Computer Science (Code 083)
Sample Paper with Solution Set - 1

Max. Marks: 70 **Duration: 3 Hours**

1.

(a) What is the difference between Global Variable and Local Variable? 2

Answer:

Global Variable	Local Variable
• It is variable which is declared outside all the functions • It is accessible throughout the program	• It is a variable which is declared with in a function or with in a compound statement • It is accessible only within a function/compound statement in which it is declared

```
#include <iostream.h>
float NUM=900;                      //NUM is a global varibale
void LOCAL(int T)
{
    int Total=0;                    //Total is a local variable
    for (int I=0;I<T;I++)
        Total+=I;
    cout<<NUM+Total;
}
void main()
{
  LOCAL(45);
}
```

(b) Write the names of the header files to which the following belong: 1
(i) strcmp() (ii) fabs()

Answer:

(i) string.h	(ii) math.h

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

```
#include [iostream.h]
class PAYITNOW
{
   int Charge;
PUBLIC:
   void Raise(){cin>>Charge;}
   void Show{cout<<Charge;}
};
void main()
{
   PAYITNOW P;
   P.Raise();
   Show();
}
```

Answer:

```
#include <iostream.h>
class PAYITNOW
{
   int Charge;
public:
   void Raise(){cin>>Charge;}
   void Show(){cout<<Charge;}
};
void main()
{
   PAYITNOW P;
   P.Raise();
   P.Show();
}
```

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

```
#include <iostream.h>
struct PLAY
{ int Score, Bonus;};
void Calculate(PLAY &P, int N=10)
{
   P.Score++;P.Bonus+=N;
}
void main()
{
   PLAY PL={10,15};
   Calculate(PL,5);
   cout<<PL.Score<<":"<<PL.Bonus<<endl;
   Calculate(PL);
   cout<<PL.Score<<":"<<PL.Bonus<<endl;
   Calculate(PL,15);
   cout<<PL.Score<<":"<<PL.Bonus<<endl;
}
```

Answer:

```
11:20
12:30
13:45
```

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

```
#include <iostream.h>
#include <ctype.h>
void Encrypt(char T[])
{
   for (int i=0;T[i]!='\0';i+=2)
      if (T[i]=='A' || T[i]=='E') T[i]='#';
         else if (islower(T[i])) T[i]=toupper(T[i]);
            else T[i]='@';
}
void main()
{
   char Text[]="SaVE EArtH";//The two words in the string Text
                            //are separated by single space
   Encrypt(Text);
   cout<<Text<<endl;
}
```

Answer:

@a@E@E#rTH

(f) In the following program, if the value of N given by the user is 15, what maximum and minimum values the program could possibly display? 2

```
#include <iostream.h>
#include <stdlib.h>
void main()
{
     int N,Guessme;
     randomize();
     cin>>N;
     Guessme=random(N)+10;
     cout<<Guessme<<endl;
}
```

Answer:

Maximum Value: 24 Minimum Value: 10

2.

(a) What do you understand by Data Encapsulation and Data Hiding? 2

Answer:

Data Encapsulation: Wrapping up of data and function together in a single unit is known as Data Encapsulation. In a class, we wrap up the data and function together in a single unit.
Data Hiding: Keeping the data in private visibility mode of the class to prevent it from accidental change is known as Data Hiding.

```
class Computer
{
  char CPU[10];int RAM;
public:
   void STOCK();
   void SHOW();
};
```

Data Hiding

Data Encapsulation

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

```
class Seminar
{
   int Time;
public:
   Seminar()                  //Function 1
   {
      Time=30;cout<<"Seminar starts now"<<end1;
   }
   void Lecture()             //Function 2
   {
      cout<<"Lectures in the seminar on"<<end1;
   }
   Seminar(int Duration)      //Function 3
   {
      Time=Duration;cout<<"Seminar starts now"<<end1;
   }
```

```
    ~Seminar()                  //Function 4
    {
      cout<<"Vote of thanks"<<end1;
    }
};
```

i) In Object Oriented Programming, what is **Function 4** referred as and when does it get invoked/called?

Answer:

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

ii) In Object Oriented Programming, which concept is illustrated by **Function 1** and **Function 3** together? Write an example illustrating the calls for these functions.

