CBSE AISSCE 2015-2016 Marking Scheme for Computer Science

(Sub Code: 083 Paper Code 91/1 Delhi)

General Instructions:

- The answers given in the marking scheme are SUGGESTIVE, Examiners are requested to award marks for all alternative correct Solutions/Answers conveying the similar meaning
- All programming questions have to be answered with respect to C++ Language / Python only
- In C++ / Python, ignore case sensitivity for identifiers (Variable / Functions / Structures / Class Names)
- In Python indentation is mandatory, however, number of spaces used for indenting may vary
- In SQL related questions – both ways of text/character entries should be acceptable for Example: "AMAR" and 'amar' both are acceptable.
- In SQL related questions – 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.
- In SQL related questions – semicolon should be ignored for terminating the SQL statements
- In SQL related questions, ignore case sensitivity.

SECTION A - (Only for candidates, who opted for C++)			

1	(a)	Out of the following, find those identifiers, which cannot be used for naming Variable, Constants or Functions in a C++ program:
		
		`_Cost, Price*Qty, float, Switch,`
		`Address One, Delete, Number12, do`
			2

	Ans	**`Price*Qty`** **`float`** **`Address One`** **`do`** ***(½ Mark for each correct name)*** ***Note:*** ***Deduct ½ Mark for each wrong name written***	
	(b)	Jayapriya has started learning C++ and has typed the following program. When she compiled the following code written by her, she discovered that she needs to include some header files to successfully compile and execute it. Write the names of those header files, which are required to be included in the code.	1

		void main() **{** **float A,Number,Outcome;** **cin>>A>>Number;** **Outcome=pow(A,Number);** **cout<<Outcome<<endl;** **}**	
	Ans	• **iostream.h OR iomanip.h** • **math.h** ***(½ Mark for writing each correct header file)*** ***Note:*** • ***Ignore any other header files, if mentioned.*** • **complex.h** ***is acceptable in place of math.h***	
	(c)	Rewrite the following C++ code after removing any/all syntactical errors with each correction underlined. Note: Assume all required header files are already being included in the program. **#define Equation(p,q) = p+2*q** **void main()** **{** **float A=3.2;B=4.1;** **C=Equation(A,B);** **cout<<'Output='<<C<<endl;** **}**	2
	Ans	**#define Equation(p,q) p+2*q** **void main()** **{** **float A=3.2, B=4.1;** **float C=Equation(A,B);** **cout<<"Output="<<C<<endl;** **}** ***(½ Mark for each correction)*** ***OR*** ***(1 mark for identifying the errors, without suggesting corrections)***	

	(d)	Find and write the output of the following C++ program code:
		Note: Assume all required header files are already included in the program.
		`typedef char STRING[80];`
		`void MIXITNOW(STRING S)`
		`{`
		`int Size=strlen(S);`
		`for (int I=0;I<Size-1;I+=2)`
		`{`
		`char WS=S[I];`
		`S[I]=S[I+1];`
		`S[I+1]=WS;`
		`}`
		`for (I=1;I<Size;I+=2)`
		`if (S[I]>='M' && S[I]<='U')`
		`S[I]='@';`
		`}`
		`void main()`
		`{`
		`STRING Word="CRACKAJACK";`
		`MIXITNOW(Word);`
		`cout<<Word<<endl;`
		`}`
			2

	Ans	**RCCAAKAJKC** ***(2 Marks for correct output)*** ***OR*** ***(½ Mark for each of two correct consecutive alphabets not exceeding 1½ marks)***	

	(e)	Find and write the output of the following C++ program code:
		Note: Assume all required header files are already being included in the program.
		
		`class Stock`
		`{`
		`long int ID;`
			3

```
 float Rate; int Date;
public:
  Stock(){ID=1001;Rate=200;Date=1;}
  void RegCode(long int I,float R)
  {
    ID=I;  Rate=R;
  }
  void Change(int New,int DT)
  {
    Rate+=New; Date=DT;
  }
  void Show()
  {
    cout<<"Date :"<<Date<<endl;
    cout<<ID<<"#"<<Rate<<endl;
  }
};
void main()
{
  Stock A,B,C;
  A.RegCode(1024,150);
  B.RegCode(2015,300);
  B.Change(100,29);
  C.Change(-20,20);
  A.Show();
  B.Show();
  C.Show();
}
```

Ans

```
Date :1
1024#150
Date :29
2015#400
Date :20
1001#180
```

(½ Mark for each correct line of output)

Note:

- Deduct only *½ Mark for not writing any or all 'Date' OR ':' OR '#' symbol(s)*
- Deduct *½ Mark for not considering any or all endl(s) at proper*

		place(s)	
	(f)	Look at the following C++ code and find the possible output(s) from the options (i) to (iv) following it. Also, write the maximum and the minimum values that can be assigned to the variable CHANGER. Note: ● Assume all the required header files are already being included in the code. ● The function random(n) generates an integer between 0 and n-1 **void main()** **{** **randomize();** **int CHANGER;** **CHANGER=random(3);** **char CITY[][25]={"DELHI","MUMBAI","KOLKATA" ,"CHENNAI"};** **for(int I=0;I<=CHANGER;I++)** **{** **for(int J=0;J<=I;J++)** **cout<<CITY[J];** **cout<<endl;** **}** **}** **(i)** **DELHI** **DELHIMUMABAI** **DELHIMUMABAIKOLKATA** **(ii)** **DELHI** **DELHIMUMABAI** **DELHIMUMABAIKOLKATA** **DELHIMUMABAIKOLKATACHENNAI** **(iii)** **MUMABAI** **MUMABAIKOLKATA** **MUMABAIKOLKATACHENNAI** **(iv)** **KOLKATA** **KOLKATACHENNAI**	2
	Ans	**(i)** **DELHI** **DELHIMUMBAI** **DELHIMUMBAIKOLKATA**	

Minimum Value of CHANGER = 0
Maximum Value of CHANGER = 2

(1 Mark for mentioning correct option)
Note: No Mark to be awarded for writing any one additional option with (i) .

