SAMPLE PAPER: SET-2
CLASS: XII
SUBJECT: COMPUTER SCIENCE

NOTE: In this solution " ' " is used instead of " ¯ " .

1(a)	**What is the purpose of using a typedef command in C++? Explain with suitable example.**	**2**
Ans.	typedef command defines a new name or an alias name for an existing type. For example, all transactions generally involve amounts which are of (say) double type. So, for a bank application, we can safely provide an alias name as Amount to the predefined double type. For this, we shall write: typedef double Amount; Now we can define any amount using the data type Amount as: Amount loan, balance, installment, interest;	
1(b)	**Name the header files to which the following belong:** **(i) isalnum() (ii) abs()**	**1**
Ans.	(i) isalnum() – ctype.h (ii) abs() – math.h	

1(c)	**Rewrite the corrected code for the following program. Underline each correction (if any):**
	`#include<iostream.h>`
	`structure Swimmingclub`
	`{`
	`  int mem number;`
	`  char memname[20];`
	`  char memtype[]="LIG";`
	`};`
	`void main()`
	`{`
	`  Swimmingclub per1,per2;`
	`  cin<<"Member Number:";`
	`  cin>>memnumber.per1;`
	`  cout<<"Member Name:";`
	`  cin>>per1.membername;`
	`  per1.memtype="HIG";`
	`  per2=per1;`
	`  cin<<"Member Number:"<<per2.memnumber;`
	`  cin<<"Member Name"<<per2.memname;`
	`  cin<<"Member Number:"<<per2.memtype;`
	`}`
		3

Ans.	`#include<iostream.h>`
	`#include<string.h>`
	`struct Swimmingclub  //should be struct`
	`{`
	`  int memnumber;  // a variable name cannot cotain spaces`
	`  char memname[20];`
	`  char memtype[4];  // cannot initialize a structure member`
	`  // inside structure defination`
	`};`
	`void main()`
	`{`
	`  Swimmingclub per1,per2;`
	`  cout<<"Member Number:";  //should be cout`
	`  cin>>per1.memnumber;  // structure.member`	

```
      cout<<"Member Name:";
      cin>>per1.memname;   //membername is not the structure member
      strcpy(per1.memtype="HIG");  //to copy string strcpy is used
      per2=per1;
      cout<<"Member Number:"<<per2.memnumber;     //should be cout
      cout<<"Member Name"<<per2.memname;          //should be cout
      cout<<"Member Number:"<<per2.memtype;       //should be cout
}
```

1(d) **What will be the output of the following program:** **2**

```
#include<iostream.h>
#include<ctype.h>
#include<conio.h>
#include<string.h>
void ChangeString(char Text[], int &Counter)
{
      char *Ptr=Text;
      int Length=strlen(Text);
      for(;Counter<Length-2;Counter+=2,Ptr++)
      {
            *(Ptr+Counter)=toupper(*(Ptr+Counter));
      }
}
void main()
{
      clrscr()'
      int Position=0;
      char Messages[]="Pointer Fun";
      ChangeString(Message,Position);
      cout<<Message<<'@"<<Position;
}
```

Ans.

Output:

PoiNteRs Fun @ 10

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

```
#include<iostream.h>
#include<ctype.h>
#include<string.h>
void Convert(char Str[], int Len)
{
      for(int Count=0; Count<Len;Count++)
      {
            if(isupper(Str[count]))
                  Str[Count]=tolower(Str[Count]);
            else if(islower(Str[Count]))
                  Str[Count]=toupper(Str[Count]);
            else if(isdigit(Str[Count]))
                  Str[Count]=Str[Count]+1;
            else Str[Count]='*';
      }
}
void main()
{
      Char Text[]="CBSE Exam 2005";
      int Size=strlen(Text);
      Convert(Text,Size);
      for(int C=0,R=size-1;C<=Size/2;C++,R--)
      {
```

```
            char Temp=Text[C];
            Text[C]=Text[R];
            Text[R]=Temp;
      }
      cout<<Text<<endl;
}
```

Ans. Output:
Cbse*eXAM*3116
6113*MAXe*esbc

1(f) **What are Nested Structures? Give an example.** **2**

Ans. A structure having another structure as its member element, is known as nested structure. *e.g.,*

```
struct addr                  //structure
{
      int houseno;
      char area[26];
      char city[26];
      char state[26];
};
struct emp       //structure having another structure as its member
{
      int empno;
      char name[26];
      char desig[16];
      addr address;          //another structure
      float basic;
};
emp worker;                 //create structure variable
```