Answer:

Constructor Overloading (Polymorphism) Seminar S1,S2(90);

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

Private Members

a. **TestCode of type integer**
b. **Description of type string**
c. **NoCandidate of type integer**
d. **CenterReqd (number of centers required) of type integer**
e. **A member function CALCNTR() to calculate and return the number of centers as (NoCandidates/100+1)**

Public Members

- **A function SCHEDULE() to allow user to enter values for TestCode, Description, NoCandidate & call function CALCNTR() to calculate the number of Centres**
- **A function DISPTEST() to allow user to view the content of all the data members**

Answer:

```
class TEST
{
   int TestCode;
   char Description[20];
   int NoCandidate,CenterReqd;
   void CALCNTR();
public:
   void SCHEDULE();
   void DISPTEST();
};
void TEST::CALCNTR()
{
   CenterReqd=NoCandidate/100 + 1;
}
void TEST::SCHEDULE()
{
   cout<<"Test Code   :";cin>>TestCode;
   cout<<"Description  :";gets(Description);
   cout<<"Number      :";cin>>NoCandidate;
   CALCNTR();
}
void TEST::DISPTEST()
{
   cout<<"Test Code   :"<<TestCode<<endl;
```

```
    cout<<"Description  :"<<Description<<endl;
    cout<<"Number      :"<<NoCandidate<<endl;;
    cout<<"Centres     :"<<CenterReqd<<endl;;
}
```

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

```
class PUBLISHER
{
   char Pub[12];
   double Turnover;
protected:
   void Register();
public:
   PUBLISHER();
   void Enter();
   void Display();
};

class BRANCH
{
   char CITY[20];
protected:
   float Employees;
public:
   BRANCH();
   void Haveit();
   void Giveit();
};

class AUTHOR:private BRANCH,public PUBLISHER
{
   int Acode;
   char Aname[20];
   float Amount;
public:
   AUTHOR();
   void Start();
   void Show();
};
```

(i) Write the names of data members, which are accessible from objects belonging to class AUTHOR.

(ii) Write the names of all the member functions which are accessible from objects belonging to class BRANCH.

(iii) Write the names of all the members which are accessible from member functions of class AUTHOR.

(iv) How many bytes will be required by an object belonging to class AUTHOR?

Answer:

(i) None of data members are accessible from objects belonging to class AUTHOR.
(ii) Haveit(), Giveit()
(iii) Data members: Employee, Acode, Aname, Amount
Member function: Register(), Enter(), Display(), Haveit(), Giveit(), Start(), Show(),
(iv) 70

3.

(a) Write a function in C++ to merge the contents of two sorted arrays A & B into third array C. Assuming array A is sorted in ascending order, B is sorted in descending order, the resultant array is required to be in ascending order. **4**

Answer:

```
void AddNSave(int A[],int B[],int C[],int N,int M, int &K)
{
  int I=0,J=M-1;
  K=0;
  while (I<N && J>=0)
    if (A[I]<B[J])
      C[K++]=A[I++];
    else
      if (A[I]>B[J])
         C[K++]=B[J--];
      else
      {
        C[K++]=A[I++];
        J--;
      }
  for (int T=I;T<N;T++)
    C[K++]=A[T];
  for (T=J;T<M;T--)
    C[K++]=B[T];
}
```

(b) An array S[40][30] is stored in the memory along the row with each of the element occupying 2 bytes, find out the memory location for the element S[15][5], if an element S[20][10] is stored at the memory location 5500. **4**

Answer:

Given,
W=2
N=40
M=30
Loc(S[15][5])=5500

Row Major Formula:

Loc(S[I][J])	=Base(S)+W*(M*I+J)
Loc(S[15][5])	=Base(S)+2*(30*15+5)
5500	=Base(S)+2*(450+5)
Base(S)	=5500- 910
Base(S)	=4590
Loc(S[20][10])	=4590+2*(30*20+10)
	=4590+2*(600+10)
	=4590+1220
	=5810

(c) Write a function in C++ to perform Insert operation in a dynamically allocated Queue containing names of students. 4