(½ Mark each for Minimum and Maximum Value of CHANGER)

2. (a) Differentiate between Constructor and Destructor functions giving suitable example using a class in C++. When does each of them execute? 2

Ans

PART 1:

Constructor	Destructor
A constructor function has same name as the class	A destructor function has same name as the class preceded by ~ symbol

Example:

```
class Exam
{
  int Eno;  float Marks;
public:
   Exam()                          //Constructor
   {
      Eno=1; Marks = 100;
      cout<<"Constructor executed..."<<endl;
   }
  void Show()
  {
     cout<<Eno<<"#"<<Marks<<endl;
  }
  ~Exam()                        //Destructor
  {
      cout<<"Exam Over"<<endl;
  }
};
void main()
{
   Exam E; //Executes constructor
   E.Show();
```

```
}  //Executes Destructor
```

OR
Any other suitable example demonstrating difference between Constructor and Destructor functions.

PART 2:
Execution of Constructor and Destructor:

Constructor	Destructor
A constructor executes by itself at the time of object creation	A destructor executes by itself when the scope of an object ends

PART 1:
(1 Mark for correct example of constructor and destructor function)
OR
(½ Mark each for correct definition of constructor and destructor function)

PART 2:
(1 Mark for constructor and Destructor execution with/without example)

(b) Observe the following C++ code and answer the questions (i) and (ii). Assume all necessary files are included:

```
class FICTION
{
  long FCode;
  char FTitle[20];
  float FPrice;
public:
  FICTION()                          //Member Function 1
  {
    cout<<"Bought"<<endl;
    FCode=100;strcpy(FTitle,"Noname");FPrice=50;
  }

  FICTION(int C,char T[],float P)  //Member Function 2
  {
    FCode=C;
    strcpy(FTitle,T);
```

```
    FPrice=P;
  }
  void Increase(float P)          //Member Function 3
  {
    FPrice+=P;
  }
  void Show()                     //Member Function 4
  {
    cout<<FCode<<":"<<FTitle<<":"<<FPrice<<endl;
  }
 ~FICTION()                      //Member Function 5
  {
    cout<<"Fiction removed!"<<end1;
  }
};
void main()                                 //Line 1
{                                           //Line 2
 FICTION F1,F2(101,"Dare",75);              //Line 3
 for (int I=0;I<4;I++)                      //Line 4
 {                                          //Line 5
   F1.Increase(20);F2.Increase(15);         //Line 6
   F1.Show();F2.Show();                     //Line 7
 }                                          //Line 8
}                                           //Line 9
```

	(i)	Which specific concept of object oriented programming out of the following is illustrated by Member Function 1 and Member Function 2 combined together? ● Data Encapsulation ● Data Hiding ● Polymorphism ● Inheritance	1
	Ans	**Polymorphism** ***(1Mark for mentioning the correct concept name)***	
	(ii)	How many times the message "Fiction removed!" will be displayed after executing the above C++ code? Out of Line 1 to Line 9, which line is responsible to display the message "Fiction removed!"?	1

	Ans	**2 times** **Line 9** ***(½ Mark for writing correct number of times)*** ***(½ Mark for writing correct line number)***	

	(c)	Write the definition of a class METROPOLIS in C++ with following description:
		Private Members
		- Mcode //Data member for Code (an integer)
		- MName //Data member for Name (a string)
		- MPop //Data member for Population (a long int)
		- Area //Data member for Area Coverage (a float)
		- PopDens //Data member for Population Density (a float)
		- CalDen() //A member function to calculate -------
		//Density as PopDens/Area
		Public Members
		- Enter() //A function to allow user to enter values of
		//Mcode,MName,MPop,Area and call CalDen()
		//function
		- ViewALL()//A function to display all the data members
		//also display a message "Highly Populated Area"
		//if the Density is more than 12000
			4

	Ans	**class METROPOLIS**
		{
		int Mcode;
		char MName[20];
		long int MPop;
		float Area;
		float PopDens;
		void CalDen();
		public:
		void Enter();
		void ViewALL();
		};
		void METROPOLIS::Enter()
		{
		cin>>Mcode;
		gets(MName); //OR cin>>MName;
		cin>>MPop;
		cin>>Area;
		CalDen();	

```
}

void METROPOLIS::ViewALL()
{
  cout<<Mcode<<MName<<MPop<<Area<<PopDens; //Ignore endl
  if(PopDens>12000)
    cout<<"Highly Populated Area";         //Ignore endl
}
void METROPOLIS::CalDen()
{
  PopDens= PopDens/Area;  //OR PopDens = MPop/Area
}
```

(½ Mark for correct syntax for class header)
(½ Mark for correctly ending the class declaration with a semicolon)
(½ Mark for correct declaration of data members)
(½ Mark for correct definition of CalDen() function)
(1 Mark for correct definition of Enter() with proper invocation of CalDen() function)
(1 Mark for correct definition of ViewALL())

NOTE:

- *Deduct ½ Mark if CalDen() is not invoked properly inside Enter() function*
- **Marks not to be deducted if any or all the member functions are defined inside the class**
- **Marks not to be deducted if `Density` is declared as an extra data member and calculated as `Density=PopDens/Area` inside `CalDen()` function**
- **Marks not to be deducted if `Density` is declared as an extra data member and checked as `if (Density>12000)` in lieu of `if (PopDens>12000)` inside `ViewALL()` function**

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

```
class PRODUCT
{
 int  Code;
 char Item[20];
protected:
 float Qty;
public:
  PRODUCT();
```

```
  void GetIn(); void Show();
};
class WHOLESALER
{
  int WCode;
protected:
  char Manager[20];
public:
  WHOLESALER();
  void Enter();
  void Display();
};
class SHOWROOM : public PRODUCT, private WHOLESALER
{
  char Name[20],City[20];
public:
  SHOWROOM();
  void Input();
  void View();
};
```

(i) Which type of Inheritance out of the following is illustrated in the above example?
- Single Level Inheritance
- Multi Level Inheritance
- Multiple Inheritance

Ans **Multiple Inheritance**
(1 Mark for writing correct option)

(ii) Write the names of all the data members, which are directly accessible from the member functions of class SHOWROOM.

Ans **`Name, City, Manager, Qty`**
(1 Mark for correct answer)

Note:
No marks to be awarded for any partial answer

(iii) Write the names of all the member functions, which are directly accessible by an object of class SHOWROOM.

