XII COMPUTER SCIENCE
CBSE Board - 2010

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

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

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

Call By Value	Call by reference
✓ Call by value is used to create a temporary copy of the data which is transferred from the actual parameter in the final parameter.	✓ Call by reference is used to share the same memory location for actual and formal parameters
✓ The changes done in the function in formal parameter are not reflected back in the calling environment.	✓ The changes done in the function are reflected back in the calling environment.
✓ It does not use & sign **Example:**	✓ It makes the use of the & sign as the reference operator.

```
#include <iostream.h>
void change(int x, int y)
{
   x = 10; /* change the value
              of x */
   y = 20; /* change the value
              of y */
}
void change(int x, int y);

void main ()
{
   // local variable
declaration:
   int a = 100;
   int b = 200;

   cout << "Before change, value
of a :" << a << endl;
   cout << "Before change, value
of b :" << b << endl;

   change(a, b);

   cout << "After change, value
of a :" << a << endl;
   cout << "After change, value
of b :" << b << endl;
}
```

```
#include <iostream.h>
void change(int *x, int *y)
{
   *x = 10; /* change the value
               of x */
   *y = 20; /* change the value
               of y */
}
void change(int *x, int *y);

void main ()
{
   // local variable
declaration:
   int a = 100;
   int b = 200;

   cout << "Before change, value
of a :" << a << endl;
   cout << "Before change, value
of b :" << b << endl;

   change(&a, &b);

   cout << "After change, value
of a :" << a << endl;
   cout << "After change, value
of b :" << b << endl;
}
```

	Value of a and b did not changed after over writing the value of x and y which contain the value of a and b.	Value of a and b is changed after over writing the value of x and y which contain the value of a and b.

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

```
void main()
{
  int Rno=24,char Name[]="Amen Singhania";
  cout<<setw(10)<<Rno<<setw(20)<<Name<<endl;
}
```

Ans:
(i) iostream.h
(ii) iomanip.h

(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:

```
#include <iostream.h>
#include <stdio.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;
    F.AddInfo( );
    F.ShowInfo ( ) ;
}
```

(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=1)
{
   T.X – =Step;
   T.Y+=Step;
   T.Z – =Step;
}
void main()
{
    THREE_D T1={10,20,5},T2={30,10,40};
    MoveIn(T1);
    MoveOut(T2,5);
    cout<<T1.X<<","<<T1.Y<<","<<T1.Z<<endl;
    cout<<T2.X<<","<<T2.Y<<","<<T2.Z<<endl;
    MoveIn(T2,10);
    cout<<T1.X<<","<<T1.Y<<","<<T1.Z<<endl;

}
```

Ans:

11, 19, 6
25, 15, 35
11, 19, 6

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

```
#include<iostream.h>
#include<ctype.h>
void MyCode(char Msg[],char CH)
```

```
{
  for(int Cnt=0;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-1];
  }
}
void main()
{
 char MyText[]="ApEACeDriVE";
 MyCode(MyText,'@');
 cout<<"NEW TEXT:"<<MyText<<endl;
}
```

Ans: NEW TEXT : @@e@ccddIIe

(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 choice 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 POINT=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:

Ans: Option i and iv both are possible output.
Justification –

a. Randomize and random both are used to generate random number, hence each time code will execute they will generate random number.

b. Why only i & iv, why not ii & iv: reason behind this is – random( ) returns a random number between 0 and (num-1). That means when Number=LOW +random(POINT) execute, it returns a random number between 25 to 29, See this table

I	POINT	LOW	+	random(POINT)	Number
1	5	25	+	4	29
2	4	25	+	3	28
3	3	25	+	2	27
4	2	25	+	1	26

Note: By default random return from 0 to (num – 1), so 0 is the minimum number return by the random( ). So random(4) Minimum value is 0 and maximum value is 4 in 1st iteration. Random( ) can return any number from 0 to 4. Hence possibilities can be 0+25=25 or 1+25=26 or 2+25=27 or 3+25=28 or 4+25=29. This theory follows for rest of the iteration.

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

Example:

```
class Computer        //class Computer Encapsulated all data
{
      private:
        char CPU[lO] ; int RNM;   //private access specifier Hiding data
      public:
                        void STOCK();
                        void SHOW();
};
```

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

```
class Exam
{
  int Rno, MaxMarks, MinMarks, Marks;
  public:
  Exam( )                          //Module 1
  {
     Rno=101; MaxMarks=100; MinMarks=40; Marks=75;
  }
  Exam(int Pron,int Pmarks)    //Module 2
  {
     Rno=Prno;MaxMarks=100;MinMarks=40;Marks=Pmarks;
  }
  ~Exam()                  //Module 3
  {
       cout<<"Exam over"<<endl;
  }
  void show()
    {
      cout<<Rno<<":"<<MaxMarks<<":"<<MinMarks<<endl;
```

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

(i) As per Object Oriented Programming, which concept is illustrated by **Module 1** and **Module2** together?

Ans Polymorphism

OR

Constructor Overloading

OR

(ii) Function Overloading

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

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

(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<=10 Discount is 5
  If Qty>100 Discount is 10

Public Members:

- A function Buy () Allow to 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 to content of all the data members.

Ans:

```
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
;
}
```

(d) Answer the questions (i) and (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 Factory: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) Multi level inheritance	
(ii)	Write the names of data members, which are accessible by objects of class type ShowRoom.	
Ans	None	
(iii)	Write the names of all member functions which are accessible by objects of class type ShowRoom.	
Ans	Enter(), Display()	
(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()	
3(a)	Write a function REASSIGN() 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. Sample Input Data of the Array A[0]=20, A[1]=12, A[2]=15, A[3]=60, A[4]=32 Content of the Array after calling REASSIGN() Function A[0]=4, A[1]=24, A[2]=3, A[3]=12, A[4]=64	**3**

Ans:	`void REASSIGN (int Arr[ ], int Size)`
	`{`
	`  for (int i=0;i<Size;i++)`
	`  if (Arr[i]%5==0)`
	`  Arr[i]=Arr[i] / 5;`
	`  else`
	`  Arr[i]=Arr[i] * 2;`
	`}`	

(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 72000.	**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] = 7200 + 4[10+3600] = 7200 + 4 x 3610 = 7200 + 14440 = 21640	
(c)	Write a complete program in C++ to implement a dynamically allocated Queue containing name of cities.	**4**
Ans:	#include <iostream.h> #include <conio.h>	

```
struct NODE
 {
            char City[20];
            NODE *Next;
};
class Queue
{
           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;
          }
}
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);
 }
```

(d) Write a function **int ALTERSUM(int B[][5],int N,int M)** in C++ to find and returns 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],B[2][2].

Ans:

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

void process_Array(int Arr[][3],int x, int y);

void process_Array(int A[][3],int N, int M)
{
  clrscr();
  int sum=0;
```

```
  for (int R = 0; R < N; R++)
  {
    if(R%2==0)
    {
       for (int C = 0; C < M; C=C+2)
       {
        sum=sum+A[R][C];
       }
    }
    else
    {
       for (int C = 1; C < M;C=C+2)
       {
        sum=sum+A[R][C];
       }
    }
  }
  for (int I = 0; I < N; I++)
  {
    for (int J = 0; J < M; J++)
    {
       cout << A[I][J]<<" ";
    }
    cout<<endl;
  }
  cout<<endl<<"Sum is  "<<sum;  //Sum of the alternate elements of array
}
int main ()
{
  int arr[3][3] ={{23, 54, 76},
             {37, 19, 28},
             {62, 13, 19},
            };
  process_Array(arr,3,3);
  return 0;
}
```

(e) Evaluate the following postfix notation of expression: (show status of stack after each operation) True,False,NOT,OR,False,True,OR,AND **2**

Ans:

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

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:
   //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(Cnoc==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 the record back on to 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(-1*sizeof(C) ,ios::cur);

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

Ans:

```
#include<fstream.h>
#include<conio.h>
int main()
{
```

```
     clrscr();
     ifstream fin;
     fin.open("POEM.TXT");
     char word[5];
     int count=0;
     while(!fin.eof())
     {
        fin>>word;
        count++;
     }
     cout<<"Number of words in file is "<<count;
     fin.close();
     getch();
     return 0;
}
```

