                              // B is call by roforonco

    A++;

    a+=A;

}
```

(½ Mark for each corroct explanatIon of Call by va/ueand Call by referenco)

(½ Mark for each corroct examplo,of Call by value and Call by reference)

OR

(Full 2 Marks for correct examples demonstrating tho dlfference botween Call by value and Call by roforonce)

OR

(Only 1 Mark to be awarded for ExplanatIon glvon without supporting examples)

(b)   Which C++ header file(s) will be essentially required to be included to run/execute the following C++ code: **1**

```
void main()

{

    int Rno=24; char Name [] =" Amen Singhania";

    cout<<setw(lO)<<Rno<<setw(20)<<Name<<endl;

}
```

Ans. iostream.h

iomanip.h

OR

iomanip.h - (As iostream.h is included in iomanip.h)

(½ Mark for writing each correct header file)

OR

(Full Mark for mentioning only iomanip.h)

Note: Ignore any other header files, if mentioned.

(c) Rewrite the following C++ program code after removing the syntax error(s) (if any). Underline each correction. **2**

```
include  <iostream.h>

class  FLIGHT

{

    long  FlightCode;

    char  Description[25];

public

    void  AddInfo ( )

    {

        cin>>FlightCode; gets (Description) ;

    {

    void  ShowInfo ()

    (

        cout<<FlightCode<<":"<<Description<<endl;

    }

} ;

void  main()

{

    FLIGHT  F;

    AddInfo.F();  ShowInfo.F();

}
```

Ans. <u>#</u>include <iostream.h>   / / Error 1

<u>#include <stdio.h></u>   / / Error 2

class FLIGHT

{

    long FlightCode;

not required if gets( ) is re-
placed with cin.getline( ) or
cin

```
        char  Description[25];

public :              / / Error 3

    void AddInfo ( )

    {

        cin>>FlightCode; gets (Description) ;

    }

    void ShowInfo ( )

    {

        cout<<FlightCode<<":"<<Description<<endl;

    }

} ;

void main ( )

{

    FLIGHT F;

    F.AddInfo( ) ;      F. ShowInfo ( ) ;/ / Error 4

}
```

(½ Mark for each correction)

OR

(1 mark for identifying at least three errors, without suggesting correction)

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

```
#include  <iostream.h>

struct  THREE_D

{int  X,Y,Z;};

void MoveIn(THREE_D &T, int Step=l)

}

    T.X+=Step;

    T.Y-=Step;
```

```cpp
        T.Z+=Step;

    }

    void MoveOut(THREE_D &T, int Step=l)

    {

        T.X-=Step;

        T.Y+=Step;

        T.Z-=Step;

    }

    void main ()

    {

        THREE_D  Tl={lO,20,5},T2={30,lO,40};

        MoveIn(T1);

        MoveOut(T2,5)  ;

        cout<<Tl.X<<","<<Tl.Y<<","<<T1.Z<<endl;

        cout<<T2.X<<","<<T2.Y<<","<<T2.Z<<endl;

        MoveIn(T2,l0);

        cout<<T2.X<<","<<T2.y<<","<<T2.Z<<endl;

    }
```

Ans. 11, 19, 6

25, 15, 35

35, 5, 45

(1 Mark for each line with correct values)
OR
(½ Mark for any two correct values in each line)
Note:

Deduct ½ Mark if any/all ',' missing

Deduct ½ Mark if endl is not considered at the right positions

(e)   Find. the output of the following program: 2

```
#include  <iostream.h>

#include  <ctype.h>

void MyCode (char Msg [], char CH)

{

    for (int (Cnt=O;Msg[Cnt]!='\0';Cnt++)

    {

    if (Msg[Cnt]>='B'  && Msg[Cnt]<='G')

        Msg[Cnt]=tolower(Msg[Cnt]);

        else

            if (Msg[Cnt]=='A'|| Msg[Cnt]=='a')

            Msg[Cnt]=CH;

        else

        if (Cnt%2==0)

            Msg[Cnt]=toupper(Msg[Cnt]);

        else

            Msg[Cnt]=Msg[Cnt-l];

    }

}

void main ()

{

    char MyText [] =" ApEACeDriVE";

    MyCode(MyText,'@');

    cout<<"NEW  TEXT:"<<MyText<<endl;

}
```

Ans. NEW TEXT :@@e@ccddIIe

(½ Mark for writing @,@,e as the first three characters)

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(f)   The following code is from a game, which generates a set of 4 random numbers. Praful is playing this game, help him to identify the correct option(s) out of the four choices given below as the possible set of such numbers generated from the program code so that he wins the game. Justify your answer.   2