Answer:

```
struct NODE
{
   char Name[20];
   NODE *Link;
};
class QUEUE
{
   NODE *R,*F;
public:
   QUEUE();
   void Insert();
   void Delete();
};
void QUEUE::Insert()
{
   NODE *Temp;
   Temp=new NODE;
   gets(Temp->Name);
   Temp->Link=NULL;
   if (Front==NULL)
   {
     Rear=Temp;
     Front=Temp;
   }
   else
   {
     Rear->Link=Temp;
     Rear=Temp;
   }
}
```

(d) Write a function in C++ to find the sum of both left and right diagonal elements from a two dimensional array (matrix). 2

Answer:

```
void DiagSum(int M[][4],int N,int M)
{
   int SumD1=0,SumD2=0;
   for (int I=0;I<N;I++)
   {
      SumD1+=M[I][I];SumD2+=M[N-I-1][I];
   }
   cout<<"Sum of Diagonal 1:"<<SumD1<<endl;
   cout<<"Sum of Diagonal 2:"<<SumD2<<endl;
}
```

(e) Evaluate the following postfix notation of expression: 2
20,30,+,50,40,-,*

Answer:

Step 1: Push

20

Step 2: Push

30
20

Step 3: +

	Pop		**Pop**	**Push**
	Op2=30		**Op1=20**	
			Op2=30	
20				**50**

Step 4: Push

50
50

Step 5: Push

40
50
50

Step 6: -

	Pop		**Pop**	**Push**
	Op2=40		**Op1=50**	
50			**Op2=40**	**10**
50		**50**		**50**

Step 7: *

	Pop		**Pop**	**Push**
	Op2=10		**Op1=50**	
			Op2=10	
50				**500**

Step 8: Pop

Result
500

4.

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

```
#include <fstream.h>
class Item
{
   int Ino;char Item[20];
public:
   //Function to search and display the content from a particular
   //record number
```

```
    void Search(int );
    //Function to modify the content of a particular record number
    void Modify(int);
};
void Item::Search(int RecNo)
{
    fstream File;
    File.open("STOCK.DAT",ios::binary|ios::in);
    _____________________                    //Statement 1
    File.read((char*)this,sizeof(Item));
    cout<<Ino<<"==>"<<Item<<endl;
    File.close();
}
void Item::Modify(int RecNo)
{
    fstream File;
    File.open("STOCK.DAT",ios::binary|ios::in|ios::out);
    cout>>Ino;cin.getline(Item,20);
    _____________________                    //Statement 2
    File.write((char*)this,sizeof(Item));
    File.close();
}
```

Answer:

```
File.seekg(RecNo*sizeof(Item));  //Statement 1

File.seekp(RecNo*sizeof(Item));  //Statement 2
```

(b) Write a function in C++ to count the number of lines present in a text file "STORY.TXT". 2

Answer:

```
void CountLine()
{
    ifstream FIL("STORY.TXT");
    int LINES=0;
    char STR[80];
    while (FIL.getline(STR,80))
      LINES++;
    cout<<"No. of Lines:"<<LINES<<endl;
}
```

(c) Write a function in C++ to search for a BookNo from a binary file "BOOK.DAT", assuming the binary file is containing the objects of the following class. 3

```
class BOOK
{
    int Bno;
    char Title[20];
public:
    int RBno(){return Bno;}
    void Enter(){cin>>Bno;gets(Title);}
    void Display(){cout<<Bno<<Title<<endl;}
};
```

Answer:

```
void BookSearch()
{
   fstream FIL;
   FIL.open("BOOK.DAT",ios::binary|ios::in);
   BOOK B;
   int bn,Found=0;
   while (FIL.read((char*)&S,sizeof(S)))
     if (FIL.RBno()==bn)
      {
         S.Display();
         Found++;
      }
   if (Found==0) cout<<"Sorry! Book not found!!!"<<endl;
   FIL.close();
}
```

5.

(a) What do you understand by Degree and Cardinality of a table? 2

Answer:

Degree of a table is total number of attributes.
Cardinality of a table is total number of rows.

