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General Instructions:

- The answers given in the marking scheme are SUGGESTIVE, Examiners are requested to award marks for all alternative correct solutions/answers conveying similar meaning.
- All programming questions have to be answered with respect to C++ Language for Section A and Python for Section B (All presently supported versions of compilers/interpreters should be considered).
- In C++/Python, ignore case sensitivity for identifiers (Variable / Functions / Structures / Class Names) unless explicitly specified in question.
- In SQL related questions :
  - Both ways of text/character entries should be acceptable. For example: "AMAR" and 'amar' both are acceptable.
  - All date entries should be acceptable for example: 'YYYY-MM-DD', 'YY-MM-DD', 'DD-Mon-YY', "DD/MM/YY", 'DD/MM/YY', "MM/DD/YY", 'MM/DD/YY' and {MM/DD/YY} are correct.
  - Semicolon should be ignored for terminating the SQL statements.
  - Ignore case sensitivity for commands.
  - Ignore headers in output questions.

		Section - A (Only for C++ candidates)	
1	(a)	Find the correct identifiers out of the following, which can be used for naming Variable, Constants or Functions in a C++ program: For, while, INT, NeW, delete, 1stName, Add+Subtract, name1	2
	Ans	`For, INT, NeW, name1`	
		(½ Mark for each correct identifier) *Note:* • *Deduct ½ Mark for writing additional incorrect identifier(s)* • *No marks to be awarded if all the identifiers are mentioned*	

	(b)	Observe the following program very carefully and write the name of those header file (s), which are essentially needed to compile and execute the following program successfully:
		
		`typedef char STRING[80];`
		`void main()`
		`{`
		`  STRING Txt[] = "We love Peace";`
		`  int Count=0;`
		`  while (Txt[Count]!='\0')`
			1

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		`if (isalpha(Txt[Count]))`
		`  Txt[Count++]='@' ;`
		`else`
		`  Txt[Count++]='#' ;`
		`puts (Txt) ;`
		`}`	

	Ans	`ctype, stdio`	
		(½ mark for each header file) *Note: Ignore any additional header file(s)*	

	(c)	Observe the following C++ code very carefully and rewrite it after removing any/all syntactical errors with each correction underlined.
		Note: Assume all required header files are already being included in the program.
		
		`#Define float MaxSpeed=60.5;`
		`void main()`
		`{`
		`  int MySpeed`
		`  char Alert='N' ;`
		`  cin»MySpeed;`
		`  if MySpeed>MaxSpeed`
		`  Alert='Y' ;`
		`cout<<Alert<<endline;`
		`}`
			2

	Ans	`#define float MaxSpeed 60.5;  //Error 1,2,3`
		`void main()`
		`{`
		`  int MySpeed ;  //Error 4`
		`  char Alert='N';`
		`  cin>>MySpeed;`
		`  if (MySpeed>MaxSpeed)  //Error 5`
		`  Alert='Y';`
		`  cout<<Alert<<endl;  //Error 6`
		`}`	

		(½ Mark for each correction upto a maximum of 4 corrections) *OR* *(1 mark for only identifying any 4 errors, without suggesting corrections)*	
	(d)	Write the output of the following C++ program code: Note: Assume all required header files are already being included in the program.	2

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		`void Location(int &X,int Y=4)`
		`{`
		`  Y+=2;`
		`  X+=Y;`
		`}`
		`void main()`
		`{`
		`  int PX=10,PY=2;`
		`  Location(PY) ;`
		`  cout<<PX<<" , "<<PY<<endl ;`
		`  Location(PX,PY);`
		`  cout<<PX<<" , "<<PY<<endl ;`
		`}`	

	Ans	**10, 8** **20, 8**	
		(½ Mark for each correct value) *Note:* ● Deduct ½ *Mark for not considering any or all endl(s) at proper place(s)* ● Deduct ½ *Mark for not considering any or all ',' at proper place(s)*	

	(e)	Write the output of the following C++ program code:
		Note: Assume all required header files are already being included in the program.
		`class Eval`
		`{`
		`  char Level;`
		`  int Point;`
		`public:`
		`  Eval() {Level='E';Point=0;}`
		`  void Sink(int L)`
		`  {`
		`  Level-=L;`
		`  }`
		`  void Float(int L)`
		`  {`
		`  Level += L;`
		`  Point++;`
		`  }`
		`  void Show()`
		`  {`
		`  cout<<Level<<"#"<<Point<<endl;`
		`  }`
		`};`
			3

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```
void main()
{
   Eval E;
   E.Sink(3);
   E.Show();
   E.Float(7);
   E.Show();
   E.Sink(2);
   E.Show();
}
```

Ans

```
B#0
I#1
G#1
```

(1 Mark for each correct line of output)

Note:

- Deduct ½ *Mark for not considering any or all endl(s) at proper place(s)*
- Deduct ½ *Mark for not writing any or all # symbol(s)*

(f) Study the following program and select the possible output(s) from the option (i) to (iv) following it. Also, write the maximum and the minimum values that can be assigned to the variable VAL. **2**

Note:

-Assume all required header files are already being included in the program.

-random(n) function generates an integer between 0 and n-1.

```
void main()
{
   randomize();
   int VAL;
   VAL=random(3)+2;
   char GUESS[]="ABCDEFGHIJK";
   for (int I=1;I<=VAL;I++)
   {
      for(int J=VAL;J<=7;J++)
       cout«GUESS[J];
     cout«endl;
   }
}
```