```cpp
#include <iostream.h>
#include <stdlib.h>
const int LOW=25;
void main ()
{
    randomize() ;
    int P01NT=5,Number;
    for (int I=1;I<=4;I++)
    {
        Number=LOW+random(POINT);
        Cout<<Number<<":";
        P0INT--;
    }
}
```

(i)   29:26:25:28:

(ii)   24:28:25:26:

(iii)   29:26:24:28:

(iv)   29:26:25:26:

Ans. (iv)   29:26:25:26:

Justification is as follows:

I	POINT	Number	
		Minimum	Maximum
1	5	25	29
2	4	25	28
3	3	25	27
4	2	25	26

The only option that satisfies these values is option (iv).

(1 Mark for mentioning correct option)

(1 Mark for any valid justification)

Note: Only ½ Mark to be given if only options (i) & (iv) are mentioned as correct options; no other combination of options is acceptable;

2. (a) What do you understand by Data Encapsulation and Data Hiding ?' Also, give an example in C++ to illustrate both. 2

Ans. Data Encapsulation: Wrapping up of data and functions together in a single unit is known as Data Encapsulation. In a class, we wrap up the data and functions together in a single unit.

Data Hidina: Keeping the data in private/protected visibility mode of the class to prevent it from accidental change is known as Data Hiding.

```
class Computer
{
    char CPU[lO] ;int RNM;    //Data Hiding
public:                       //Data Encapeulation
    void STOCK();
    void SHOW();
};
```

(½ Mark for each correct explanation of Data Encapsulation and Data Hiding)

(½ Marie for each correct example of Data Encapsulation and Data Hiding)

OR

(2 Marks for explaining the concept of the terms through suitable examples)

OR

(Only 1 Mark to be awarded for Explanation given without any example)

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

```
class  Exam

{

    int  Rno,MaxMarks,MinMarks,Marks;

public:

    Exam ( )                                    //Module  1

    {

        Rno=101;MaxMarks=l00;MinMarks=40;Marks=75;

    }

    Exam (int  Prno,  int  Pmarks)         //Module  2

    {

    Rno=Prno;MaxMarks=l00;MinMarks=40;Marks=Pmarks;

    }

    ~Exam ()                                    //Module  3

    {

        cout<<"Exam  Over"<<endl;

    }

    void Show ()                               //Module  4

    {

        cout<<Rno<<":"<<MaxMarks<<":"<<MinMarks<<endl;

        cout<<"[Marks  Got]"<<Marks<<endl;

    }

};
```

(i)   As per Object Oriented Programming, which concept is illustrated by **Module 1** and **Module 2** together?

Ans.   Polymorphism

OR

Constructor Overloading

OR

Function Overloading

(1 Mark for mentioning the correct concept)

(ii)   What is **Module 3** referred as ? When do you think, **Module 3** will be invoked/called?

Ans.   Destructor. It is invoked as soon as the scope of the object gets over.

(½ Mark for identifying it as Destructor)

(½ Mark for mentioning correctly when it be called/invoked)

(c)   Define a class STOCK in C++ with following description: **4**

Private Members

- ICode of type integer (Item Code)

- Item of type string (Item Name)

- Price of type float (Price of each item)

- Qty of type integer (Quantity in stock)

- Discount of type float (Discount percentage on the item)

- A member function FindDisc() to calculate discount as per the following rule:

    If Qty<=50   Discount is 0

    If 50<Qty<=100   Discount is 5

    If Qty>100   Discount is 10

Public Members

- A function Buy() to allow user to enter values for ICode, Item, Price, Qty and call function FindDisc() to calculate the Discount.

- A function ShowAll() to allow user to view the content of all the data members.

Ans.
```cpp
class  STOCK
{
    int  ICode,Qty;
    char  Item[20];
    float  Price,Discount;
    void  FindDisc();
public:
    void  Buy();
    void  ShowAll();
} ;
void  STOCK::Buy()
{
    cin>>ICode;
    gets(Item);
    cin>>Price;
    cin»Qty;
    FindDisc();
}
void  STOCK::FindDisc()
{
    if  (Qty<=50)
        Discount=0;
    else if  (Qty<=100)
        Discount=5;        // =0.05;
    else
```

```
            Discount=10;          // =0.1;

}

void  STOCK::ShowAll()

{

    cout<<ICode<<'\t'<<Item<<'\t'<<Price<<'\t'<<Qty

    <<'\t'<<Discount<<endl;

}
```

(½ Mark for correct syntax for class header)

(½ Mark for correct declaration of data members)

(1 Mark for correct definition of FindDisc())

(1 Mark for correct definition of Buy() with proper invocation of FindDisc() function)

(1 Mark for correct definition of ShowAll())

NOTE:

Deduct ½ Mark if FindDisc() is not invoked properly inside Buy() function

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

```
class  Director

{

    long DID;      //Director Identification Number

    char  Name[20];

protected:

    char  Description[40];

    void Allocate () ;

public:

    Director() ;

    void Assign () ;

    void Show () ;

} ;
```

```
class Ractory:public Director
}
    int FID;      //Factory ID
    char Address[20];
protected:
    int NOE;      //No. of Employees
public:
    Factory();
    void Input ();
    void Output ();
};
class ShowRoom:private Factory
{
    int SID;       //Showroom ID
    char City[20];
public:
    ShowRoom();
    void Enter ();
    void Display ();
};
```

(i)   Which type of inheritance out of the following is illustrated in the above C++ code?

(a)   Single Level Inheritance

(b)   Multi Level Inheritance

(c)   Multiple Inheritance

Ans. (b)   Multilevel Inheritance

      (1 Mark for mentioning correct option)

(ii)   Write the names of data members, which are accessible by objects of class type ShowRoom.

Ans.   None

(1 Mark for correct answer)

Note: No marks to be awarded for any partial/alternative answer

(iii)   Write the names of all member functions which are accessible by objects of class type ShowRoom.

Ans.   Enter(), Display()

(1 Mark for correct answer)

Note:

No marks to be awarded for any partial/alternative answer Ignore mention of Constructor(s)

(iv)   Write the names of all members, which are accessible from member functions of class Factory.

Ans.   FID, Address, NOE, Description,

Input(), Output(), Assign(), Show(), Allocate()

(1 Mark for correct answer)

Note:

No marks to be awarded for any partial/alternative answer Ignore mention of Constructor(s)

3. (a) Write a function REASSIGNO in C++, which accepts an array of integers and its size as parameters and divide all those array elements by 5 which are divisible by 5 and multiply other array elements by 2.   3

Sample Input Data of the array

A[0]	A[1]	A[2]	A[3]	A[4]
20	12	15	60	32

Content of the array after calling REASSIGNO function

A[0]	A[1]	A[2]	A[3]	A[4]
4	24	3	12	64

Ans.
```
void REASSIGN (int Arr[ ], int Size)

{

    for (int i=0;i<Size;i++)

        if (Arr[i]%5==0)

            Arr[i]/=5;

        else

            Arr[i]*=2;

}
```

OR

```
void REASSIGN(int Arr[ ],int Size)

{

    for (int i=0;i<Size;i++)

        Arr[i]%5 ? Arr[i]/=5 : Arr[i]*=2;

}
```

OR

Any other correct equivalent function definition

(½ Mark for correct Function Header)

(½ Mark for correct loop)

(½ Mark for correct checking of divisibility of array elements by 5)

(½ Mark for correct placing of else OR correct checking of non divisibility of array elements by 5)

(½ Mark for each correct assignment)

(b) An array T[90][100] is stored in the memory along the column with each of the elements occupying 4 bytes. Find out the memory location for the element T[10][40], if the Base Address of the array is 7200.   3

Ans.
```
Loc(T[I][J])        = Base(T)+W(I+J*N)

                      (where N is the number of rows, LBR = LBC = 0)

                      = 7200 + 4[10 + 40 x 90]
```

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```
                    = 7200 + 4[10+3600]

                    = 7200 + 4 x 3610

                    = 7200 + 14440

                    = 21640
```

OR

```
Address of T[I][J] along the column

                    = BaseAddress + W [(I-LBR)+(J-LBC)* N]

                    (where N is the number of rows, LBR=LBC = 1)

Address of T[10][40]=BaseAddress + 4[ (10 - 1) +(40 - l)x 90]

                    = 7200+4[9 + 39 x 90]

                    = 7200+4[9 + 3510]

                    = 7200+4 x 3519

                    = 7200+14076

                    = 21276
```

(1 Mark for writing correct formula (for column major) OR. substituting formula with correct values for calculating Address)

(2 marks for calculating correct address)

(c) Write a complete program in C++ to implement a dynamically allocated Queue containing names of Cities.   4

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

#include  <conio.h>

struct  NODE

{

    char  City[20];

    NODE  *Next;

};

class  Queue
```

```cpp
{
    NODE  *Rear,*Front;
puplic:
    Queue()  {Rear=NULL;Front=NULL;}
    void  Qinsert();
    void  Qdelete();
    void  Qdisplay ();
    ~Queue();
} ;
void  Queue::Qinsert()
{
    NODE  *Temp;
    Temp=new  NODE;
    cout<<"Data:";
    gets  (Temp->City);
    Temp->Next=NULL;
    if  (Rear==NULL)
    {
        Rear=Temp;
        Front=Temp;
    }
    else
    {
        Rear->Next=Temp;
        Rear=Temp;
    }
```