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

Table: ACTIVITY

ACode	ActivityName	ParticipantsNum	PrizeMoney	ScheduleDate
1001	Relay 100x4	16	10000	23-Jan-2004
1002	High jump	10	12000	12-Dec-2003
1003	Shot Put	12	8000	14-Feb-2004
1005	Long Jump	12	9000	01-Jan-2004
1008	Discuss Throw	10	15000	19-Mar-2004

Table: COACH

PCode	Name	ACode
1	Ahmad Hussain	1001
2	Ravinder	1008
3	Janila	1001
4	Naaz	1003

(i) To display the name of all activities with their Acodes in descending order.

Answer:

SELECT ActivityName, ACode FROM ACTIVITY ORDER BY Acode DESC;

(ii) To display sum of PrizeMoney for each of the Number of participants groupings (as shown in column ParticipantsNum 10,12,16)

Answer:

SELECT SUM(PrizeMoney),ParticipantsNum FROM ACTIVITY GROUP BY ParticipantsNum;

(iii) To display the coach's name and ACodes in ascending order of ACode from the table COACH

Answer:

SELECT Name, ACode FROM PLAYER ORDER BY ACode;

(iv) To display the content of the GAMES table whose ScheduleDate earliar than 01/01/2004 in ascending order of ParticipantNum.

Answer:

SELECT * FROM ACTIVITY WHERE Schedule<{01/01/2004} ORDER BY ParticipantNum;

(v) SELECT COUNT(DISTINCT ParticipantsNum) FROM ACTIVITY;

Answer:

3

(vi)SELECT MAX(ScheduleDate),MIN(ScheduleDate) FROM ACTIVITY;

Answer:

19/03/2004 12/12/2003

(vii)SELECT SUM(PrizeMoney) FROM ACTIVITY;

Answer:

54000

(viii) SELECT DISTINCT ParticipantNum FROM COACH;

Answer:

16
10
12

6.

(a) State and verify Demorgan's Laws. 2

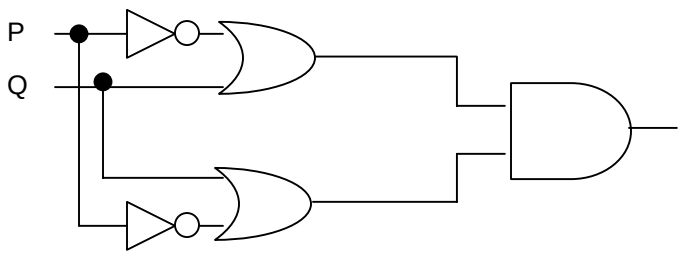
Answer:

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

X	Y	X+Y	(X+Y)'	X'	Y'	X'.Y'	X.Y	(X.Y)'	X'+Y'
0	0	0	1	1	1	1	0	1	0
0	1	1	0	1	0	0	0	1	0
1	0	1	0	0	1	0	0	1	0
1	1	1	0	0	0	0	1	0	1

Verified

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



Answer:

F(P,Q)=(P'+Q).(P+Q')

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

U	V	W	F
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

Answer:

F(U,V,W) = (U+V+W').(U+V'+W').(U'+V+W')

(d) Reduce the following Boolean Expression using K-Map: 3
F(A,B,C,D)=Σ(0,1,2,4,5,6,8,10)

Answer:

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

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

7.

a) What is the significance of ARPANET in the network? 1

Answer:

The first computer network was jointly designed by The Advanced Research Projects Agency (ARPA) and Department of Defence (DoD) in 1969 and was called ARPANET. It was an experimental project, which connected a few computers of some of the reputed universities of USA and DoD. ARPANET allowed access and use of computer resource sharing projects. Later Defence Data Network (DDN) was born in 1983.

b) Expand the following terminologies: 1
(i) CDMA (ii) GSM

Answer:

(i) Code Division Multiple Access
(ii) Global System for Mobile Communication

c) Give two major reasons to have network security. 1

Answer:

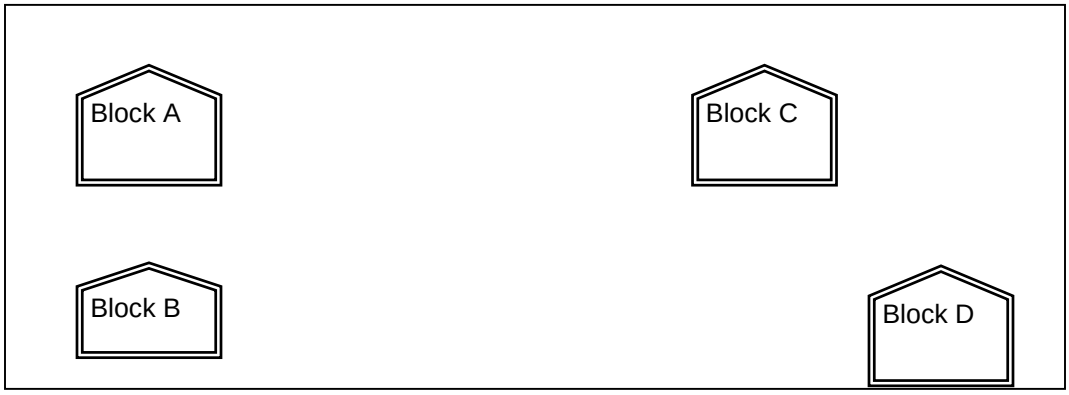
Two major reasons to have Network Security are
(i) **Secrecy**: Keeping information out of the reach of unauthorized users.
(ii) **Authentication**: Determining the authorized user before sharing sensitive information with or entering into a business deal.

d) What is the purpose of using a Web Browser? Name any one commonly used Web Browser. 1

Answer:

The Web Browser fetches the page requested, interprets the text and formatting commands that it contains, and displays the page properly formatted on the screen.
Example of a Web Browser:
Internet Explorer OR Netscape Navigator.OR Mosaic

e) Knowledge Supplement Organisation has set up its new center at Mangalore for its office and web based activities. It has 4 blocks of buildings as shown in the diagram below:



Center to center distances between various blocks

Black A to Block B	50 m
Block B to Block C	150 m
Block C to Block D	25 m
Block A to Block D	170 m
Block B to Block D	125 m
Block A to Block C	90 m

Number of Computers

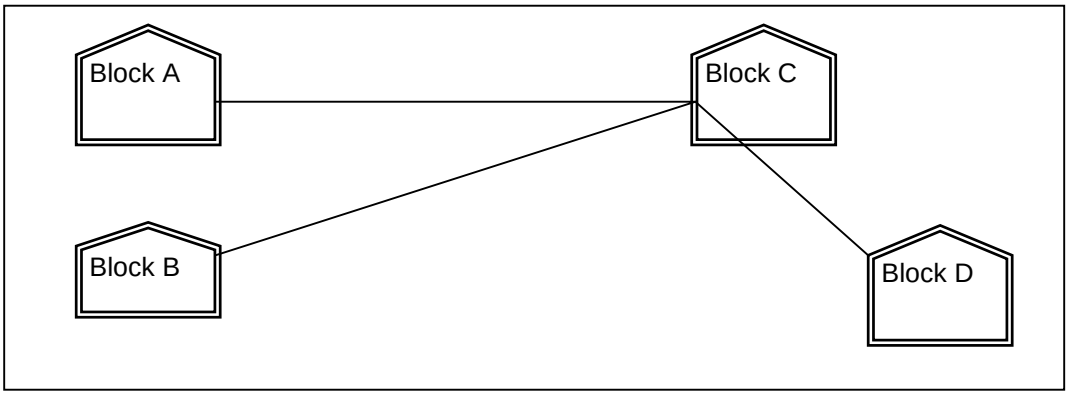
Black A	25
Block B	50
Block C	125
Block D	10