```
(i)          (ii)         (iii)        (iv)
BCDEFGH      CDEFGH       EFGH         FGHI
BCDEFGH      CDEFGH       EFGH         FGHI
                          EFGH         FGHI
                          EFGH         FGHI
```

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	Ans	(ii) and (iii) Min Value of VAL = 2 Max Value of VAL = 4	
		(½ Mark for writing option (ii)) *(½ Mark for writing option (iii))* *Note:* • *Deduct ½ mark for writing each <u>additional</u> option along with both correct options* *(½ Mark for writing correct Minimum value of VAL)* *(½ Mark for writing correct Maximum value of VAL)*	
2.	(a)	What is a copy constructor? Give a suitable example in C++ to illustrate with its definition within a class and a declaration of an object with the help of it.	2

	Ans	A copy constructor is an overloaded constructor in which an object of the same class is passed as reference parameter.
		`class Point`
		`{`
		`  int x;`
		`public:`
		`  Point(){x=0;}`
		`  Point(Point &p) // Copy constructor`
		`  {x = p.x;}`
		`  :`
		`};`
		
		`void main()`
		`{`
		`  Point p1;`
		`  Point p2(p1);//Copy constructor is called here`
		`  //OR`
		`  Point p3=p1;//Copy constructor is called here`
		`}`	

		(1½ Mark to be awarded if the copy constructor is explained with an appropriate example) OR *(1 Mark for correct explanation of copy constructor only without an example)* *(½ Mark for correct declaration of an object)*	

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	(b)	Observe the following C++ code and answer the questions (i) and (ii) :
		`class Passenger`
		`{`
		`long PNR;`
		`char Name [20] ;`
		`public:`
		`Passenger() //Function 1`
		`{ cout<<"Ready"<<endl; }`
		`void Book(long P,char N[]) //Function 2`
		`{ PNR = P; strcpy(Name, N); }`
		`void Print() //Function 3`
		`{ cout«PNR << Name <<endl; }`
		`~Passenger() //Function 4`
		`{ cout<<"Booking cancelled!"<<endl; }`
		`};`	

		(i) Fill in the blank statements in Line 1 and Line 2 to execute Function 2 and Function 3 respectively in the following code:
		`void main()`
		`{`
		`Passenger P;`
		`_____ //Line 1`
		`_____ //Line 2`
		`}//Ends here`
			1

	Ans	`P.Book(1234567,"Ravi"); //Line 1`
		`P.Print(); //Line 2`	

		(½ Mark for writing each correct Function)	
		(ii) Which function will be executed at }//Ends here? What is this function referred as ?	1

	Ans	`Function 4`
		OR
		`~Passenger()`
		It is a Destructor function.	

		(½ Mark for writing Function 4 OR ~Passenger()) *(½ Mark for referring Destructor)*	

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	(C)	Write the definition of a class Photo in C++ with following description:
		Private Members
		-Pno //Data member for Photo Number (an integer)
		-Category //Data member for Photo Category (a string)
		-Exhibit //Data member for Exhibition Gallery (a string)
		-FixExhibit//A member function to assign //Exhibition Gallery as per Category //as shown in the following table
		Public Members
		-Register()//A function to allow user to enter //values //Pno,Category and call FixExhibit() //function
		-ViewAll()//A function to display all the data //members
			4

Category	Exhibit
Antique	Zaveri
Modern	Johnsen
Classic	Terenida

Ans

```
class Photo
{
    int Pno;
    char Category[20];
    char Exhibit[20];
    void FixExhibit();
 public:
     void Register();
     void ViewAll();
};
void Photo::FixExhibit()
{
  if(strcmpi(Category,"Antique")==0)
     strcpy(Exhibit,"Zaveri");
  else if(strcmpi(Category,"Modern")==0)
     strcpy(Exhibit,"Johnsen");
  else if strcmpi(Category,"Classic")==0)
     strcpy(Exhibit,"Terenida");
}
void Photo::Register()
{
  cin>>Pno;
  gets(Category);
```

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		`FixExhibit();`
		`}`
		`void Photo:: ViewAll()`
		`{`
		`cout<<Pno<<Category<<Exhibit<<endl;`
		`}`	

		(½ Mark for correct syntax for class header) *(½ Mark for correct declaration of data members)* *(1 Mark for correct definition of FixExhibit())* *(1 Mark for correct definition of Register() with proper invocation of FixExhibit() function)* *(1 Mark for correct definition of ViewAll())* *NOTE:* • *Deduct ½ Mark if FixExhibit() is not invoked properly inside Register() function* • *No marks to be deducted for defining Member Functions inside the class* • *strcmp()/strcmpi() acceptable*	

	(d)	Answer the questions (i) to (iv) based on the following:
		`class Interior`
		`{`
		`int OrderId;`
		`char Address[20];`
		`protected:`
		`float Advance;`
		`public:`
		`Interior();`
		`void Book(); void View();`
		`};`
		`class Painting:public Interior`
		`{`
		`int WallArea,ColorCode;`
		`protected:`
		`char Type;`
		`public:`
		`Painting();`
		`void PBook();`
		`void PView();`
		`};`
		
		`class Billing:public Painting`
		`{`
		`float Charges;`
		`void Calculate();`
			4

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		`public:`
		`  Billing();`
		`  void Bill();`
		`  void BillPrint();`
		`};`	

		(i) Which type of Inheritance out of the following is illustrated in the above example? -Single Level Inheritance -Multi Level Inheritance -Multiple Inheritance	
	Ans	Multi Level Inheritance *(1 Mark for mentioning correct option)*	
		(ii) Write the names of all the data members, which are directly accessible from the member functions of class Painting.	
	Ans	WallArea, ColorCode,Type, Advance *(1 Mark for correct answer)* *Note:* • *No marks to be awarded for any partial or additional answer(s)*	
		(iii) Write the names of all the member functions, which are directly accessible from an object of class Billing.	
	Ans	Bill(), BillPrint(), PBook(), PView(), Book(), View() *(1 Mark for correct answer)* *Note: No marks to be awarded for any partial/additional answer(s)* • *Constructors can be ignored*	
		(iv) What will be the order of execution of the constructors, when an object of class Billing is declared?	
	Ans	Interior, Painting, Billing *(1 Mark for correct answer)* *Note: No marks to be awarded for any other order*	
3	(a)	Write the definition of a function Change(int P[], int N) in C++, which should change all the multiples of 10 in the array to 10 and rest of the elements as 1. For example, if an array of 10 integers is as follows:	2

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		<table><tr><td>P[0]</td><td>P[1]</td><td>P[2]</td><td>P[3]</td><td>P[4]</td><td>P[5]</td><td>P[6]</td><td>P[7]</td><td>P[8]</td><td>P[9]</td></tr><tr><td>100</td><td>43</td><td>20</td><td>56</td><td>32</td><td>91</td><td>80</td><td>40</td><td>45</td><td>21</td></tr></table> After executing the function, the array content should be changed as follows: <table><tr><td>P[0]</td><td>P[1]</td><td>P[2]</td><td>P[3]</td><td>P[4]</td><td>P[5]</td><td>P[6]</td><td>P[7]</td><td>P[8]</td><td>P[9]</td></tr><tr><td>10</td><td>1</td><td>10</td><td>1</td><td>1</td><td>1</td><td>10</td><td>10</td><td>1</td><td>1</td></tr></table>	

	Ans	```
		void Change(int P[ ],int N)
		{
		  for (int i=0;i<N;i++)
		  if(P[i]%10==0)
		  P[i]=10;
		  else
		  P[i]=1;
		}
		``
		OR
		Any other correct equivalent function definition	

		(½ Mark for correct loop) *(½ Mark for correct checking of divisibility of array elements by 10)* *(½ Mark for correct use of else OR correct checking of non divisibility of array elements by 10)* *(½ Mark for correct assignment of 10 and 1 for multiples and non multiples of 10 respectively)*	
	(b)	A two dimensional array ARR[50][20] is stored in the memory along the row with each of its elements occupying 4 bytes. Find the address of the element ARR[30][10], if the element ARR[10] [5] is stored at the memory location 15000.	3

	Ans	```
		Loc(ARR[I][J]) along the row
		 =BaseAddress + W [(I – LBR)*C + (J – LBC)]
		(where C is the number of columns, LBR = LBC = 0
		LOC(ARR[10][5])
		  = BaseAddress + W [I*C + J]
		15000 = BaseAddress + 4[10*20 + 5]
		  = BaseAddress + 4[200 + 5]
		  = BaseAddress + 4 x 205
		  = BaseAddress + 820
		  BaseAddress = 15000-820
		  = 14180
		LOC(ARR[30][10])= 14180 + 4[30 * 20 + 10]
		  = 14180 + 4 * 610
		``	

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```
      = 14180 + 2440
      = 16620
OR
LOC(ARR[30][10])
      = LOC(ARR[10][5])+ W[( I-LBR)*C + (J-LBC)]
      = 15000 + 4[(30-10)*20 + (10-5)]
      = 15000 + 4[ 20*20 + 5]
      = 15000 + 4 *405
      = 15000 + 1620
      = 16620
OR
 Where C is the number of columns and LBR=LBC=1
LOC(ARR[10][5])
15000 = BaseAddress + W [( I-1)*C  + (J-1)]
      = BaseAddress + 4[9*20 + 4]
      = BaseAddress + 4[180 + 4]
      = BaseAddress + 4 * 184
      = BaseAddress + 736
BaseAddress = 15000 - 736
      = 14264
LOC(ARR[30][10])
      = 14264 + 4[(30-1)*20 + (10-1)]
      = 14264 + 4[29*20 + 9]
      = 14264 + 4[580 + 9]
      = 14264 + 4*589
      = 14264 + 2356
      = 16620
```