```cpp
}
void Queue::Qdelete()
{
    if (Front!=NULL)
    {
        NODE *Temp=Front;
        cout<<Front->City<<"Deleted \n";
        Front=Front->Next;
        delete Temp;
        if (Front==NULL) Rear=NULL;
    }
    else
        cout<<"Queue Empty..";
}
Queue:: Qdisplay ()
{
    NODE *Temp=Front;
    while (Temp!=NULL)
    {
        cout<<Temp->City<<endl;
        Temp=Temp->Next;
    }
}
Queue:: ~Queue()//Destructor Function
{
    while (Front!=NULL)
    {
```

```
            NODE  *Temp=Front;

            Front=Front->Next;  delete  Temp;

        }

    }

    void main ()

    {

        Queue QU; char Ch;

        do

        {

            :

            :

        } while (Ch!='Q');

    }
```

(4 Marks for correct program)

OR

(Full 4 Marks for correct logic of either Insertion OR Deletion functions for Dynamically Allocated Queue.)

OR

(2 Marks for defining class with Constructor, function prototypes for Insertion & deletion and Destructor or equivalent using Structures.)

(d)   Write a function int ALTERSUM (int B[ ] [5], int N, int M in C++ to find and return the sum of elements from all alternate elements of a two-dimensional array starting from B[0][0].   2

Hint: If the following is the content of the array:

B[0][0]	B[0][1]	B[0][2]
4	5	1
B[1][0]	B[1][1]	B[1][2]
2	8	7
B[2][0]	B[2][1]	B[2][2]
9	6	3

The function should add elements B[0][0], B[0][2], B[1][l], B[2][0] and
B[2][2].

Ans.
```
//Sample Code 1

int ALTERSUM(int B[][5] ,int N,int M)

{

    int Sum=0;

    for (int I=0;I<N;I++)

        for (int J=(I%2==0)?0:1;J<M;J+=2)

                Sum+=B[I][J] ;

    return Sum;

}

OR

//Sample Code 2

int ALTERSUM(int B[][5],int N,int M)

{

    int Sum=0,J=0;

    for (int I=0;I<N;I++)

    {

        for (;J<M;J+=2)

            Sum+=B[I][J] ;

        J-=M;

    }

    return Sum;

}

OR

//Sample Code 3

int ALTERSUM(int B[][5],int N,int M)
```

```cpp
{
    int  *P=&B[0][0],Sum=0;

    for (int  I=0;I<M*N;I+=2)

    {

        Sum+=(*P);

        P+=2;

    }

    return Sum;

}
```

OR

```cpp
//Sample Code 4

int ALTERSUM (int B[][5], int N, int M)

{

    int S=0, C=0;

    for(int I = 0; 1< N; 1++)

        for (int J = 0; J<M; J++ )

        {

            if (C%2 == 0)

                S = S + B[I][J];

            C++;

        }

    return S;

}
```

OR

```cpp
//Sample Code 5

int ALTERSUM(int B[][5],int N,int M)

{
```

```
        int Sum=0;

        for (int I=0;1<N;1++)

            for (int J=0;J<M;J++)

                if ((1+J)%2==0)

                    Sum+=B [I][J] ;

        return Sum;

}

OR

//Sample Code 6

int ALTERSUM(int B[][5],int N,int M)

{

        int Sum=0;

        for (int I=0;1<N;1++)

            for (int J=0;J<M;J++)

            {

              if ((1%2==0 && J%2=0)||(1%2!=0 && J%2!=0))

                 Sum+=B [I][J] ;

            }

        return Sum;

}
```

Note: Kindly note Sample Code 5 and 6 will not work in case of Even Dimensional Arrays, but keeping in view of the Sample given for 3x3 array the solution is acceptable.

(½ Mark for correct loops)

(1 Mark for finding Sum of alternate cells)

(½ Mark for returning the Sum)

(e)   Evaluate the following postfix notation of expression: 2
      (Show status of Stack after each operation)