Ans **`Input(), View(), GetIn(), Show()`**

		(1 Mark for correct answer) ***Note:*** ● ***No marks to be awarded for any partial answer*** ● ***Ignore constructor functions***	
	(iv)	What will be the order of execution of the constructors, when an object of class SHOWROOM is declared?	
	Ans	**(i) PRODUCT()** **(ii) WHOLESALER()** **(iii) SHOWROOM()** ***(1 Mark for writing correct order)*** ***Note:*** ● ***No Marks to be awarded for any other combination/order.*** ● ***Names of the constructor/class without parenthesis is acceptable.***	
3	(a)	Write the definition of a function FixPay(float Pay[], int N) in C++, which should modify each element of the array Pay having N elements, as per the following rules: **Existing Value of Pay** | **Pay to be changed to** If less than 100000 | Add 25% in the existing value If >=100000 and <20000 | Add 20% in the existing value If >=200000 | Add 15% in the existing value	2

	Ans	`void FixPay(float Pay[ ], int N)`
		`{`
		`  for (int i=0;i<N;i++)`
		`  if(Pay[i]<100000)`
		`  Pay[i]+= 0.25 * Pay[i];`
		`  else if (Pay[i]>=100000 && Pay[i]<20000)`
		`  Pay[i]+= 0.2 * Pay[i];`
		`  else if(Pay[i]>=200000)`
		`  Pay[i]+= 0.15 * Pay[i];`
		`}`
		OR
		Any other correct equivalent function definition
		
		(½ Mark for correctly writing the loop)	

		(½ Mark for checking at least one or all of the conditions correctly) *(1 Mark for correct increment of Pays for all conditions)* *OR* *(½ Mark for incrementing only one of the pays correctly)* *Note:* ● *Marks not to be deducted for writing second condition check for the range as* `>=100000 && <200000` *instead of* `>=100000 && <20000` ● **Marks not to be deducted for incrementing Salary as** `Pay[i]+= Pay[i]*20/100;` **OR** `Pay[i]+= 20/100*Pay[i];` **and likewise for all increments**	
	(b)	T[20][50] is a two dimensional array, which is stored in the memory along the row with each of its element occupying 4 bytes, find the address of the element T[15][5], if the element T[10][8] is stored at the memory location 52000.	3
	Ans	**Loc(T[I][J])** **=BaseAddress + W [(I – LBR)*C + (J – LBC)]** **(where** **W=size of each element = 4 bytes,** **R=Number of Rows=20, C=Number of Columns=50)** **Assuming LBR = LBC = 0** **LOC(T[10][8])** **52000 = BaseAddress + W[I*C + J]** **52000 = BaseAddress + 4[10*50 + 8]** **52000 = BaseAddress + 4[500 + 8]** **52000 = BaseAddress + 4 x 508** **BaseAddress = 52000 - 2032** **= 49968** **LOC(T[15][5])= BaseAddress + W[I*C + J]** **= 49968 + 4[15*50 + 5]** **= 49968 + 4[750 + 5]** **= 49968 + 4 x 755** **= 49968 + 3020** **= 52988** **OR** **Loc(T[I][J])** **=ReferenceAddress + W [(I – LR)*C + (J – LC)]** **(where**	

		W=size of each element = 4 bytes, **R=Number of Rows=20, C=Number of Columns=50)** **ReferenceAddress= Address of given cell T[10][8]=52000** **LR = Row value of given cell = 10** **LC = Column value of given cell = 8** **LOC(T[15][5])= LOC(T[10][8]) + 4[(15 - 10)*50 + (5 - 8)]** **LOC(T[15][5]) = 52000 + 4[5*50 + (-3)]** **= 52000 + 4[250 -3]** **= 52000 + 4 x 247** **= 52000 + 988** **= 52988** ***(1 Mark for writing correct formula (for Row major) OR substituting formula with correct values)*** ***(1Mark for correct calculation)*** ***(1 Mark for final correct address)***	
	(c)	Write the definition of a member function INSERT() for a class QUEUE in C++, to insert an ITEM in a dynamically allocated Queue of items considering the following code is already written as a part of the program. **struct ITEM** **{** **int INO; char INAME[20];** **ITEM *Link;** **};** **class QUEUE** **{** **ITEM *R,*F;** **public:** **QUEUE(){R=NULL;F=NULL;}** **void INSERT();** **void DELETE();** **~QUEUE();** **};**	4
	Ans	**void QUEUE::INSERT()** **{**	

```
  ITEM *T = new ITEM;
  cin>>T->INO;
  gets(T->INAME);    //OR cin>> T->INAME;
  T->Link = NULL;
  if(R==NULL)
  {
    F=T;     R=T;
  }
  else
  {
    R->Link=T;     R=T;
  }
}
```

(1 Mark for creating a new node)
(½ Mark for entering data for the new node)
(½ Mark for assigning NULL to link of the new node)
(½ Mark for assigning Front to the first node as F = T)
(½ Mark for linking the last node to the new node as R->Link =T)
(1 Mark for assigning Rear to the new node as R = T)

(d) Write definition for a function SHOWMID(int P[][5],int R,int C) in C++ to display the elements of middle row and middle column from a two dimensional array P having R number of rows and C number of columns. 3

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

115	112	116	101	125
103	101	121	102	101
185	109	109	160	172

The function should display the following as output :

```
103 101 121 102 101
116 121 109
```

ANS

```
void SHOWMID(int P[][5],int R,int C)
{
  for (int J=0;J<C;J++)
     cout<<P[R/2][J]<< " ";
  cout<<endl;
  for (int I=0;I<R;I++)
```

```
    cout<<P[I][C/2]<< " ";
}
```

OR

```
void SHOWMID(int P[][5],int R,int C)
{
  if(R%2!=0)
  {
    for (int J=0;J<C;J++)
      cout<<P[R/2][J]<< " ";
  }
  else
    cout<<"No Middle Row";
  cout<<endl;
  if(C%2!=0)
  {
    for (int I=0;I<R;I++)
     cout<<P[I][C/2]<< " ";
  }
  else
    cout<<"No Middle Column";
}
```

OR

Any other correct equivalent function definition

(½ Mark for correct loop for displaying middle row elements)
(1 Mark for correct statement to display middle row elements)
(½ Mark for correct loop for displaying middle column elements)
(1 Mark for correct statement to display middle column elements)