(1 Mark for writing correct formula (for row major) OR substituting formula with correct values)
(1 Mark for at least one step of intermediate calculation)
(1 Mark for final correct address)

(c) Write the definition of a member function PUSH() in C++, to add a new book in a dynamic stack of BOOKS considering the following code is already included in the program: **4**

```
struct BOOKS
{
  char ISBN[20], TITLE[80];
  BOOKS *Link;
};
class STACK
{
  BOOKS *Top;
public:
  STACK()
  {Top=NULL;}
  void PUSH();
```

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```
  void POP();
  ~STACK();
};
```

Ans

```
void STACK::PUSH()
{
  BOOKS *Temp;
  Temp=new BOOKS;
  gets(Temp->ISBN);
  gets(Temp->TITLE);
  Temp->Link=Top;
  Top=Temp;
}
```

OR

Any other correct equivalent function definition

(1 Mark for creating a new node of BOOKS dynamically)
(½ Mark for entering value of ISBN)
(½ Mark for entering value of TITLE)
(1 Mark for linking the new node of BOOKS to the Top)
(1 Mark for making the new node of BOOKS as Top)

(d) Write a function REVROW(int P[][5],int N, int M) in C++ to display the content of a two dimensional array, with each row content in reverse order. **3**

For example, if the content of array is as follows:

15	12	56	45	51
13	91	92	87	63
11	23	61	46	81

The function should display output as:

```
51      45      56      12      15
63      87      92      91      13
81      46      61      23      81
```

Ans

```
void REVROW(int P[][5],int N,int M)
 {
   for(int I=0; I<N; I++)
    {   for(int J=M-1; J>=0; J--)
            cout<<P[I][J];
        cout<<endl;
    }
  }
```

OR

```
void REVROW(int P[ ][5],int N,int M)
 {
   for(int I=0; I<N; I++)
    {
       for(int J=0; J<M/2; J++)
       {
```

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```
            int T = P[I][J];
            P[I][J] = P[I][M-J-1];
            P[I][M-J-1] = T;
        }
    }
   for(I=0; I<N; I++)
    {
        for(int J=0; J<M; J++)
            cout<<P[I][J];
        cout<<endl;
    }
}
```

(1 Mark for correct nesting of loop(s))
(1½ Mark for correct logic for reversing the content of each row)
(½ Mark for correctly displaying the content)
Note: N and M can be written interchangeably for number of rows and columns

(e) Convert the following infix expression to its equivalent Postfix expression, showing the stack contents for each step of conversion. **2**

`U * V + R/ (S-T)`

Ans

`U * V + R/ (S-T)`
`= ((U * V)+(R/(S-T)))`

Element	Stack	Postfix
(		
(		
U		U
*	*	
V		UV
)		UV*
+	+	
(		
R		UV*R
/	+/	
(		
S		UV*RS
-	+/-	
T		UV*RST
)		UV*RST-
)		UV*RST-/
)		UV*RST-/+

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OR

Element	Stack	Postfix
U		U
*	*	U
V	*	UV
+	+	UV*
R	+	UV*R
/	+/	UV*R
(	+/(	UV*R
S	+/(	UV*RS
-	+/(-	UV*RS
T	+/(-	UV*RST
)	+/	UV*RST-
	+	UV*RST-/
		UV*RST-/+

OR

Any other method for converting the given Infix expression to its equivalent Postfix expression showing stack contents

(½ mark for converting expression up to each operator)