```
True, False, NOT, OR, False, True, OR, AND
```

Ans.

Element Scanned	Stack Content
True	True
False	True, False
NOT	True, True
OR	True
False	True, False
True	True, False, True
OR	True, True
AND	True

OR

Step 1: Push

True

Step 2: Push

False
True

Step 3: NOT

True

Pop
Op2=False
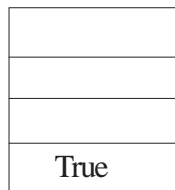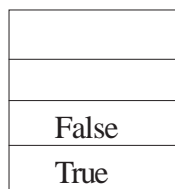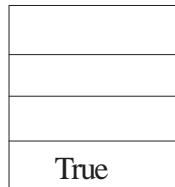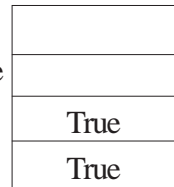
Push

True
True

Step 4 OR
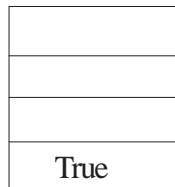
True

Pop
Op2=True
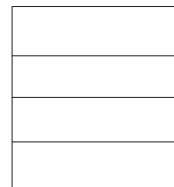
Pop
Op1 =True
Op2=True

Push

True

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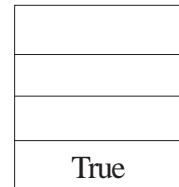
Step 5: Push

False
True

Step 6: Push

True
False
True

Step 7: OR   Push

Stack				
	Pop		Pop	
	Op2=True		Op1=False	
False			Op2=True	True
True		True		True

Step 8: AND   Push

Stack				
	Pop		Pop	
	Op2=True		Op1=True	
			Op2=True	
True				True

Step 9: Pop

	Result
	True

OR

Any other method for evaluating the given postfix expression showing the Stack Status.

(½ Mark for correctly evaluating expression up to each operator)

OR

(1 Mark only to be given for writing correct answer without showing the Stack Status)

4.   (a)   Observe the program segment given below carefully and fill the blanks marked as Statement 1 and Statement 2 using tellg() and seekp() functions for performing the required task.   1

```cpp
#include <fstream.h>
class Customer
{
    long Cno;char Name[20],Mobile[12];
public:
    //Function to allow user to enter the Cno, Name,
    Mobile
void Enter();
    //Function to allow user to enter (modify) mobile
    number void Modify();
    //Function to return value of Cno
    long GetCno () {return Cno;}
};
void ChangeMobile()
{
    Customer C;
    fstream F;
    F.open("CONTACT.DAT",ios::binary|ios::in|ios::out);
    long Cnoc; //Customer no. whose mobile number needs
    to be changed cin>>Cnoc;
    while (F.read((char*)& C,sizeof(C)))
    {
        if (Choc==C.GetCno())
        {
            C.Modify ();
                                    //Statement 1
            int Pos=_____//To find the current
                    position of file pointer
                                    //Statement 2
        _____//To move the file pointer to write the
                //modified record back onto the file
```

```
                    //for the desired Cnoc

            F.write((char*)&C,sizeof(C));

            }

        }

        F. close( ) ;

    }
```

Ans.
```
Statement 1:

File.tellg() ;

Statement 2:

File.seekp(Pos-sizeof(C));
```

OR

```
File.seekp(-l*sizeof(C)  ,ios::cur);
```

(½ Mark for each correct Statement)

(b)   Write a function in C++ to count the words "to" and "the" present in a text file "POEM.TXT".   2

[Note that the words "to" and "the" are complete words]

Ans.
```
void COUNT ()

    {

        ifstream Fil;

        Fil. open ("POEM.TXT");    OR ifstream Fil ("POEM. TXT");

        char Word[80] ;

        int Cl = 0, C2 = 0;

        while(!Fil.eof())

        {

            Fil>>Word;

            if (strcmp (Word, "to") ==0)

                Cl++;

            else if (strcmp (Word, "the") ==0)

                C2++;
```

```cpp
        }
            cout<<"Count of -to- in file:" <<Cl;
            cout<<"Count of -the- in file:"<<C2;
                OR cout<<"Count of -to- and -the- in file:"<<Cl+C2;
        Fil.close();  //Ignore
    }
OR
void COUNT ( )
{
    ifstream  Fil("POEM.TXT");
    // OR fstream Fil;
    // Fil.open("POEM.TXT",ios::in);
    char  STR[l0];
    int Cl=O, C2=0;
    while (Fil.getline(STR,l0,''))
    {
        if (strcmp (STR, "to") ==0)
            Cl++;
        else if (strcmp(STR, "the") ==0)
            C2++;
    }
        cout<<"Count of -to- in file:"<<Cl;
        cout<<"Count of -the- in file:"<<C2;
            OR cout<<"Count of -to- and -the- in file:"<<Cl+C2;
    Fil.close();  //Ignore
}
```

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```
OR

void COUNT()

{

    ifstream Fil;
                                        OR ifstream Fill("POEM.TXT");
    Fil. open ("POEM.TXT");

    char Word[BO], Chi

    int Cl =0, C2=0, 1=0;

    while(Fil.get(Ch))

    {

        if (Ch! = ' ')

            Word[1++] = Chi

        else

        {

            Word[I] = '\0';

            if (strcmp (Word, "to") ==0)

                Cl++;

            else if (strcrap (Word, "the") ==0)

                C2++;

            1=0;

        }

    }

    cout<<"Count of -to- in file:"<<Cl;

    cout<<"Count of -the- in file:"<<C2;

                OR cout«"Count of -to- and -the- in

    Fil.close(); //1gnore

}

OR
```

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Any-other correct function definition

(½ Mark for opening POEM. TXT correctly)