(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
          charFrom[20];             // Train Starting Point
          charTo [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);
             while(fin.read((char*)&T, sizeof(T)))
            {
                   if(strcmp(T.GetTo() ,Delhi)==0)
                   T.Show() ;
            }
           fin.close(); //Ignore
}
```

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 (row) uniquely is known as Primary Key.

Table: Students

Admission_No	First Name	Last Name	DOB
27354	Rajit	Kumar	05-02-1998
25350	Mala	Sinha	09-24-2004
26385	Rajit	Sharma	19-05-1997
16238	Mukesh	Kumar	09-24-2004

Admission No. is Primary Key because this column will contain unique data for each record.

(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;
```

(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;
```

(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;
```

(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;
```

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

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

Ans.

Count(DISTINCT Dcode)
3

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

Ans.

Qty*UnitPrice
4400

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

Ans.

Item	Dname
Eraser Big	Clear Deals

(iv) **Ans.**

SELECT MIN(StockDate) FROM Stock;

MIN (StockDate)
01-Jan-09

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)

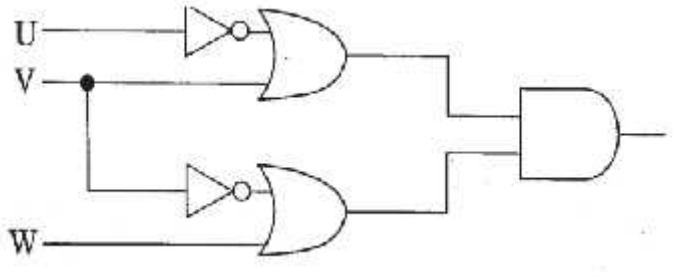
= x.x'+X'.y+y'.x+y'.y

= x'.y+y'.X

= x'.y+x.y'

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

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



Ans: (U'+V) . (V'+W)

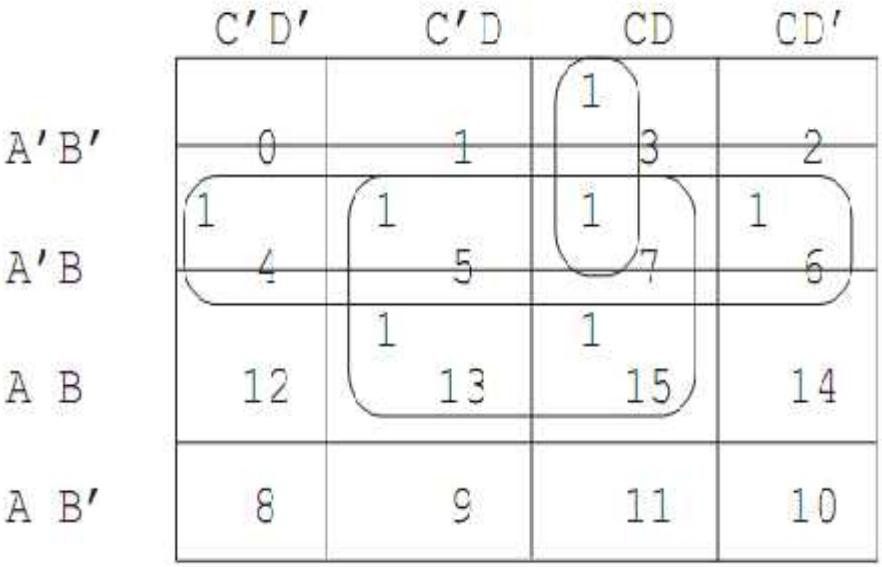
(c) Write the SOP form of a Boolean function G, which is represented in a truth table as follows: **1**