2(a) **Define the term Data Hiding in the context of Object Oriented Programming. Give a suitable example using a C++ code to illustrate the same.** **2**

Ans. In the context of Object Oriented Programming, *data hiding* is a property whereby the internal data structure of an object is hidden from the rest of the program.
In C++, data hiding is achieved by declaring object numbers under private section of a class e.g.,

```
class Student
{
      int rollno;
      char name[25];
      float marks;
      char grade;
      char calgrade();
      public:
      void GetData();
      void ShowData();
}
```

These members will remain hidden from outside world

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

```
class Exam
{
      int year;
      public:
            Exam(it y)   {    year=y;    }    //Constructor 1
            Exam(Exam &t)                     //Constructor 1
};
```

(i) Create an object, such that it invokes Constructor 1.
(ii) Write complete definition for constructor 2.

Ans.

```
(i)  Exam obj1(2006);
(ii) Exam(Exam &t)
```

```
        {
            year = t.year;
        }
```

2(c) **4**

Define a class Travel i C++ with the description given below:

Private Members:

T_Code	**of type string**
No_of_Adults	**of type integer**
No-of_Children	**of type integer**
Distace	**of type integer**
TotalFare	**of ype float**

Public Members:

- **A constructor to assign initial values as follows:**
  - **T_Code with the word "NULL"**
  - **No_of_Adults as 0**
  - **No_of_children as 0**
  - **Distance as 0**
  - **TotalFare as 0**
- **A function AssignFare() which calculates and assign the value of the date member TotalFare as follows:**

  For each Adult

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

  For each child the above Fare will be 50% of the Fare mentioned in the above table.

  For example:

  If Distance is 750, No_of_Adults=3 and No_of_Children=2

  Then totalFare should be calculated as

  No_of_Adults*30 + No_of_children*150

  i.e., 3*300+2*150=1200
- **A function EnterTravel() to input the values of the data members T_Dode, No_of_adults, No_of_children and Distance; and invoke the AssignFare() function**
- **A Function ShowTravel() which display the content of all the data members for a Travel.**

Ans.

```
class Travel
{
      char T_Code[5];
      int No_of_Adults;
      int No_of_Children;
      int Distance;
      float TotalFare;
      public:
      Travel()
      {
            strcpy(T_Code,"NULL");
            No_of_Aduts=0;
            No_of_Children=0;
            Dustance=0;
            TotalFare=0;
      }
      void AssignFare()
      {
            float fare=0;
            if(Distance>=1000)
```

```
            fare=No_of_Adults*500 + No_of_Children*250;
            else if(Distance>=500)
                  fare=No_of_Children*300 + No_of_Children*150;
            else
                  fare=No_of_Adults*200 + No_of_Children*100;
            TotalFare=fare;
      }
      void EnterTravel()
      {
            cout<<"Enter value of travel code:";
            cin>>T_Code;
            cout<<"Enter No. of Adults:";
            cin>>No_of_Adults;
            cout<<"Enter No. of Children:";
            cin>>No_of_Children;
            cout<<"Enter Distance:";
            AssignFare();
      }
      void ShowTravel()
      {
            cout<<"Travel code:"<<T_Code<<endl;
            cout<<"No of Adults:"<<No_of_Adults<<endl;
            cout<<"No of Children:"<<No_of_Children<<endl;
            cout<<"Distance:"<<Distance<<endl;
            cout<<"Total Fare:"<<TotalFare<<endl;
      }
};
```

2(d) **Answer the question (i) to (iv) based on the following code:** **4**

```
class Trainer
{
      char TNo[5], TName[20], Specialisation[10];
      int Days;
     protected:
      float Remuneration;
      void AssignRem(float);
     public:
      Trainer();
      void TEntery();
      void TDisplay();
};
class Learner
{
      char regno[10], LName[20],Prpgram[10];
     protected:
      int Attendeance, Grade;
     public:
      Learner();
      void LEntery();
      void LDisplay();
};
class Institute:public Learner, public Trainer
{
      char ICode[10],IName[20];
     public:
      Institute();
      vod IEntry();
```

	`void IDisplay();`
	`};`
	(i) Which type of Inheritance is depicted by the above example?
	(ii) Identify the member function(s) that cannot be called directly from the objects of class Institute from the following:
	TEntry()
	LDisplay()
	IEntry()
	(iii) Write name of all the member(s) accessible from member functions of class Institute.
	(iv) If class Institute was derived privately from class Learner and privately from class Trainer, then, name the member function(s) that could be accessed through Objects of class Institute.	