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

`A/(B+C)*D-E`

Ans

`A/(B+C)*D-E`
`= (((A / (B+C)) * D) - E)`

Element	Stack of Operators	Postfix Expression
(		

(		
(		
A		A
/	/	A
(	/	A
B	/	AB
+	/+	AB
C	/+	ABC
)	/	ABC+
)		ABC+/
*	*	ABC+/
D	*	ABC+/D
)		ABC+/D*
-	-	ABC+/D*
E	-	ABC+/D*E
)		ABC+/D*E-

= ABC+/D*E-

OR

A/(B+C)*D-E

= (A / (B+C) * D - E)

Element	Stack of Operators	Postfix Expression
(	(	
A	(	A
/	(/	A
(	(/(	A
B	(/(	AB
+	(/(+	AB
C	(/(+	ABC
)	(/	ABC+
*	(*	ABC+/
D	(*	ABC+/D
-	(-	ABC+/D*
E	(-	ABC+/D*E
)		ABC+/D*E-

= ABC+/D*E-

		OR **Any other method for converting the given infix expression to its equivalent postfix expression showing stack contents.** ***(½ Mark for correctly converting till each operator)*** ***OR*** ***(1 Mark to be given for writing correct answer without showing the stack content on each step)***	

4.	(a)	Write function definition for WORD4CHAR() in C++ to read the content of a text file FUN.TXT, and display all those words, which has four characters in it.
		
		Example:
		If the content of the file fun.TXT is as follows:
		`When I was a small child, I used to play in the garden with my grand mom. Those days were amazingly funful and I remember all the moments of that time`
		
		The function WORD4CHAR() should display the following:
		`When used play with days were that time`
			2

	Ans	`void WORD4CHAR()`
		`{`
		`  ifstream Fil;`
		`  Fil.open("FUN.TXT");`
		`  char W[20];`
		`  Fil>>W;`
		`  while(!Fil.eof())  //OR while(Fil)`
		`  {`
		`  if (strlen(W)) == 4 ) //Ignore words ending with '.'`
		`  cout<<W<< " ";`
		`  Fil>>W;`
		`  }`
		`  Fil.close();  //Ignore`
		`}`
		OR
		Any other correct function definition
		
		(½ Mark for opening FUN.TXT correctly)
		(½ Mark for reading each word** (using any method) **from the file)	

		(½ Mark for checking length of the extracted word to be of 4 letters) *(½ Mark for displaying the 4 letter extracted word correctly)*	

	(b)	Write a definition for function BUMPER( ) in C++ to read each object of a binary file GIFTS.DAT, find and display details of those gifts, which has remarks as "ÖN DISCOUNT". Assume that the file GIFTS.DAT is created with the help of objects of class GIFTS, which is defined below:
		`class GIFTS`
		`{`
		`int ID;char Gift[20],Remarks[20]; float Price;`
		`public:`
		`void Takeonstock()`
		`{`
		`cin>>ID;gets(Gift);gets(Remarks);cin>>Price;`
		`}`
		`void See()`
		`{`
		`cout<<ID<<":"<<Gift<<":"<<Price<<"":"<<Remarks<<endl;`
		`}`
		`char *GetRemarks(){return Remarks;}`
		`};`
			3

	Ans	`void BUMPER()`
		`{`
		`GIFTS G;`
		`ifstream fin;`
		`fin.open("GIFTS.DAT", ios::binary);`
		`while(fin.read((char*)&G, sizeof(G)))`
		`{`
		`if(strcmp(G.GetRemarks(),"ON DISCOUNT")==0)`
		`G.See();`
		`}`
		`fin.close(); //Ignore`
		`}`
		OR
		Any other correct function definition
		
		(1Mark for opening GIFTS .DAT correctly)
		(½ Mark for reading records from GIFTS.DAT)
		(½ Mark for comparing Remarks with ON DISCOUNT (ignore case sensitive checking))
		(1 Mark for displaying record)	

	(c)	Find the output of the following C++ code considering that the binary file MEM.DAT exists on the hard disk with a data of 1000 members.
		`class MEMBER`
		`{`
		`int Mcode;char MName[20];`
		`public:`
		`void Register();void Display();`
		`};`
		
		`void main()`
		`{`
		`fstream MFile;`
		`MFile.open("MEM.DAT",ios::binary|ios::in);`
		`MEMBER M;`
		`MFile.read((char*)&M, sizeof(M));`
		`cout<<"Rec:"<<MFile.tellg()/sizeof(M)<<endl;`
		`MFile.read((char*)&M, sizeof(M));`
		`MFile.read((char*)&M, sizeof(M));`
		`cout<<"Rec:"<<MFile.tellg()/sizeof(M)<<endl;`
		`MFile.close();`
		`}`
			1

	Ans	`Rec:1`
		`Rec:3`
		(½ Mark for each correct value of MFile.tellg()/sizeof(M) as 1 and 3 respectively)	

SECTION B - (Only for candidates, who opted for Python)			

1	(a)	Out of the following, find those identifiers, which can not be used for naming Variable or Functions in a Python program:
		
		`_Cost, Price*Qty, float, Switch,`
		`Address One, Delete, Number12, do`
			2

	Ans	`Price*Qty, float, Address One, do`	
		(½ Mark for each correct name) ***Note:*** ***Deduct ½ Mark for each wrong name written***	
	(b)	Name the Python Library modules which need to be imported to invoke the following functions (i) `load()` (ii) `pow()`	1

	Ans	(i) pickle (ii) math	
		(½ Mark for writing each correct Library modules) ***Note: Ignore any other Library modules, if mentioned.***	

	(c)	Rewrite the following code in python after removing all syntax error(s). Underline each correction done in the code.
		`for Name in [Amar, Shveta, Parag]`
		`  IF Name[0]='S':`
		`  print(Name)`
			2

	Ans	`for Name in [“Amar”, “Shveta”, “Parag”] : // ‘ ‘ can be used`
		`  if Name[0] == ‘S’:`
		`  print(Name)`	

		(½ Mark for each correction) ***OR*** ***(1 mark for identifying the errors, without suggesting corrections)***	
	(d)	Find and write the output of the following python code:	2

		`Numbers=[9,18,27,36]`
		`for Num in Numbers:`
		`  for N in range(1, Num%8):`
		`  print(N,"#",end="")`
		`  print()`	