OR

(1 mark to be given for writing correct answer without showing the stack content)

4 (a) Write function definition for TOWER() in C++ to read the content of a text file WRITEUP.TXT, count the presence of word TOWER and display the number of occurrences of this word. **2**

Note :

- The word TOWER should be an independent word
- Ignore type cases (i.e. lower/upper case)

Example:

If the content of the file WRITEUP.TXT is as follows:

```
Tower of hanoi is an interesting problem.
Mobile phone tower is away from here. Views
from EIFFEL TOWER are amazing.
```

The function TOWER () should display the following:

```
3
```

Ans

```
void TOWER()
{
    int count=0;
    ifstream f("WRITEUP.TXT");
    char s[20];
```

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		`while (!f.eof())`
		`{`
		`f>>s;`
		`if (strcmpi(s,"TOWER")==0)`
		`count++;`
		`}`
		`cout<<count;`
		`f.close();`
		`}`
		OR
		Any other correct function definition	

		(½ Mark for opening WRITEUP.TXT correctly) ***(½ Mark for reading each word (using any method) from the file)*** ***(½ Mark for comparing the word with TOWER)*** ***(½ Mark for displaying correct count of TOWER)*** ***NOTE:*** ***(½ Mark to be deducted if TOWER is compared without ignoring the case)***	

	(b)	**Write a definition for function COSTLY() in C++ to read each record of a binary file GIFTS.DAT, find and display those items, which are priced more that 2000. Assume that the file GIFTS.DAT is created with the help of objects of class GIFTS, which is defined below:**
		
		`class GIFTS`
		`{`
		`int CODE;char ITEM[20]; float PRICE;`
		`public:`
		`void Procure()`
		`{`
		`cin>>CODE; gets(ITEM);cin>>PRICE;`
		`}`
		`void View()`
		`{`
		`cout<<CODE<<":"<<ITEM<<":"<<PRICE<<endl;`
		`}`
		`float GetPrice() {return PRICE;}`
		`};`
			3

	Ans	`void COSTLY()`
		`{`
		`GIFTS G;`
		`ifstream fin("GIFTS.DAT",ios::binary);`
		`while (fin.read((char *)&G,sizeof(G)))`	

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		{
		if(G.GetPrice()>2000)
		G.View();
		}
		fin.close();
		}
		OR
		Any other correct equivalent function definition	

		(½ Mark for opening GIFTS.DAT correctly) *(1 Mark for reading all records from the file)* *(1 Mark for checking value of PRICE > 2000)* *(½ Mark for displaying the desired items)*	

	(c)	Find the output of the following C++ code considering that the binary file MEMBER.DAT exists on the hard disk with records of 100 members:
		class MEMBER
		{
		int Mno; char Name[20];
		public:
		void In();void Out();
		};
		void main()
		{
		fstream MF;
		MF.open("MEMBER.DAT",ios::binary|ios::in);
		MEMBER M;
		MF.read((char*)&M,sizeof(M));
		MF.read((char*)&M,sizeof(M));
		MF.read((char*)&M,sizeof(M));
		int POSITION=MF.tellg()/sizeof(M);
		cout<<"PRESENT RECORD:"<<POSITION<<endl;
		MF.close();
		}
			1

	Ans	PRESENT RECORD: 3	
		(1 Mark for writing <u>PRESENT RECORD: 3</u>) OR *(1 Mark for writing only <u>3</u>)* OR *(½ Mark for writing only <u>PRESENT RECORD:</u>)*	

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		Section - B **(Only for Python candidates)**	
1	(a)	**How is __init( ) __different from __del ( )__ ?**	2

	Ans	`__init__()` is the class constructor or initialization method which is automatically invoked when we create a new instance of a class.
		`__del__()` is a destructor which is automatically invoked when an object (instance) goes out of scope.
		For Example:
		`class Sample:`
		`  def __init__(self):`
		`  self.data = 79`
		`  print('Data:',self.data,'created')`
		`  def __del__(self):`
		`  print('Data:',self.data,'deleted')`
		`s = Sample()`
		`del s`	

		(2 Marks for correct differentiation) *OR* *(2 Marks for differentiation through example)* *OR* *(1 Mark for each correct definition)*	
	(b)	**Name the function/method required to** **(i) check if a string contains only alphabets** **(ii) give the total length of the list.**	1
	Ans	`isalpha()` `len()`	
		(½ Mark for each correct function/ method name)	

	(c)	**Rewrite the following code in python after removing all syntax error(s). Underline each correction done in the code.**
		`def Sum(Count) #Method to find sum`
		`  S=0`
		`  for I in Range(1,Count+1):`
		`  S+=I`
		`  RETURN S`
		`print Sum[2] #Function Call`
			2

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		`print Sum[5]`	

	Ans	`def Sum(Count): #Method to find sum  #Error 1`
		`  S=0`
		`  for I in range (1,Count+1):  #Error 2`
		`  S+=I`
		`  return S  #Error 3`
		
		`print Sum(2) #Function Call  #Error 4`
		`print Sum(5)  #Error 4`	

		(½ Mark for each correction) *OR* *(1 mark for identifying all the errors, without suggesting corrections)*	

	(d)	Find and write the output of the following python code :
		`for Name in ['John','Garima','Seema','Karan']:`
		`  print Name`
		`  if Name[0]== 'S':`
		`  break`
		`else :`
		`  print 'Completed!'`
		`print 'Weldone!'`
			2

	Ans	`John`
		`Garima`
		`Seema`
		`Weldone!`	

		(½ Mark for each correct line) *Note:* Deduct ½ *Mark for not considering any or all line breaks at proper place(s)*	

	(e)	Find and write the output of the following python code:
		
		`class Emp:`
		`  def __init__(self,code,nm): #constructor`
		`  self.Code=code`
		`  self.Name=nm`
		`  def Manip (self) :`
		`  self.Code=self.Code+10`
		`  self.Name='Karan'`
		`  def Show(self,line):`
		`  print self.Code,self.Name,line`
		`s=Emp(25,'Mamta')`
			3

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		`s.Show(1)`
		`s.Manip()`
		`s.Show(2)`
		`print s.Code+len(s.Name)`	

	Ans	25 Mamta 1 35 Karan 2 40	
		(1 Mark for each correct line) *Note:* Deduct ½ *Mark for not considering any or all line break(s) at proper place(s).*	

	(f)	What are the possible outcome(s) executed from the following code? Also specify the maximum and minimum values that can be assigned to variable COUNT.
		