(½ Mark for reading each word (using any method) from the file)

(½ Mark for comparing the word with 'to' and 'the')

(½ Mark for incrementing counter(s))

(c)   Write a function in C++ to search and display details. of all trains, whose destination is "Delhi" . from a binary file "TRAIN.DAT". Assuming the binary file is containing the objects of the following class.   3

```
class  TRAIN
{
    int  Tno;                          // Train Number
    char From[20];         // Train Starting Point
    char To [20];               // Train Destination
public:
    char*   GetFrom (){return  From;}
    char*   GetTo (){return  To;}
    void  Input () {cin>>Tno;gets(From);gets(To);}
    void  Show () {cout<<Tno<<":"<<From<<":"<<To<<endl;}
};
```

Ans.
```
void Read ( )
{
    TRAIN T;
    ifstream fin;
    fin. open ("TRAIN.DAT", ios::binary);
                OR ifstream fin ("TRAIN.DAT", ios::binary);
    while(fin.read((char*)&T, sizeof(T)))
    {
        if(strcmp(T.GetTo() ,"Delhi")==O)
            T.Show() ;
```

```
        }
        fin.close();  //Ignore
}
```

OR

Any other correct function definition

(½ Mark for opening TRAIN .DAT correctly)

(½ Mark for reading each record from TRAIN.DAT)

(½ Mark for correct loop / checking end of file)

(1 Mark for comparing value returned by GetTo( ) with "Delhi")

(½ Mark for displaying the matching record)

5. (a) What do you understand by Primary Key? Give a suitable example of Primary Key from a table containing some meaningful data.   2

Ans. An attribute or set of attributes which are used to identify a tuple uniquely is known as Primary Key

Table: Item

Ino	Item	Qty
I01	Pen	300
I02	Pencil	780
I04	CD	450
I09	Floppy	700

PRIMARY KEY

(1 Mark for writing correct definition/purpose of valid Primary Key)

(1 Mark for giving suitable example)

OR

(2 Marks for illustrating the purpose of Key with/without showing it as a part of a Table)

(b) Consider the following tables STOCK and DEALERS and answer (b1) and (b2) parts of this question:

Table: STOCK

ItemNo	Item	Dcode	Qty	UnitPrice	StockDate
5005	Ball Pen 0.5	102	100	16	31-Mar-10
5003	Ball Pen 0.25	102	150	20	01-Jan-10
5002	Gel Pen Premium	101	125	14	14-Feb-10
5006	Gel Pen Classic	101	200	22	01-Jan-09
5001	Eraser Small	102	210	5	19-Mar-09
5004	Eraser Big	102	60	10	12-Dec-09
5009	Sharpener Classic	103	160	8	23-Jan-09

Table: DEALERS

Dcode	Dname
101	Reliable Stationers
103	Classic Plastics
102	Clear Deals

(b1)   Write SQL commands for the following statements: 4

(i)   To display details of all Items in the Stock table in ascending order of StockDate.

Ans.   SELECT * FROM STOCK ORDER BY StockDate;

(1 Mark for correct query)

(½ Mark for partially correct answer)

(ii)   To display ItemNo and Item name of those items from Stock table whose UnitPrice is more than Rupees 10.

Ans.   SELECT ItemNo,Item FROM STOCK WHERE UnitPrice >10;

(1 Mark for correct query)

(½ Mark for partially correct answer)

(iii) To display the details of those items whose dealer code (Dcode) is 102 or Quantity in Stock (Qty) is more than 100 from the table Stock.

Ans.   SELECT * FROM STOCK WHERE Dcode=102 OR Qty >100;

(1 Mark for correct query)

(½ Mark for partially correct answer)

(iv) To display Maximum UnitPrice of items for each dealer individually as per Dcode from the table Stock.

Ans. `SELECT Dcode, MAX (UnitPrice) FROM STOCK GROUP BY Dcode;`

`OR`

`Any other query that will give an equivalent output`

(1 Mark for correct query)
(½ Mark for partially correct answer)

(b2) Give the output of the following SQL queries: 2

(i) SELECT COUNT(DISTINCT Dcode) FROM Stock;

Ans.
```
Count(DISTINCT  Dcode)
          3
```

(½ Mark for correct output)

(ii) SELECT Qty*UnitPrice FROM Stock WHERE ItemNo=5006;

Ans.
```
Qty*UnitPrice
    4400
```

(½ Mark for correct output)

(iii) SELECT Item,Dname FROM Stock S, Dealers D

WHERE S.Dcode=D.Dcode AND ItemNo=5004;

Ans.
```
Item               Dname
Eraser Big   Clear Deals
```

(½ Mark for correct output)

(iv) SELECT MIN(StockDate) FROM Stock;

Ans.
```
MIN  (StockDate)
    01-Jan-09
```

(½ Mark for correct output)

6. (a) Verify the following algebraically :   2

$X'.Y + X.Y' = (X'+Y').(X+Y)$

Ans. R. H . S

       (X'+y').(x+y)

   =   x'.(x+y)+y'.(x+y)

   =   x.x'+X'.y+y'.x+y'.y

   =   x'.y+y'.X

   =   x'.y+x.y'

So L.H.S=R.H.S

OR

L.H.S.