	Ans	<table><tr><td>1# 1# 2# 1# 2# 3#</td><td>() (1 #) (1 #) (2 #) (1 #) (2 #) (3 #)</td><td>() (1 #) (1 # 2 #) (1 # 2 # 3 #) 1# 1#2# 1#2#3#</td></tr></table>	
		(2 marks for correct output) ***OR*** ***(½ mark for each correct value with ‘#’ not exceeding 2 Marks)*** ***OR***	

(2 mark for mentioning the syntax error in line
`print(N,"#",end="")`*)*

(e) Find and write the output of the following python code: 3

```
class Notes:
   def __init__(self,N=100,Nt="CBSE"): #constructor
      self.Nno=N
      self.NName=Nt
   def Allocate(self, N,Nt):
      self.Nno= self.Bno + N
      self.NName= Nt + self.NName
   def Show(self):
      print(self.Nno,"#",self.NName)
s=Notes()
t=Notes(200)
u=Notes(300,"Made Easy")
s.Show()
t.Show()
u.Show()
s.Allocate(4, "Made ")
t.Allocate(10,"Easy ")
u.Allocate(25,"Made Easy")
s.Show()
t.Show()
u.Show()
```

Ans

Python 2.7 output	Other Versions output
100 # CBSE 200 # CBSE 300 # Made Easy 104 # Made CBSE 210 # Easy CBSE 325 # Made EasyMade Easy	(100, '#', 'CBSE') (200, '#', 'CBSE') (300, '#', 'Made Easy') (104, '#', 'Made CBSE') (210, '#', 'Easy CBSE') (325, '#', 'Made EasyMade Easy')

(½ Mark for each correct line of output)

Note:

- **Deduct** *½ Mark for not writing any or all '#' symbol(s)*
- **Deduct** *½ Mark for not considering any or all line breaks 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 PICKER. 2

```
import random
PICK=random.randint(0,3)
CITY=["DELHI","MUMBAI","CHENNAI","KOLKATA"];
for I in CITY:
  for J in range(1,PICK):
    print(I,end="")
  print()
```

(i)	(ii)
DELHIDELHI MUMBAIMUMBAI CHENNAICHENNAI KOLKATAKOLKATA	DELHI DELHIMUMBAI DELHIMUMBAICHENNAI
(iii)	**(iv)**
DELHI MUMBAI CHENNAI KOLKATA	DELHI MUMBAIMUMBAI KOLKATAKOLKATAKOLKATA

Ans Option (i) and (iii) are possible

OR

Option (i) only

PICK maxval=3 minval=0

(1 Mark for mentioning correct option(s))

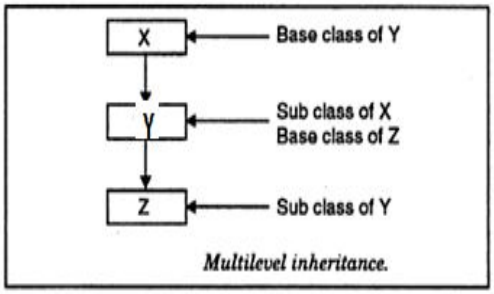
Note: No marks to be awarded for writing any other option.

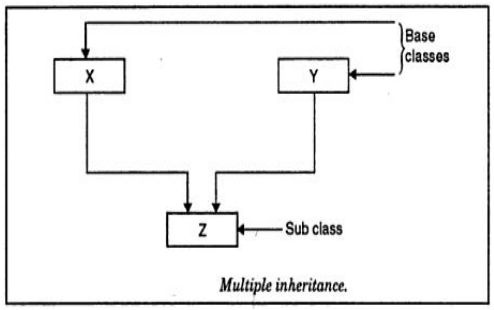
(½ Mark each for Minimum and Maximum Value of PICK)

2 (a) What is the difference between Multilevel and Multiple inheritance? Give suitable examples to illustrate both. 2

Ans

Multilevel inheritance	Multiple inheritance

<table>
<tr><td></td><td></td><td>
<table>
<tr>
<td> 

Multilevel inheritance.</td>
<td> 

Multiple inheritance.</td>
</tr>
<tr>
<td>X is the parent class of Y and Y is the parent class of Z</td>
<td>The child class Z has parents X and Y</td>
</tr>
</table>
</td><td></td></tr>
<tr><td></td><td></td><td>(1 mark for correct difference)
(1 mark for correct example)</td><td></td></tr>
<tr><td></td><td>(b)</td><td>What will be the output of the following python code considering the following set of inputs?
JAYA
My 3 books
PICK2
2120

Also, explain the try and except used in the code.</td><td>2</td></tr>
<tr><td></td><td></td><td><pre>
Counter=0
while True:
  try:
    Number=int(raw_input("Give a Number"))
    break
  except ValueError:
    Counter=Counter+2
    print("Re-enter Number")
print(Counter)
</pre></td><td></td></tr>
<tr><td></td><td>Ans</td><td>Output:
Give a Number JAYA
Re-enter Number
Give a Number My 3 books
Re-enter Number
Give a Number PICK2
Re-enter Number</td><td></td></tr>
</table>

		Give a Number 2120 **6** Explanation: The code inside try makes sure that the valid number is entered by the user. When any input other than an integer is entered, a value error is thrown and it prompts the user to enter another value.	
		(½ mark for correct output for text entry) ***(½ mark for correct output for number entry)*** ***(1 mark for correct explanation of try and except)***	
	(c)	Write a class CITY in Python with following specifications	4
		Instance Attributes **- Code # Numeric value** **- Name # String value** **- Pop # Numeric value for Population** **- KM # Numeric value** **- Density # Numeric value for Population Density** Methods: **- CalDen() # Method to calculate Density as Pop/KM** **- Record() # Method to allow user to enter values Code,Name,Pop,KM and call CalDen() method** **- See() # Method to display all the members also display a message "Highly Populated Area" if the Density is more than 12000.**	
	Ans	**class CITY:** **def __init__(self):** **self.Code = 0** **self.Name = ""** **self.Pop = 0** **self.KM =0** **self.Density=0** **def CalDen(self):** **self.Density = self.Pop / self.KM** **def Record(self):** **self.Code = input("Enter Code")** **self.Name = raw_input("Enter Name")** **self.Pop = input("Enter population")** **self.KM = input("Enter KM")** **CalDen(self) // or self.CalDen()** **def See(self):**	