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

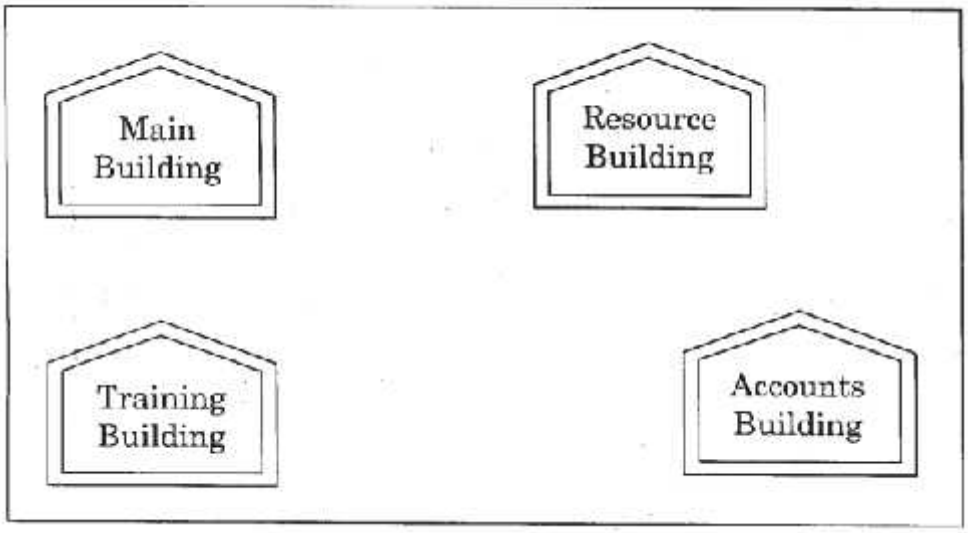
(d) Reduce the following Boolean Expression using K-Map : **3**

F (A,B,C,D) = Σ (3,4,5,6, 7,13,15)



F(A,B,C,D) = A'B + BD + A'CD

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.	
(b)	Which of the following is not a unit for data transfer rate? (i) mbps (ii) kbps (iii) sbps (iv) gbps	**1**
Ans:	(iii) sbps	
(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.	
(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	
(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 building as per architectural drawing (in meters) is as follows:

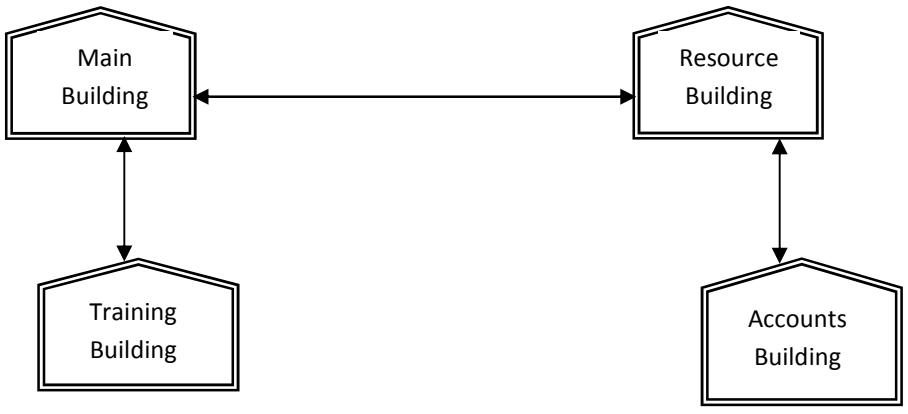
Main Building to Resource Building	120 m
Main Building to Training Building	40 m
Main Building to Accounts Building	135 m
Resource Building to Training Building	125 m
Resource Building to Accounts Building	45 m
Training Building to Accounts Building	110 m

Expected Number of Computers in each Building is as follows:

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

(e1) Suggest a cable layout of connection between the buildings.

Ans.



(e2) Suggest the most suitable place (i.e. buildings) 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.

(e3) Suggest the placement of the following device 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	
(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 very high speed connectivity? (i) Telephone Analog Line (ii) Optical Fiber (iii) Ethernet cable	
Ans.	(ii) Optical Fiber	
(f)	Write the full forms of the following: (f1) FTP (f2) FSF	**1**
Ans.	(f1) FILE TRANSFER PROTOCOL (f2) FREE SOFTWARE FOUNDATION	
(g)	Name any two common Web browsers.	**1**
Ans.	Internet explorer Google Chrome	