   X'.Y + X.Y'

   = (X'.Y+X) (X'.Y+Y')

   = (X'+X).(Y+X).(X'+Y').(Y+Y')

   = 1.(X+Y).(X' +Y').1

   = (X+Y).(X'+Y')

   = R.H.S.

(2 Marks for correct verification)

(b)   Write the equivalent Boolean Expression for the following Logic Circuit: 2
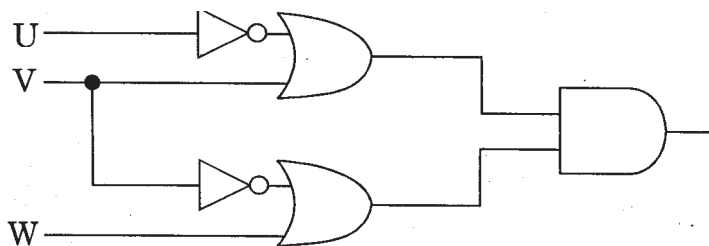
Ans. (U'+V) . (V'+W)

(2 Marks for the final expre~sion (U'+V).(V'+W))

OR

(1 Mark for anv one of the correct terms out of (U'+V) or (V'+W))

(c)   Write the SOP form of a Boolean function G, which is represented in a truth
     table as follows: 1

P	Q	R	G
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

Ans. `G(P,Q,R)=P'.Q.R'+P'.Q.R+P.Q'.R'+P.Q.R'+P.Q.R`

`OR`

`G(P,Q,R) = Σ(2,3,4,6,7)`

(1 Mark for the correct SOP form)

Note: Deduct ½ mark if wrong variable names are used

(d) Reduce the following Boolean Expression using K-Map :   3
F (A,B,C,D) = Σ (3,4,5,6, 7,13,15)

Ans.