Ans.	(i) Multiple Inheritance (ii) None (Since all of these functions can be called from object of class Institute). (iii) Remuneration, Attendance, Grade, ICode, IName (iv) IEntry(), IDisplay	
3(a)	**Write a function in C++ which accepts an integer array and its size as argument/parameters and assign the elements into a two dimensional array of integers in the following format:** **If the array is 1, 2, 3, 4, 5, 6** **The resultant 2 D array is given below** **1 2 3 4 5 6** **1 2 3 4 5 0** **1 2 3 4 0 0** **1 2 3 0 0 0** **1 2 0 0 0 0** **1 0 0 0 0 0** **If the array is 1, 2, 3** **The resultant 2 D array is given below** **1 2 3** **1 2 0** **1 0 0**	**4**

Ans.	`void func(int arr[],int size)`
	`{`
	`int a2[20][20];`
	`int i,j;`
	`for(i=0;i<size;i++)`
	`{`
	`for(j=0;j<size;j++)`
	`{`
	`if((i+j)>=size)`
	`a2[i][j]=0;`
	`else`
	`a2[i][j]=arr[j];`
	`cout<<a2[i][j]=arr[j];`
	`}`
	`cout<<endl;`
	`}`
	`}`	

3(b)	**An array ARR[5][5] is stored in the memory with each element occupying 2 bytes of space. Assuming the base address of ARR to be 1500, compute the address of ARR[2][4], when the array is stored:** **(i) Row Wise (ii) Column Wise**	**4**
Ans.	Base address B=1500 Element width w=2 bytes Total rows r=5 Total columns c=5 ARR[I][J] = ARR[2][4] => I=2, J=4 Lowest row index l_r=0 in C++	

Lowest column index l_c=0 in C++

(i) Row wise

ARR[I][J] = B + w(c(J – l_r) + (J – L_c))

ARR[2][4] = 1500 + 2(5(2-0) + (4-0))

= 1500 + 28

= 1528

(ii) Column wise

ARR[2][4] = B + w(c(I – l_r) + (I – l_c))

ARR[2][4] = 1500 + 2((2-0) + 5(4-0))

= 1500 + 44

= 1544

3(c) **Define member function queins() to insert nodes and quedel() to delete nodes of the linked list implemented class queue, where each node has the following structure:** **4**

```
struct node
{
      char name[20];
      int age;
      node *Link;
};
class queue
{
      node *rear,*front;
      public:
      queue() { rear=NULL; front=NULL; };
      void queins();
      void quedel();
};
```

Ans.

```
void queue::queins()
{
      node *nptr;
      nptr=new node;
      nptr->Link=NULL;
      cout<<"Enter name and age for new node";
      gets(nptr->name);
      cin>>nptr->age;
      if(rear==NULL)
      {
            front=rear=nptr;
      }
      else
      {
            rear->Link=nptr;
            rear=nptr;
      }
}
void queue::quedel()
{
      node *ptr;
      if(front==NULL)
            cout<<"Underflow";
      else
      {
```

```
            ptr=front;
            if(front==rear)
                  front=rear=NULL;
            else
                  front=front->Link;
            delete ptr;
      }
}
```

3(d) **Write a function in C++ to find the sum of diagonal element from a 2 dimensional array of type float. Use the array and its size as parameters with float as its return type.** **2**

Ans.

```
// assuming that maximum rows ad cols are 10, 10 respectively
float diagonalSum(float A[10][10], int r, int c)
{
      int i,j;
      float sum=0;
      //We are calculating sum of diagonal elements considering both diagonals
      //We are adding intersecting element on two diagonal twice
      for(i=0;i<r;i++)
      {
            for(j=0;j<c;j++)
            {
                  if(i==j)        //elements on first diagonal
                  sum+=A[i][j];
                  if((i+j)==(r-1))    // elements on off-diagonal
                  sum+=A[i][j];
            }
      }
      return sum;
}
```

3(e) **Evaluate the following postfix notation of expression:**
25 8 3 - / 6 * 10 + **2**

Ans. 25 8 3 - / 6 * 10 +]

Adding] at the end of postfix expression and inserting [to the stack.