		`TEXT="CBSEONLINE"`
		`COUNT=random.randint(0,3)`
		`C=9`
		`while TEXT[C]!='L':`
		`  print TEXT[C]+TEXT[COUNT]+'*',`
		`  COUNT=COUNT+1`
		`  C=C-1`
		`(i)  (ii)  (iii)  (iv)`
		`EC*NB*IS*  NS*IE*LO*  ES*NE*IO*  LE*NO*ON*`
			2

	Ans	`(i)  EC*NB*IS*`
		`(iii) ES*NE*IO*`
		`Minimum COUNT = 0  Maximum COUNT = 3`	

		(½ Mark for writing option (i)) *(½ Mark for writing option (iii))* *Note:* • *Deduct ½ mark for writing each <u>additional</u> option along with both correct options* *(½ Mark for writing correct Minimum value of COUNT)* *(½ Mark for writing correct Maximum value of COUNT)*	
2	(a)	Illustrate the concept inheritance with the help of a python code	2

	Ans	`class Base:`
		`  def __init__ (self):`
		`  print "Base Constructor at work..."`
		`  def show(self):`
		`  print "Hello Base"`	

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		class Der(Base): **def __init__(self):** **print "Derived Constructor at work..."** **def display(self):** **print "Hello from Derived"**	
		(1 Mark for base class) ***(1 Mark for derived class)***	
	(b)	**What will be the output of the following python code ? Explain the try and except used in the code.** **A=0** **B=6** **print 'One'** **try:** **print 'Two'** **X=B/A** **Print 'Three'** **except ZeroDivisionError:** **print B*2** **print 'Four'** **except:** **print B*3** **print 'Five'**	**2**
	ANS	**One** **Two** **12** **Four** The code written within try triggers the exception written after except ZeroDivisionError: in case there is a division by zero error otherwise the default exception is executed OR Any other correct explanation for usage of try and except	
		(½ Mark for first two lines of correct output) ***(½ Mark for next two lines of correct output)*** ***(½ Mark each for correct explanation of try and except)***	
	(c)	**Write a class PHOTO in Python with following specifications:** Instance Attributes - Pno # Numeric value - Category # String value - Exhibit # Exhibition Gallery with String value Methods: - FixExhibit() # A method to assign Exhibition	**4**

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		# Gallery as per Category as # shown in the following table Category | Exhibit Antique | Zaveri Modern | Johnsen Classic | Terenida Register() # A function to allow user # to enter values of Pno, Category # and call FixExhibit() method ViewAll{} # A function to display all the data # members	

	Ans	class PHOTO:
		Pno=0
		Category=" "
		Exhibit=" "
		def FixExhibit():
		if self.Category=="Antique":
		self.Exhibit="Zaveri"
		elif self.Category=="Modern":
		self.Exhibit="Johnsen"
		elif self.Category=="Classic":
		self.Exhibit="Terenida"
		def Register():
		self.Pno=int(input("Enter Pno:"))
		self.Category=input("Enter Name:")
		self.FixExhibit()
		def ViewAll()
		print self.Pno,self.Category,self.Exhibit	

		(½ Mark for correct syntax for class header) *(½ Mark for correct declaration of instance attributes)* *(1 Mark for correct definition of FixExhibit())* *(1 Mark for correct definition of Register() with proper invocation of FixExhibit() method)* *(1 Mark for correct definition of ViewAll())* *NOTE:* *Deduct ½ Mark if FixExhibit() is not invoked properly inside Register() method*	
	(d)	What is operator overloading with methods? Illustrate with the help of an example using a python code.	2
	Ans	Operator overloading is an ability to use an operator in more than one form. Examples:	

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		In the following example operator + is used for finding the sum of two integers:
		`a = 7`
		`b = 5`
		`print(a+b)  # gives the output: 12`
		
		Whereas in the next example, shown below the same + operator is used to add two strings:
		`a = 'Indian '`
		`b = 'Government'`
		`print(a+b)  # gives the output: Indian Government`	

		(1 Mark for correct definition of Operator overloading) *(1 Mark for correct example of Python code to illustrate Operator overloading)*	

	(e)	Write a method in python to display the elements of list twice, if it is a number and display the element terminated with '*' if it is not a number.
		For example, if the content of list is as follows:
		`MyList=['RAMAN','21','YOGRAJ', '3', 'TARA']`
		`The output should be`
		`RAMAN*`
		`2121`
		`YOGRAJ*`
		`33`
		`TARA*`
			2

	Ans	`def fun(L):`
		`  for I in L:`
		`  if I.isnumeric():`
		`  print(2*I) # equivalently: print(I+I)`
		`  else:`
		`  print(I+'*')`	

		(½ Mark for correct loop) *(½ Mark for checking numeric/non numeric)* *(½ Mark for displaying numeric content)* *(½ Mark for displaying numeric content)*	
3	(a)	What will be the status of the following list after fourth pass of bubble sort and fourth pass of selection sort used for arranging the following elements in descending order ? `34,-6,12,-3,45,25`	3
	Ans	Bubble Sort `34,-6,12,-3,45,25  (Original Content)`	

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		i. 34,12,-3,45,25,-6 ii. 34,12,45,25,-3,-6 iii. 34,45,25,12,-3,-6 iv. 45,34,25,12,-3,-6 Selection Sort 34,-6,12,-3,45,25 (Original Content) i. 45,-6,12,-3,34,25 ii. 45,34,12,-3,-6,25 iii. 45,34,25,-3,-6,12 iv. 45,34,25,12,-6,-3 (Unsorted status after 4th pass)	
		For Bubble Sort *(1 ½ Mark if (iv) pass is correct)* *OR* *(½ Mark for (i) pass)* *(½ Mark for (ii) pass)* *(½ Mark for (iii) pass)* *For Selection Sort* *(1 ½ Mark if (iv) pass is correct)* *OR* *(½ Mark for (i) pass)* *(½ Mark for (ii) pass)* *(½ Mark for (iii) pass)*	
	(b)	Write a method in python to search for a value in a given list (assuming that the elements in list are in ascending order) with the help of Binary Search method. The method should return -1, if the value not present else it should return position of the value present in the list.	2