		`print Code,Name,Pop, KM, Density`
		`if self.Density > 12000:`
		`print("Highly Populated Area")`
		`# OR print("Highly populated Area")`	

		Note: Accept self.__Code to indicate private members	
		(½ Mark for correct syntax for class header) ***(1 Mark for correct declaration of instance attributes)*** ***(½ Mark for correct definition of CalDen() function)*** ***(1 Mark for correct definition of Record() with proper invocation of CalDen() function)*** ***(1 Mark for correct definition of See())*** ***NOTE:*** ***Deduct ½ Mark if CalDen() is not invoked properly inside Record() function***	
	(d)	How do we implement abstract method in python? Give an example for the same.	2

	Ans	Abstract method: An unimplemented method is called an abstract method. When an abstract method is declared in a base class, the derived class has to either define the method or raise "NotImplementedError"
		
		`class Shape(object):`
		`def findArea(self):`
		`pass`
		`class Square(Shape):`
		`def __init__(self,side):`
		`self.side = side`
		`def findArea(self):`
		`return self.side * self.side`	

		(1 mark for correct explanation) ***(1 mark for correct example)*** ***Note : We can use @abstractmethod to enable parent class method to be executed.***	
	(e)	What is the significance of super() method? Give an example for the same.	2
	Ans	super() function is used to call base class methods which has been extended in derived class. EX: `class GradStudent(Student):`	

```
        def __init__(self):
            super(GradStudent, self).__init__()
            self.subject = ""
            self.working = ''
        def readGrad (self):
            # Call readStudent method of parent class
            super(GradStudent, self).readStudent()
```

(1 mark for correct explanation)
(1 mark for correct example)

3. **(a)** What will be the status of the following list after the First, Second and Third pass of the insertion sort method used for arranging the following elements in descending order? 3

22, 24, -64, 34, 80, 43

Note: Show the status of all the elements after each pass very clearly underlining the changes.

Ans

	22	24	-64	34	80	43
Pass 1	(24)	22	-64	34	80	43
Pass 2	24	22	(-64)	34	80	43
Pass 3	(34)	24	22	-64	80	43

(1 mark for each correct pass)

(b) For a given list of values in descending order, write a method in python to search for a value with the help of Binary Search method. The method should return position of the value and should return -1 if the value not present in the list. 2

Ans

```
def binarysrch(nums,x):
   high = len(nums)
   low =0
   while low < high:
     mid = (low + high)//2
     midval = nums[mid]
     if midval > x:
       low = mid + 1
     elif midval < x:
       high = mid
     else:
       return mid
  return -1
```

(½ mark for assignment of high/ub and low/lb)
(½ mark for appropriate looping condition)

		(½ mark for calculation of Mid) ***(½ mark for changing high/ub and low/lb)***	
	(c)	Write Insert(Place) and Delete(Place) methods in python to add Place and Remove Place considering them to act as Insert and Delete operations of the data structure Queue.	4

	Ans	`class queue:`
		`  place = [ ]`
		`  def insert(self):`
		`  a = raw_input("Enter place")`
		`  queue.place.append(a)`
		`  def delete(self):`
		`  if (queue.place == [ ] ):`
		`  print "Queue empty"`
		`  else:`
		`  print "Deleted element is", queue.place[0]`
		`  queue.place.delete()`
		OR
		
		`class queue:`
		`  place = [ ]`
		`  def insert(self):`
		`  a = raw_input("Enter place")`
		`  queue.place.append(a)`
		`  def delete(self):`
		`  if (queue.place == [ ] ):`
		`  print("Queue empty")`
		`  else:`
		`  print("Deleted element is", queue.place[0])`
		`  queue.place.delete()`	

		(½ mark insert header) ***(½ mark for accepting a value from user)*** ***(½ mark for adding value in list)*** ***(½ mark for delete header)*** ***(½ mark for checking empty list condition)*** ***(½ mark for displaying "Empty Message")***	
	(d)	Write a method in python to find and display the prime numbers between 2 to N. Pass N as argument to the method.	3

	Ans	`def prime(N):`
		`  for a in range(2,N):`
		`  for I in range(2,a):`
		`  if N%i ==0:`
		`  break`	

```
    print a

OR
def prime N:
   for a in range 2,N:
     for I in range 2,a:
       if a%i ==0:
         break
     else:
       print a
```

½ mark function header *½ mark for Divisibility check.*
½ mark first loop *01 mark for Displaying view.*
½ mark for second loop

e Evaluate the following postfix notation of expression. Show status of stack after every operation. 2

22,11,/,14,10,-,+,5,-

Ans

Element	Stack
22	**22**
11	**22, 11**
/	**2**
14	**2, 14**
10	**2, 14, 10**
–	**2, 4**
+	**6**
5	**6, 5**
–	**1**

Final Result = 1

½ Mark for evaluation till each operator)
OR
1 Mark for only writing the Final answer without showing stack status

4 **a)** Write a statement in Python to perform the following operations: 1

- To open a text file "BOOK.TXT" in read mode
- To open a text file "BOOK.TXT" in write mode

Ans

```
f1 = open "BOOK.TXT",'r'
f2 = open "BOOK.TXT", 'w'
```

		(½ Mark for each correct statement)	
	(b)	Write a method in python to write multiple line of text contents into a text file myfile.txt line.	2

	Ans	`def writel():`
		`  f = open("myfile.txt",'w')`
		`  while True:`
		`  line = raw_input("Enter line")`
		`  f.write(line)`
		`  choice = raw_input("Are there more lines")`
		`  if choice == 'N':`
		`  break;`
		`  f.close()`	

		Note: Using writelines() is also correct	
		(½ Mark for opening file in appropriate mode) *(½ Mark for end of file check and loop)* *(½ Mark for taking input from user)* *(½ Mark for writing the line into the file)*	

	(c)	Consider the following definition of class Staff, write a method in python to search and display the content in a pickled file staff.dat, where Staffcode is matching with 'S0105'.
		