Symbol	Action	Stack	Intermediate Output
25	Operand: Push	[↑ [25 ↑ (↑-top)	
8	Operand: Push	[25,8 ↑	
3	Operand: Push	[25,8,3 ↑	
-	Operator: Pop twice	[25 ↑	
	Calculate result and Push back	[25,5 ↑	8 -3=5
	Operator: Pop twice	[↑	
	Calculate result and Push back	[5 ↑	25/5=5
6	Operand: Push	[5,6	

	*	Operator: Pop twice	↑ [↑	
		Calculate result and Push back	[30 ↑	5*6=30
	10	Operand: Push	[30,10 ↑	
	+	Operator: Pop twice	[↑	
		Calculate result and Push back	[40 ↑	30+10=40
	]	End of expression, Pop everything	40: Answer	

4(a) **1**

Observe the program segment given below carefully, and answer the question that follows:

```
class Member
{
      int Member_no;
      char Member_name[20];
       public:
      //function to enter Member details
      void enterdetails();
      //function to display Member details
      void showdetails();
      //function to return Member_no
      int RMember_no() { return Member_no; }
};
void Update(Member NEW)
{
      fstream File;
      File.open("MEMBER.DAT",ios::binary|ios::in|ios::out);
      Member OM;
      int Recoedsread=0,Found=0;
      while(!Found && File.read((char*)&OM,sizeof(OM)))
      {
            Recordsread++;
            if(NEW.RMember_no()==OM.RMember_no())
            {
                  __________ //Missing Statement
                  File.write((char*)&NEW,sizeof(NEW));
                  Found=1;
            }
            else
                  File.write((char*)&OM,sizeof((OM));
      }
      if(!Found)
            cout<<"Records for modification does not exist";
      File.close();
}
```

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

Ans. `File.seekg(-1 * sizeof(OM),ios::cur);`

4(b)	**Assuming that a text file named TEXT.TXT already contains some text written into it, write a function named vowelwords(), that reads the file TEXT1.TXT and creates a new file named TEXT2.TXT, which shall contains only those words from the file TEXT1.TXT which don't start with an uppercase vowel(i.e., with 'A', 'E', 'I', 'O', 'U'). For example, if the file TEXT1.TXT contains** **Carry Umbrella and Overcoat When it Rains** **then the file TEXT.2TXT shall contain** **Carry When it Rains**	**3**

Ans.	`#include<fstream.h>`
	`void main()`
	`{`
	`  fstream fin("text1.txt");`
	`  ofstream fout("text2.txt");`
	`  char word[25];`
	`  while(!fin.eof())`
	`  {`
	`  fin>>word;`
	`  switch(word[0])`
	`  {`
	`  case 'A':`
	`  case 'E':`
	`  case 'I':`
	`  case 'O':`
	`  case 'U': continue;`
	`  }`
	`  fout<<word<<' ';`
	`  }`
	`}`	

4(c)	**Assuming the class Vehicle as follows:** **class vehicle** **{** **char vehicletype[10];** **int no_of_wheels;** **public:** **void getdetails()** **{** **gets(vehicletype);** **cin>>no_of_wheels;** **}** **void showdetails()** **{** **cout<<"Vehicle Type"<<vehicletype;** **cout<<"Number of wheels="<<no_of_wheels;** **}** **};** **Write a function shoefile() to read all the records present in an already existing binary file SPEED.DAT and display them on the screen, also count the number of records present in the file.**	**2**

Ans.	`void showfile()`
	`{`
	`  ifstream fin;`
	`  fin.open("SPEED.DAT",ios::in|ios::binary);`
	`  vehicle V1;`
	`  int count=0;`
	`  while(!fin.eof())`
	`  {`
	`  fin.read((char*)&V1,sizeof(V1));`	

```
            count++;
            V1.showdetails();
      }
      cout<<"Total number of records are"<<count;
}
```

5(a) **What is the importance of Primary key in a table? Explain with a suitable example.** **2**

Ans. A Primary Key is a set of one or more attributes that can uniquely identify tuples within the relation. For example, in the following table Student, the column Rollno can uniquely identify each row in the table; hence Rollno is the primary key of the following table.

Rollno	Name	Marks	Grade
1	.	.	.
2	.	.	.
3	.	.	.
4	.	.	.