	Ans	`def bSearch(L, key):`
		`  low = 0`
		`  high = len(L)-1`
		`  found = False`
		`  while (low <= high) and (not found):`
		`  mid = (low+high)//2`
		`  if L[mid] == key:`
		`  found = True`
		`  elif L[mid] < key:`
		`  low = mid + 1`
		`  else:`
		`  high = mid - 1`
		`  if found:`
		`  return mid+1  # may even be 'return mid'`
		`  else:`
		`  return -1`	

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		(½ Mark for correct Initialization of lower and upper bounds) *(½ Mark for correct loop)* *(½ Mark for reassigning Mid,Low,Up bound)* *(½ Mark for returning correct value)*	
	(c)	Write PUSH (Names) and POP (Names) methods in python to add Names and Remove names considering them to act as Push and Pop operations of Stack.	4

	Ans	`def push(Name):`
		`  Stack.append(Name)`
		`  print 'Element:',Name,'inserted successfully'`
		
		`def pop():`
		`  if Stack == []:`
		`  print('Stack is empty!')`
		`  else:`
		`  print('Deleted element is',Stack.pop())`	

		(2 Marks for correctly pushing an element into the stack) *(1 Mark for checking empty stack in POP())* *(1 Mark for popping element from stack)*	
	(d)	Write a method in python to find and display the composite numbers between 2 to N. Pass N as argument to the method.	3

	Ans	`def composite_numbers(N):`
		`  for I in range(2, N+1):`
		`  M = I // 2`
		`  for J in range(2, M+1):`
		`  if I % J == 0:`
		`  print(I)`
		`  break`
		OR
		Any other correct equivalent method definition	

		(1 Mark for correct loops) *(1 Mark for checking composite numbers between 2 to N)* *(1 Mark for displaying the numbers)*	
	(e)	Evaluate the following postfix notation of expression. Show status of stack after every operation. `34,23,+,4,5,*,-`	2
	Ans		

Element	Stack
34	34
23	34, 23

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		<table><tr><td>+</td><td>57</td></tr><tr><td>4</td><td>57, 4</td></tr><tr><td>5</td><td>57, 4, 5</td></tr><tr><td>*</td><td>57, 20</td></tr><tr><td>-</td><td>37</td></tr></table>	
		(1 mark for evaluating till 57) *(½ mark for evaluating till 57,20)* *(½ mark for evaluating till final 37)* *Note:* *Only 1 mark to be awarded for evaluating final answer as 37 without showing stack contents*	

4	(a)	Differentiate between the following:
		`(i) f = open ('diary. txt', 'a')`
		`(ii) f = open ('diary. txt', 'w')`
			1

	Ans	(i) diary.txt is opened for writing data at the end of file (ii) diary.txt is opened for writing data from the beginning of file in create mode	
		(1 mark for writing correct difference) *OR* *(½ Mark for each correct explanation of (i) and (ii))*	
	(b)	Write a method in python to read the content from a text file story.txt line by line and display the same on screen.	2

	Ans	`def read_file():`
		`  inFile = open('story.txt', 'r')`
		`  for line in inFile:`
		`  print line`	

		(½ Mark for opening the file) *(1 Mark for reading all lines)* *(½ Mark for displaying all lines)*	

	(c)	Consider the following definition of class Student. Write a method in python to write the content in a pickled file student.dat
		`class Student:`
		`  def_init_(self,A,N} :`
		`  self.Admno=A`
		`  self.Name=N`
		`  def Show(self}:`
		`  print (self.Admno, "#" , self.Name}`
			3

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	Ans	`import pickle`
		
		`class Student:`
		`  def __init__(self, A, N):`
		`  self.Admno = A`
		`  self.Name = N`
		
		`  def show(self):`
		`  print(self.Admno,"#",self.Name)`
		
		`  def store_data(self):`
		`  piFile = open('student.dat','wb')`
		`  pickle.dump(self, piFile)`
		`  piFile.close()`	

		(1 Mark for method header) *(1 Mark for opening the file student.dat in correct mode)* *(1 Mark each for writing student details into the file)*	
		Section - C **(For all candidates)**	
5	(a)	Observe the following table carefully and write the names of the most appropriate columns, which can be considered as (i) candidate keys and (ii) primary key.	2

Code	Item	Qty	Price	Transaction Date
1001	Plastic Folder 14”	100	3400	2014-12-14
1004	Pen Stand Standard	200	4500	2015-01-31
1005	Stapler Mini	250	1200	2015-02-28
1009	Punching Machine Small	200	1400	2015-03-12
1003	Stapler Big	100	1500	2015-02-02

	Ans	`Candidate keys : Code, Item` `Primary keys  : Code`	
		(1 Mark for writing correct Candidate keys) *(1 Mark for writing correct Primary key)* *Note:* *No marks to be deducted for mentioning Price and/or Transaction Date as additional candidate keys.*	
	(b)	Consider the following DEPT and EMPLOYEE tables. Write SQL queries for (i) to (iv) and find outputs for SQL queries (v) to (viii). Table: DEPT	6

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DCODE	DEPARTMENT	LOCATION
D01	INFRASTRUCTURE	DELHI
D02	MARKETING	DELHI
D03	MEDIA	MUMBAI
D05	FINANCE	KOLKATA
D04	HUMAN RESOURCE	MUMBAI

Table: EMPLOYEE

ENO	NAME	DOJ	DOB	GENDER	DCODE
1001	George K	2013-09-02	1991-09-01	MALE	D01
1002	Ryma Sen	2012-12-11	1990-12-15	FEMALE	D03
1003	Mohitesh	2013-02-03	1987-09-04	MALE	D05
1007	Anil Jha	2014-01-17	1984-10-19	MALE	D04
1004	Manila Sahai	2012-12-09	1986-11-14	FEMALE	D01
1005	R SAHAY	2013-11-18	1987-03-31	MALE	D02
1006	Jaya Priya	2014-06-09	1985-06-23	FEMALE	D05

Note: DOJ refers to date of joining and DOB refers to date of Birth of employees.

(i) To display Eno, Name, Gender from the table EMPLOYEE in ascending order of Eno.