	A'B'	A'B	AB	AB'
C' D'	0	1 4	12	8
C' D	1	1 5	1 13	9
C D	1 3	1 7	1 13	11
C D	2	1 6	14	10

`OR`

	C'D'	C'D	CD	CD'
A'B'	0	1	1 3	2
A'B	1 4	1 5	1 7	1 6
A B	12	1 13	1 15	14
A B'	8	9	11	10

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```
F(A,B,C,D) = A'B + BD + A'CD
```
(½ Mark for drawing K-Map with correct variable names)
(½ Mark for placing all 1s at correct positions in K-Map)
(½ Mark for each grouping)
(½ Mark for writing final expression in reduced/minimal form)

7.   (a)   What was the role of ARPANET in the Computer Network?   1

Ans. The first computer network was jointly designed by The Advanced Research Projects Agency (ARPA) and Department of Defence (DoD) of United States in 1969 and was called ARPANET. It was an experimental project, which connected a few computers from some of the reputed universities of USA and DoD. ARPANET allowed access to computer resource sharing projects. This ARPANET was handed over to Defence Communication Agency (DCA) for further development.

(1 Mark for mentioning that ARPANET was the first computer network)

OR

(½ Mark if only the expansion of ARPANET is mentioned)

   (b)   Which of the following is not a unit for data transfer rate?   1

      (i)   mbps

      (ii)   kbps

      (iii) sbps

      (iv) gbps

Ans. (iii) sbps

(1 Mark for the correct option/answer)

   (c)   What is the difference between Virus and Worms in the computers?   1

Ans. Virus: Virus is a malicious program that damages data and files and causes harm to computer system.

Worms: Worms disrupt services and create system management problems. In some cases worms can install viruses that cause damage to system.

(1 Mark for mentioning anyone valid difference)

OR

(½ Mark for correct definition of each term)

(d) What term do we use for a software/hardware device, which is used to block unauthorized access while permitting authorized communications? This term is also used for a device or set of devices configured to permit, deny, encrypt, decrypt, or proxy all (in and out) computer traffic between different security domains based upon a set of rules and other criteria.   1
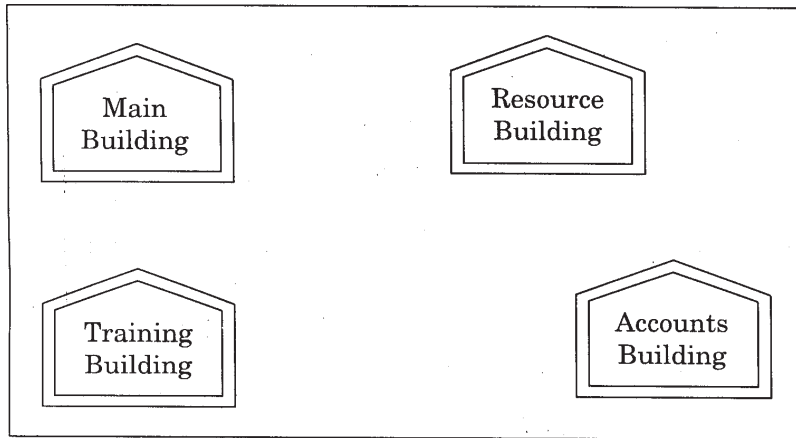
Ans. Firewall

(1 Mark for writing correct term)

(e) "Vidya for All" is an educational NGO. It is setting up its new campus at Jaipur for its web-based activities. The campus has four buildings as shown in the diagram below: 4

Center to center distances between various buildings as per architectural drawings (in meters) is as follows:
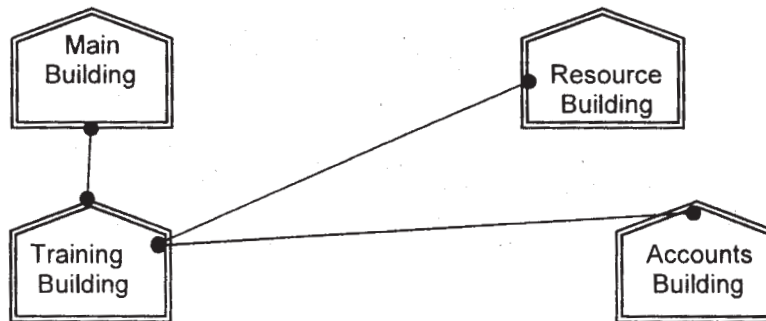
Main Building to Resource Building	120 m
Main Building to Training Building	40 m
Main Building to Accounts Building	135 m
Resource Building to Training Building	125 m
Resource Building to Accounts Building	45 m
Training Building to Accounts Building	110 m

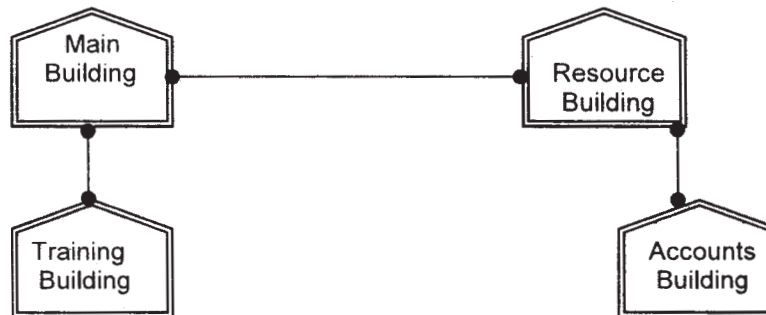Expected Number of Computers in each Building is as follows:

Main Building	15
Resource Building	25
Training Building	250
Accounts Building	10

(el)   Suggest a cable layout of connections between the buildings.

Ans.

OR

(1 Mark for mentioning any valid connectivity or topology or diagram connecting various buildings inside the campus)

(e2)   Suggest the most suitable place (i.e. building) to house the server for this NGO. Also, provide a suitable reason for your suggestion.

Ans.   Training Building as it contains maximum number of computers.

(½ Mark for mentioning the building)

(½ Mark for correct justification)

OR

(1 Mark for any other location with a valid justification)

(e3)   Suggest the placement of the following devices with justification:

(i)   Repeater

(ii)   Hub/Switch

Ans.   (i)   A Repeater should be placed when the distance between any two connecting buildings exceeds 70 m.

(ii) Every building will need one Hub / Switch, to send signals to all of the workstations connected to it

OR

Any diagrammatic representation with valid justification

(½ Mark for correct placement of Repeater with justification)

(½ Mark for correct placement of Hub/Switch with justification)

(e4) The NGO is planning to connect its International office situated in Delhi. Which out of the following wired communication links, will you suggest for a very high speed connectivity ?

(i) Telephone Analog Line

(ii) Optical Fiber

(iii) Ethernet Cable

Ans. (ii) Optical Fibre

(1 Mark for correct Option / Answer)

(f) Write the full forms of the following: 1

(f1) FTP

(f2) FSF

Ans. (f1) FILE TRANSFER PROTOCOL

(f2) FREE SOFTWARE FOUNDATION

(½ Mark. for each full form)

(g) Name any two common Web browsers.   1

Ans. Internet explorer

Firefox

Netscape

Chrome

Opera

Safari

OR any other Web Browser

(½ Mark each for any two web browsers)