5(b) **Consider the following tables TEACHER and TEACHSALARY and answer (b1) and (b2) parts of this question.**

Table: TEACHER

TID	FIRSTNAME	LASTNAME	ADDRESS	SUBJECT
010	Rohit	Sharma	83 Lok vihar	English
105	Meena	Rathi	842 Rajouri Garden	Physics
152	Seema	Verma	33 Safdarjung	Maths
215	Sarad	Singh	440 Ashok Vihar	Physics
144	Manish	Sengupta	24 New Street	Maths
300	Ram	Gupta	9 Fifth Road	Chemistry
335	Heena	Jain	12 Friends Street	Computer
400	Rachit	Sharma	12 Pachim Vihar	Computer
441	Puneet	Jain	11 Roshni	Chemistry

Table: TEACHSALARY

TID	SALARY	BONUS	DESIGNATION
010	7500	1500	PGT
105	8500	1500	PGT
152	600	1200	TGT
215	7500	1500	TGT
144	5000	1000	PRT
300	4500	1000	PRT
335	4000	1000	PRT
400	6500	1200	TGT
441	7800	1500	PGT

(b1) Write SQL commands for the statements (i) to (iv).

i. **To display Firstname, Lastname and Subject of all teachers having subject Physics.** **1**

ii. **To display the content of Teachers table in ascending order of LASTNAME.** **1**

iii. **To display the TID, Firstname and Total Salary of all PGT from table TEACHER and TEACHSALARY, where Total Salary is calculated as Salary + Bonus.** **1**

iv. **To display the sum of salary of all the PRT Teachers.** **1**

(b2) Give the output of the following SQL queries v to viii:

v. **SELECT FIRSTNAME, SALARY FROM TEACHER, TEACHSALARY WHERE DESIGNATION ="PGT"** **½**

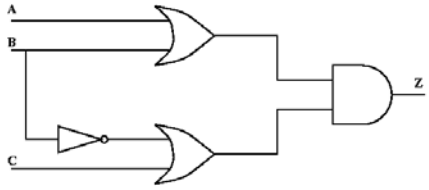
	AND TEAHER.TID=TEACHSALARY.TID; **vi. SELECT DISTINCT DESIGNATION FROM TEACHSALRY;** **vii. SELECT DESIGNATION, MAX(SALRY) FROM TEACSALRY GROUP BY DESIGNATION;** **viii. SELECT SUM(BONUS) FROM TEACHSALRY WHERE DESIGNATION="PGT";**	**½** **½** **½**
Ans.	(b1) i. SELECT FIRSTNAME,LASTNAME,SUBJECT FROM TEACHER WHERE SUBJECT='Physics'; ii. SELECT * FROM TEACHER ORDER BY LASTNAME; iii. SELECT A.TID,FIRSTNAME, SALARY+BONUS AS "Total Salary" FROM TEACHER A,TEACHSALARY B WHERE ((A.TID=B.TID) && (DESIGNATION='PGT')); iv. SELECT SUM(SALARY) FROM TEACHSALARY WHERE DESIGNATION='PRT'; (b2) v. FIRSTNAME: Rohit, Meena, Puneet — SALARY: 7500, 8500, 7800 vi. DESIGNATION: PGT, TGT, PRT vii. DESIGNATION / MAX (SALARY): PGT 8500; PRT 5000; TGT 7500 viii. SUM (BONUS): 4500	
6(a)	**State and verify Absorption law in Boolean Algebra.**	**2**
Ans.	Absorption law states that (i) X + XY = X and (ii) X(X + Y) = X (i) Truth Table for X + XY = X (ii) Truth Table for X(X + Y) = X	
6(b)	**Write the equivalent Boolean expression of the following logic Circuit**	**2**
Ans.	The equivalent Boolean Expression for the given Logic Circuit is: Z = (A + B).(B' + C)	
6(c)	**Write the POS form of a Boolean Function F, which is represented in a truth table as follows:**	**1**

X	Y	XY	X + XY
0	0	0	0
0	1	0	0
1	0	0	1
1	1	1	1

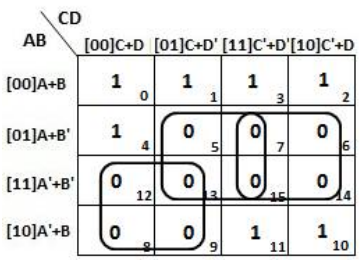
From Truth Table it is proved that X + XY = X