		`class Staff:`
		`  def __init__(self,S,SNM):`
		`  self.Staffcode=S`
		`  self.Name=SNM`
		`  def Show(self):`
		`  print(self.Staffcode," - ",self.Name)`
			3

	Ans	`def search():`
		`  f = open("staff.dat", 'rb')`
		`  try:`
		`  while True:`
		`  e = pickle.load(f)`
		`  if e.Staffcode == 'S0105':`
		`  e.Show()`
		`  except EOFError:`
		`  pass`
		`  f.close()`	

		(½ Mark for correct function header) *(½ Mark for opening the file staff.dat correctly)* *(½ Mark for correct file check and loop)*	

(½ Mark for correct load())
(½ Mark for correct checking of Staffcode)
(½ Mark for displaying the record)

SECTION C - (For all the candidates)

5 (a) Observe the following STUDENTS and EVENTS tables carefully and write the name of the RDBMS operation which will be used to produce the output as shown in LIST ? Also, find the Degree and Cardinality of the LIST. 2

STUDENTS

NO	NAME
1	Tara Mani
2	Jaya Sarkar
3	Tarini Trikha

EVENTS

EVENTCODE	EVENTNAME
1001	Programming
1002	IT Quiz

LIST

NO	NAME	EVENTCODE	EVENTNAME
1	Tara Mani	1001	Programming
1	Tara Mani	1002	IT Quiz
2	Jaya Sarkar	1001	Programming
2	Jaya Sarkar	1002	IT Quiz
3	Tarini Trikha	1001	Programming
3	Tarini Trikha	1002	IT Quiz

Ans **Cartesian Product**

Degree = 4
Cardinality = 6

(1 Mark for writing the correct name of RDBMS operation)
(½ Mark for writing correct value of degree)
(½ Mark for writing correct value of cardinality)

(b) **Write SQL queries for (i) to (iv) and find outputs for SQL queries (v) to (viii), which are based on the tables** 6

Table: VEHICLE

CODE	VTYPE	PERKM
101	VOLVO BUS	160

102	AC DELUXE BUS	150	
103	ORDINARY BUS	90	
105	SUV	40	
104	CAR	20	

Note:

- **PERKM is Freight Charges per kilometer**
- **VTYPE is Vehicle Type**

Table: TRAVEL

NO	NAME	TDATE	KM	CODE	NOP
101	Janish Kin	2015-11-13	200	101	32
103	Vedika Sahai	2016-04-21	100	103	45
105	Tarun Ram	2016-03-23	350	102	42
102	John Fen	2016-02-13	90	102	40
107	Ahmed Khan	2015-01-10	75	104	2
104	Raveena	2016-05-28	80	105	4
106	Kripal Anya	2016-02-06	200	101	25

Note:

- **NO is Traveller Number**
- **KM is Kilometer travelled**
- **NOP is number of travellers travelled in vehicle**
- **TDATE is Travel Date**

(i) To display NO, NAME, TDATE from the table TRAVEL in descending order of NO.

Ans

```
SELECT NO, NAME, TDATE FROM TRAVEL
ORDER BY NO DESC;
```

(½ Mark for `SELECT NO, NAME, TDATE FROM TRAVEL`*)*
(½ Mark for `ORDER BY NO DESC`*)*

(ii) To display the NAME of all the travellers from the table TRAVEL who are traveling by vehicle with code 101 or 102.

Ans

```
SELECT NAME FROM TRAVEL
WHERE CODE='101' OR CODE='102';
```

OR

```
SELECT NAME FROM TRAVEL
WHERE CODE=101 OR CODE=102;
```

		OR
		`SELECT NAME FROM TRAVEL`
		`WHERE CODE IN ('101','102');`
		OR
		`SELECT NAME FROM TRAVEL`
		`WHERE CODE IN (101,102);`
		(½ Mark for correct **SELECT***)*
		(½ Mark for correct **WHERE** *)*	

	(iii)	**To display the NO and NAME of those travellers from the table TRAVEL who travelled between '2015-12-31' and '2015-04-01'.**	

	Ans	`SELECT NO, NAME from TRAVEL`
		`WHERE TDATE >= '2015-04-01' AND TDATE <= '2015-12-31';`
		OR
		`SELECT NO, NAME from TRAVEL`
		`WHERE TDATE BETWEEN '2015-04-01' AND '2015-12-31';`
		OR
		`SELECT NO, NAME from TRAVEL`
		`WHERE TDATE <= '2015-12-31' AND TDATE >= '2015-04-01';`
		OR
		`SELECT NO, NAME from TRAVEL`
		`WHERE TDATE BETWEEN '2015-12-31' AND '2015-04-01';`
		
		(½ Mark for correct **SELECT***)*
		(½ Mark for correct **WHERE** *)*	

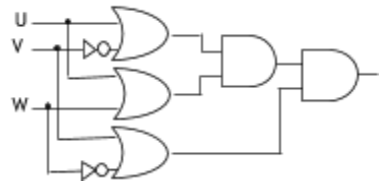
	(iv)	**To display all the details from table TRAVEL for the travellers, who have travelled distance more than 100 KM in ascending order of NOP.**	

	Ans	`SELECT * FROM TRAVEL`
		`WHERE KM > 100 ORDER BY NOP;`
		(½ Mark for correct **SELECT***)*
		(½ Mark for correct **WHERE** *)*	

	(v)	`SELECT COUNT(*),CODE FROM TRAVEL` `GROUP BY CODE HAVING COUNT(*)>1;`	

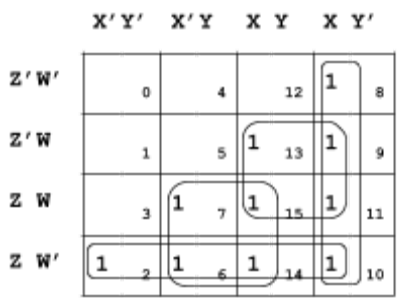
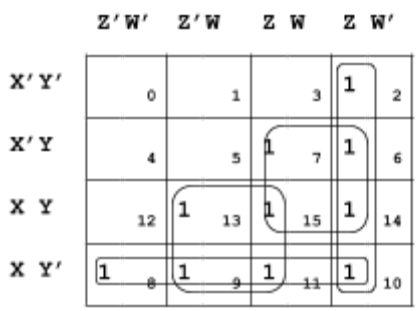
	Ans	`COUNT(*)  CODE`
		`2  101`
		`2  102`
		(½ Mark for correct output)	