Ans

```
SELECT Eno,Name,Gender FROM Employee
ORDER BY Eno;
```

(½ Mark for `SELECT Eno,Name,Gender FROM Employee`*)*
(½ Mark for `ORDER BY Eno`*)*

(ii) To display the Name of all the MALE employees from the table EMPLOYEE.

Ans

```
SELECT Name FROM Employee WHERE Gender='MALE';
```

(½ Mark for `SELECT Name FROM Employee`*)*
(½ Mark for `WHERE Gender='MALE'`*)*

(iii) To display the Eno and Name of those employees from the table EMPLOYEE who are born between '1987-01-01' and '1991-12-01'.

Ans

```
SELECT Eno,Name FROM Employee
WHERE DOB BETWEEN '1987-01-01' AND '1991-12-01'
```

OR

```
SELECT Eno,Name FROM Employee
WHERE DOB >='1987-01-01' AND DOB <='1991-12-01';
```

OR

```
SELECT Eno,Name FROM Employee
WHERE DOB >'1987-01-01' AND DOB <'1991-12-01';
```

(½ Mark for `SELECT Eno,Name FROM Employee`*)*
(½ Mark for

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		WHERE DOB BETWEEN '1987-01-01' AND '1991-12-01' ***OR*** **WHERE DOB >='1987-01-01' AND DOB <='1991-12-01'** ***OR*** **WHERE DOB >'1987-01-01' AND DOB <'1991-12-01')**	
		(iv) To count and display FEMALE employees who have joined after '1986-01-01'.	
	Ans	**SELECT count(*) FROM Employee** **WHERE GENDER='FEMALE' AND DOJ > '1986-01-01';** **OR** **SELECT * FROM Employee** **WHERE GENDER='FEMALE' AND DOJ > '1986-01-01';** ***(Any valid query for counting and/or displaying for female employees will be awarded 1 mark)***	
		(v) SELECT COUNT(*),DCODE FROM EMPLOYEE **GROUP BY DCODE HAVING COUNT(*)>1;**	
	Ans	**COUNT** **DCODE** 2 D01 2 D05 ***(½ Mark for correct output)***	
		(vi) SELECT DISTINCT DEPARTMENT FROM DEPT;	
	Ans	**Department** INFRASTRUCTURE MARKETING MEDIA FINANCE HUMAN RESOURCE ***(½ Mark for correct output)***	
		(vii) SELECT NAME, DEPARTMENT FROM EMPLOYEE E, DEPT D WHERE E.DCODE=D.DCODE AND EN0<1003;	
	Ans	**NAME** **DEPARTMENT** George K INFRASTRUCTURE Ryma Sen MEDIA ***(½ Mark for correct output)***	
		(viii) SELECT MAX(DOJ), MIN(DOB) FROM EMPLOYEE;	
	Ans	**MAX(DOJ)** **MIN(DOB)** 2014-06-09 1984-10-19	

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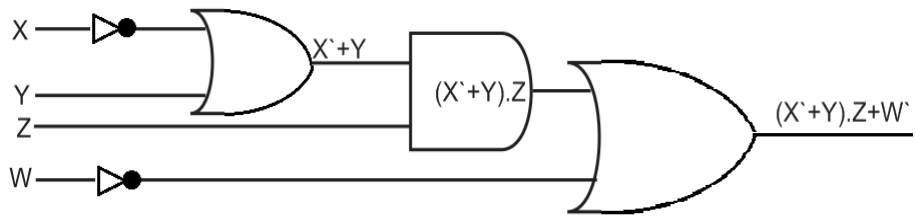
		(½ Mark for correct output)	
		Note: In the output queries, please ignore the order of rows.	
6	(a)	Verify the following using Boolean Laws. U'+ V= U'V'+U'.V +U.V	2
	Ans	L.H.S =U'+ V =U'.(V+V')+ V.(U'+ U) =U'.V + U'.V' + U'.V + U.V =U'.V+U'.V'+U.V =R.H.S OR R.H.S =U'V'+U'.V +U.V =U'.(V'+ V)+ U.V =U'.1 + U.V =U'+ U.V =U'+ V =L.H.S	
		(2 Marks for any valid verification using Boolean Laws) *OR* *(1 Mark for partial correct verification using Boolean Laws)*	
	(b)	Draw the Logic Circuit for the following Boolean Expression : (X'+Y).Z+W'	2
	Ans		
		(½ Mark for X' and W') *(½ Mark for (X'+Y))* *(½ Mark for (X'+Y).Z)* *(½ Mark for (X'+Y).Z+W')*	
	(c)	Derive a Canonical POS expression for a Boolean function F, represented by the following truth table:	1

P	Q	R	F(P,Q,R)
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1

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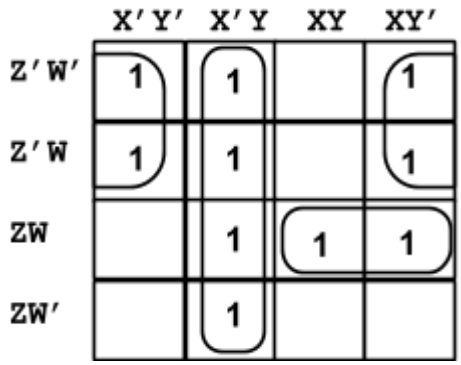
1	0	1	0
1	1	0	0
1	1	1	1

Ans F(P,Q,R)= (P+Q+R')(P+Q'+R)(P'+Q+R')(P'+Q'+R)
OR
F(P,Q,R)= Π(1,2,5,6)

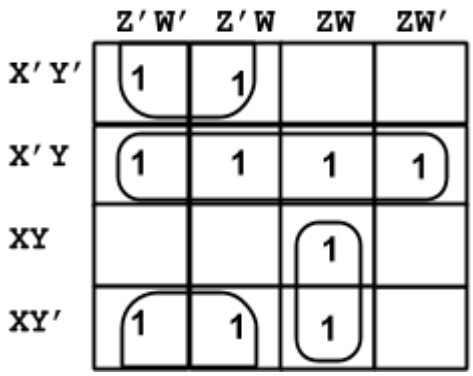
(1 Mark for the correct POS form)
OR
(½ Mark for writing any two term correctly)
Note: Deduct ½ mark if wrong variable names are used