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

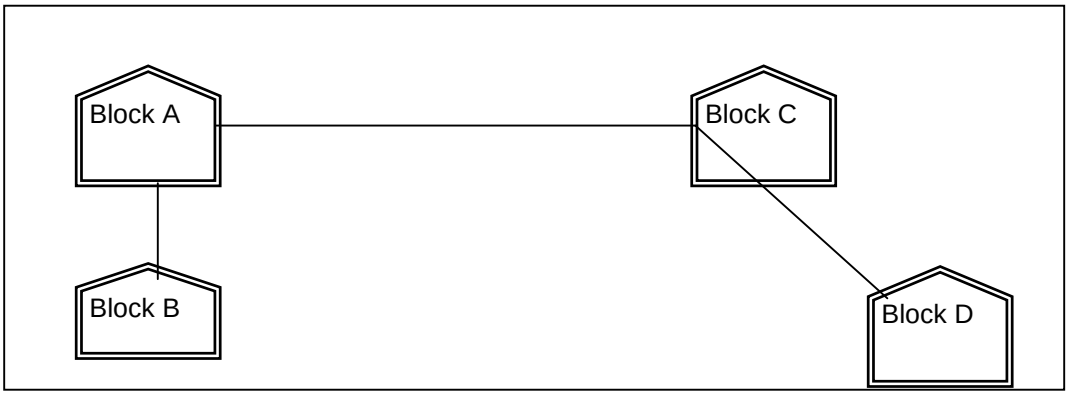
Answer:

(Any of the following option)

Layout Option 1:



Layout Option 2: Since the distance between Block A and Block B is quite short



e2) Suggest the most suitable place (i.e. block) to house the server of this organisation with a suitable reason. 1

Answer:

The most suitable place / block to house the server of this organisation would be Block C, as this block contains the maximum number of computers, thus decreasing the cabling cost for most of the computers as well as increasing the efficiency of the maximum computers in the network.

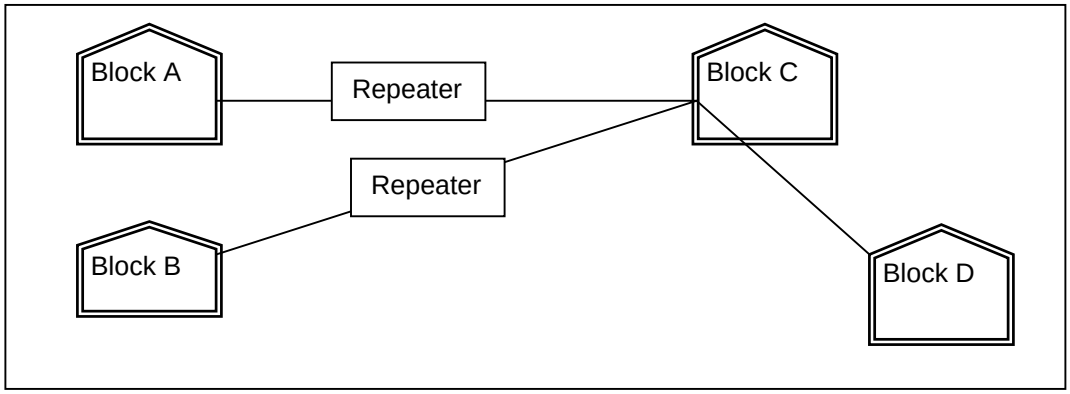
e3) Suggest the placement of the following devices with justification 1

(i) Repeater

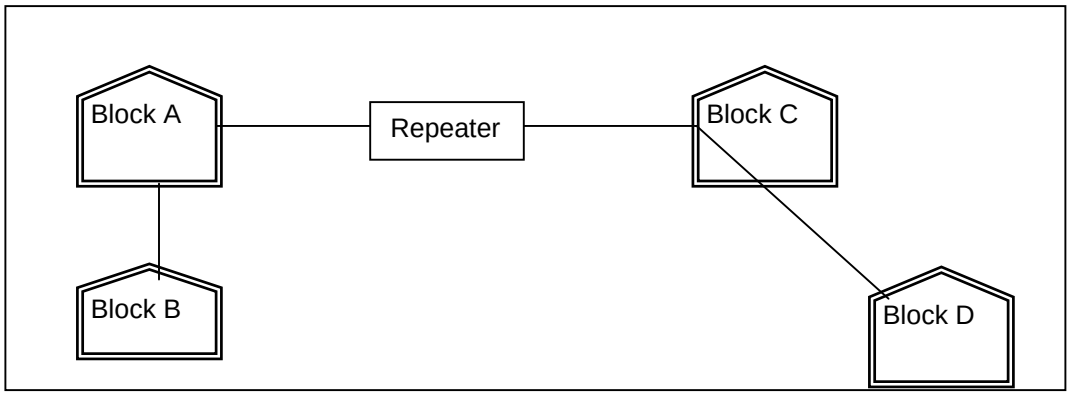
(ii) Hub/Switch

Answer:

(i) For Layout 1, since the cabling distance between Blocks A and C, and that between B and C are quite large, so a repeater each, would ideally be needed along their path to avoid loss of signals during the course of data flow in these routes.