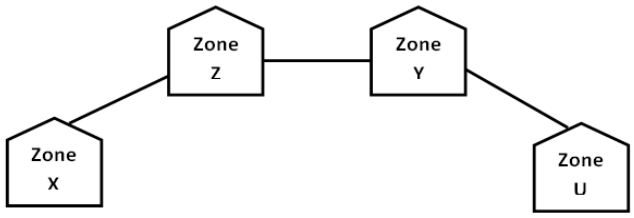
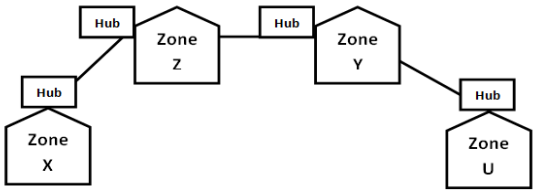
X	Y	X +Y	X(X + Y)
0	0	0	0
0	1	1	0
1	0	1	1
1	1	1	1

From Truth Table it is proved that X(X + Y) = X



X	Y	Z	F
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0

		1	0	1	1	
		1	1	0	0	
		1	1	1	0	
Ans.	The desired Canonical Product -of- Sum form is as following; F = (X+Y'+Z)(X'+Y+Z)(X'+Y'+Z)(X'+Y'+Z')					
6(d)	**Reduce the following Boolean Expression using K-Map:** **F(A,B,C,D)= π(5, 6, 7, 8, 9, 12, 13, 14, 15)**					**2**
Ans.	 There are 3 Quads that reduce as given below: Quad-1(M_5. M_7. M_{13}. M_{15}) reduces to B'+D' Quad-2(M_6. M_7. M_{14}. M_{15}) reduces to B'+C' Quad-2(M_8. M_9. M_{12}. M_{13}) reduces to A'+C Simplified Boolean expression for given K-map is F(A, B, C, D) = (B'+D').(B'+C').(A'+C)					
7(a)	**When do you prefer XML over HTML and why?**					**1**
Ans.	The first benefit of XML is that it allows one to write own markup language, without being restricted to a limited set of tags defined by proprietary vendors. HTML on the other hand adheres a specific standard. With XML, one can create own set of tags at own pace. In HTML, however, one cannot new tags.					
7(b)	**What do you mean by a backbone network?**					**1**
Ans.	A Backbone is central interconnecting structure that connects one or more networks just like the trunk of a tree or the spine of a human being.					
7(c)	**How does firewall protect our Network?**					**1**
Ans.	A firewall is a part of a computer system or network that is designed to block unauthorized access while permitting authorized communications. It is a programmer software or device, or set of devices configured to permit, deny, encrypt, decrypt, or proxy all (in and out) computer traffic between different security domain based upon a set of rules and other criteria.					
7(d)	**What is the importance of URL in networking?**					**1**
Ans.	A Uniform Resource Locator (URL) is used to specify, where an identical resource is available in the network and the mechanism for retrieving for it. A URL is also referred to as a web address.					
7(e)	**The Sony has set up its Branch at Srinagar for its office and web based activities. It has 4 Zone of buildings as shown in the diagram:** Zone Z Zone Y Zone X Zone U **Branch to branch distances are :** **Zone X to Zone Z — 40 Mtr** **Zone Z to Zone Y — 60 Mtr** **Zone Y to Zone X — 135 Mtr** **Zone Y to Zone U — 70 Mtr** **Zone X to Zone U — 165 Mtr** **Zone Z to Zone U — 80 Mtr** **Number of Computers:** **Zone X — 50** **Zone Z — 130**					**4**

		Zone Y | **40** **Zone U** | **15** **(i) Suggest a most suitable cable layout or Networking Topology of connections between the Zones.** **(ii) Suggest the most suitable place (i.e. Zone) to house the ERP and BI Server of this organization with a suitable reason, with justification.** **(iii) Suggest the placement of the following devices with justifications:** **(1) Repeater (2) Hub / Switch** (iv) **Which is the most economic type of cable for the selected topology?**	
Ans.	(i) Bus Topology  (ii) The most suitable place (i.e. Zone) to house the ERP and BI Server is Zone Z as it has the most number of computers thus cabling cost will be reduced and most traffic will be local. (iii) (1) As per suggested layout separate repeaters need not be installed as each building/zone will be having a hub that acts as a repeater. (2) One hub per zone.  (iv) An economic type of cable is Dial-up or broadband as it can connect two computers at an economic rate though it provides lesser speed than other expensive methods.	

NOTE: In this solution " ' " is used instead of" ¯ " .