(d) Reduce the following Boolean Expression to its simplest form using K-Map : **3**
F(X,Y,Z,W) = ∑(0,1,4,5,6,7,8,9,11,15)

Ans



OR



Simplified Expression: Y'Z' + X'Y + XZW

(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 of three grouping **Y'Z' , X'Y , XZW***)*
(½ Mark for writing final expression in reduced/minimal/non redundant form as **Y'Z' + X'Y + XZW** *)*
Note: Deduct ½ mark if wrong variable names are used

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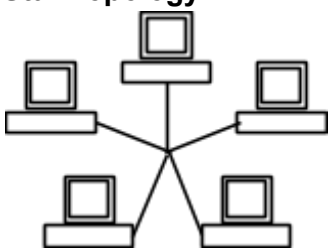
7	(a)	**Illustrate the layout for connecting 5 computers in a Bus and a Star topology of Networks.**	1
	Ans	**Bus topology** **Star Topology**  OR any valid illustration of Bus and Star Topology.	
		(½ Mark for drawing each correct layout)	
	(b)	**What kind of data gets stored in cookies and how is it useful?**	1
	Ans	When a Website with cookie capabilities is visited , its server sends certain information about the browser, which is stored in the hard drive as a text file. It's a way for the server to remember things about the visited sites.	
		(1 Mark for correct kind of data stored)	
	(c)	**Differentiate between packet switching over message switching?**	1
	Ans	**Packet Switching**-follows store and forward principle for fixed packets. Fixes an upper limit for packet size. **Message Switching**-follows store and forward principle for complete message. No limit on block size.	
		(1 Mark for any valid differentiation) ***OR*** ***(1 Mark for correct definition of Packet Switching only)***	
	(d)	**Out of the following, which is the fastest (i) wired and (ii) wireless medium of communication?** **Infrared, Coaxial Cable, Ethernet Cable, Microwave, Optical Fiber**	1
	Ans	***(i) Wired – Optical Fiber*** ***(ii) Wireless - Infrared OR Microwave***	
		(½ Mark each for Wired and Wireless **medium of communication*)***	

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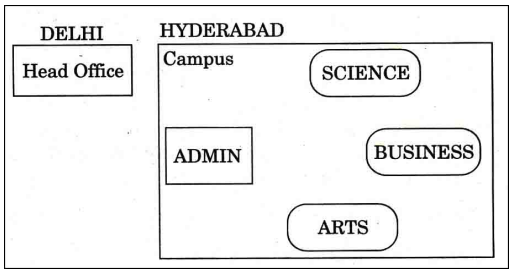
	(e)	What is Trojan Horse?	1
	Ans	*A Trojan Horse is a code hidden in a program, that looks safe but has hidden side effects typically causing loss or theft of data, and possible system harm.*	
		(1 Mark for writing correct meaning of Trojan)	
	(f)	Out of the following, which all comes under cyber crime? (i) Stealing away a brand new hard disk from a showroom. (ii) Getting in someone's social networking account without his consent and posting on his behalf. (iii) Secretly copying data from server of a organization and selling it to the other organization. (iv) Looking at online activities of a friends blog.	1
	Ans	*(ii) & (iii)*	
		(½ Mark for choosing each of the correct options) *Note:* • *No marks to be given, if all options are there in the answer* • *½ Mark to be deducted, if one extra option is given along with the correct options*	
	(g)	Xcelencia Edu Services Ltd. is an educational organization. It is planning to set up its India campus at Hyderabad with its head office at Delhi. The Hyderabad campus has 4 main buildings - ADMIN, SCIENCE, BUSINESS and MEDIA. You as a network expert have to suggest the best network related solutions for their problems raised in (i) to (iv), keeping in mind the distances between the buildings and other given parameters.  Shortest Distances between various buildings:	

ADMIN to SCIENCE	65M
ADMIN to BUSINESS	100m
ADMIN to ARTS	60M
SCIENCE to BUSINESS	75M
SCIENCE to ARTS	60M
BUSINESS to ARTS	50M
DELHI Head Office to HYDERABAD Campus	1600KM

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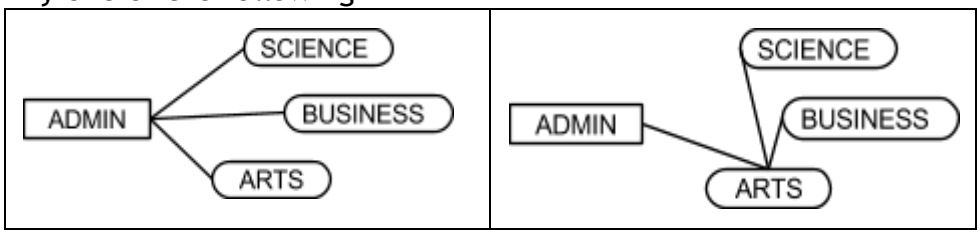
		Number of Computers installed at various building are as follows: **ADMIN 100** **SCIENCE 85** **BUSINESS 40** **ARTS 12** **DELHI Head Office 20**	
		(i) Suggest the most appropriate location of the server inside the HYDERABAD campus (out of the 4 buildings), to get the best connectivity for maximum no. of computers. Justify your answer.	**1**
	Ans	**ADMIN** (due to maximum number of computers) OR **ARTS** (due to shorter distance from the other buildings)	
		(1 Mark for mentioning Correct building name with reason) **OR** ***(½ Mark to be deducted for not giving reason)***	
		(ii) Suggest and draw the cable layout to efficiently connect various buildings 'within the HYDERABAD campus for connecting the computers.	1
	Ans	Any one of the following 	
		(1 Mark for drawing correct layout)	
		(iii) Which hardware device will you suggest to be procured by the company to be installed to protect and control the intemet uses within the campus?	**1**
	Ans	**Firewall OR Router**	
		(1 Mark for correct Answer)	
		(iv) Which of the following will you suggest to establish the online face-to-face communication between the people in the Admin Office of HYDERABAD campus and DELHI Head Office? **(a) E-mail (b) Text Chat (c) Video Conferencing (d) Cable TV**	**1**
	Ans	**Video Conferencing**	
		(1 Mark for correct Option / Answer)	