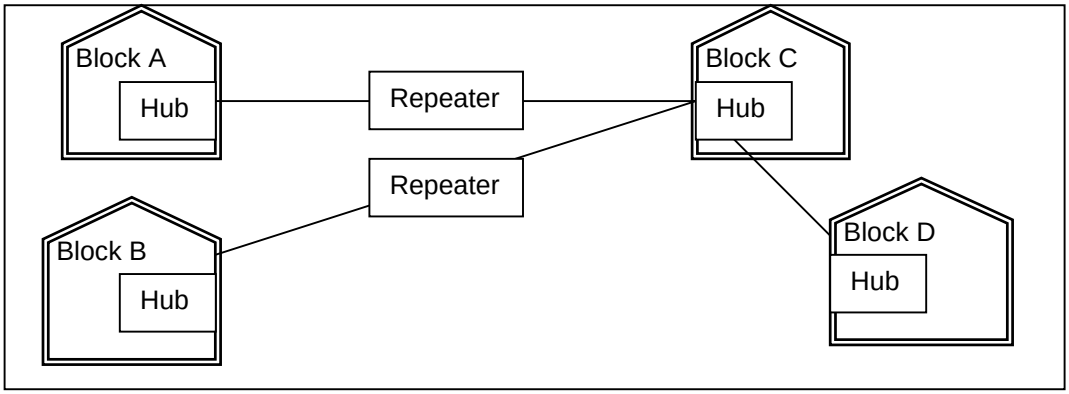


For layout 2, since the distance between Blocks A and C is large so a repeater would ideally be placed in between this path

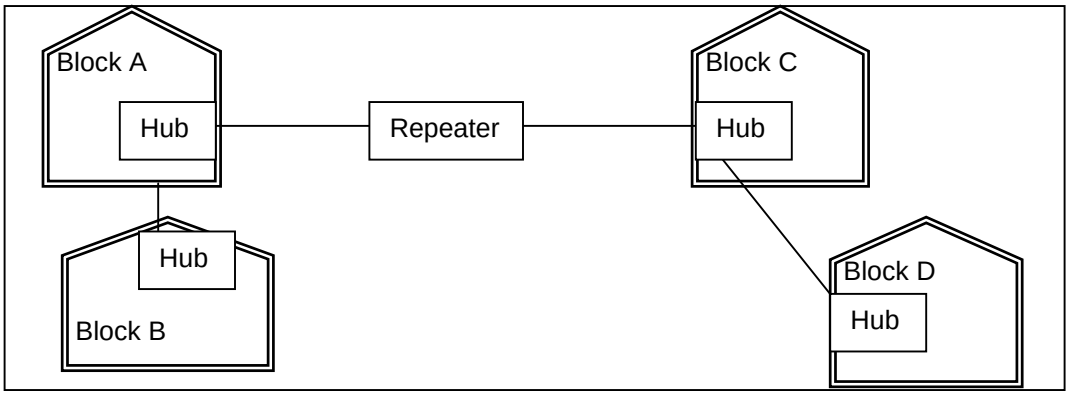


(ii) In both the layouts, a hub/switch each would be needed in all the blocks, to interconnect the group of cables from the different computers in each block

Layout 1



Layout 2



e4) The organization is planning to link its front office situated in the city in a hilly region where cable connection is not feasible, suggest an economic way to connect it with reasonably high speed? 1

Answer:

The most economic way to connect it with a reasonable high speed would be to use radio wave transmission, as they are easy to install, can travel long distances, and penetrate buildings easily, so they are widely used for communication, both indoors and outdoors. Radio waves also have the advantage of being omni directional, which is they can travel in all the directions from the source, so that the transmitter and receiver do not have to be carefully aligned physically.