	(vi)	SELECT DISTINCT CODE FROM TRAVEL;	
	Ans	DISTINCT CODE 101 102 103 104 105 *(½ Mark for correct output)* *Note: Ignore the order*	
	(vii)	SELECT A.CODE,NAME,VTYPE FROM TRAVEL A,VEHICLE B WHERE A.CODE=B.CODE AND KM<90;	
	Ans	CODE NAME VTYPE 104 Ahmed Khan CAR 105 Raveena SUV *(½ Mark for correct output)*	
	(viii)	SELECT NAME,KM*PERKM FROM TRAVEL A,VEHICLE B WHERE A.CODE=B.CODE AND A.CODE='105';	
	Ans	NAME KM*PERKM Raveena 3200 *(½ Mark for correct output)*	
6	a.	Verify the following using Boolean Laws. A'+ B'.C = A'.B'.C'+ A'.B.C'+ A'.B.C + A'.B'.C+ A.B'.C	2
	Ans	LHS A' + B'.C = A'.(B + B').(C + C') + (A + A').B'.C = A'.B.C + A'.B.C' + A'.B'.C + A'.B'.C' + A.B'.C + A'.B'.C = A'.B.C + A'.B.C' + A'.B'.C + A'.B'.C' + A.B'.C = A'.B'.C' + A'.B.C' + A'.B.C + A'.B'.C + A.B'.C = RHS OR RHS = A'.B'.C' + A'.B.C' + A'.B.C + A'.B'.C + A.B'.C = A'.B'.C + A'.B'C' + A'.B.C + A'.B.C' + A.B'.C = A'.B'.(C+C') + A'.B.(C+C') + A.B'.C = A'.B' + A'.B + A.B'.C = A'.(B'+B) +A.B'.C	

		= A′ + A.B′.C = (A′ + A).(A′ + B′.C) = A′ + B′.C = LHS *(2 Marks for correct Verification)* *OR* *(1 Mark for expanding LHS up to 1 correct step)* *OR* *(1 Mark for reducing RHS up to 1 correct step)*	
	b.	Write the Boolean Expression for the result of the Logic Circuit as shown below:	2
			
	Ans	((U + V′).(U + W)). (V + W′) OR (U + V′).(U + W). (V + W′) *(2 Marks for correctly writing the full expression)* *OR* *(½ Mark each for correctly writing any one term)*	
	c.	Derive a Canonical POS expression for a Boolean function F, represented by the following truth table:	1

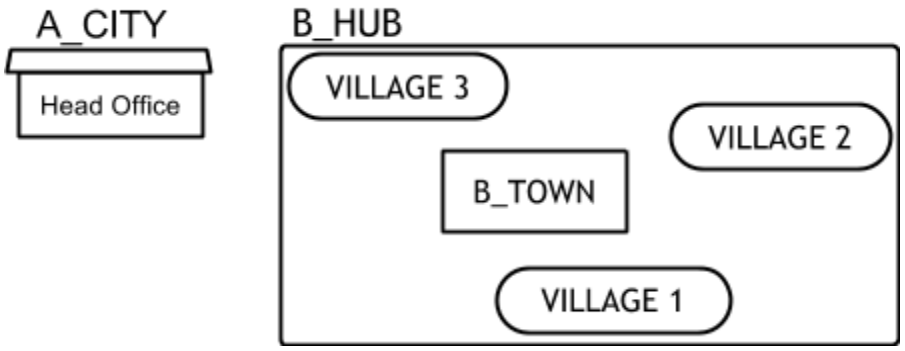
P	Q	R	F(P,Q,R)
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

	Ans	F(P,Q,R)=(P+Q+R).(P+Q′+R′).(P′+Q+R).(P′+Q+R′) OR F(P,Q,R)= π(0,3,4,5) *(1 Mark for the correctly writing the POS form)*	

		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)= (2,6,7,8,9,10,11,13,14,15)	
	Ans	 OR  **F(X,Y,Z,W) = XY′ + ZW′ + XW + YZ** ***(½ Mark for drawing K-Map with correct variable names)*** ***(½ Mark each for 4 groupings)*** ***(½ Mark for writing final expression in reduced/minimal form)*** ***Note: Deduct ½ mark if wrong variable names are written in the expression***	
7	(a)	Give two examples of PAN and LAN type of networks.	1
	Ans	**PAN Examples** / **LAN Examples**: **Connecting two cell phones to transfer data** / **Connecting computers in a school**; **Connecting smartphone to a smart watch** / **Connecting computers in an office**. **Note: Any one example of each OR Any other one/two correct examples for each of PAN and LAN**	
		(½ Mark for any one/two correct examples of PAN) ***(½ Mark for any one/two correct examples of LAN)***	
	(b)	Which protocol helps us to browse through web pages using internet browsers? Name any one internet browser.	1

	Ans	**Protocol: HTTP OR TCP/IP** **Browser:** Chrome **OR** Internet Explorer **OR** Firefox **OR** OPERA **OR** SAFARI **OR** any other correct Browser Name	
		(½ Mark for any one correct protocol name) ***(½ Mark for any one correct browser name)***	
	(c)	Write two advantages of 4G over 3G Mobile Telecommunication Technologies in terms of speed and services?	1
	Ans	<table><tr><th>4G</th><th>3G</th></tr><tr><td>Speed approximately 100 mbps</td><td>Speed approximately 2 mbps</td></tr><tr><td>LTE True mobile broadband</td><td>Data services with multimedia</td></tr></table> **OR** Any other two correct advantages of 4G over 3G in terms of speed and services	
		(½ Mark for each correct advantage)	
	(d)	Write two characteristics of Web 2.0.	1
	Ans	● Makes web more interactive through online social media ● Supports easy online information exchange ● Interoperability on the internet ● Video sharing possible in the websites **OR** Any two of the above or any other two correct characteristics of Web 2.0	
		(½ Mark each for any two correct characteristics)	
	(e)	What is the basic difference between Trojan Horse and Computer Worm?	1
	Ans	<table><tr><th>Trojan Horse</th><th>Computer Worm</th></tr><tr><td>It is a "Malware" computer program presented as useful or harmless in order to induce the user to install and run them.</td><td>It is a self-replicating computer program. It uses a network to send copies of itself to other nodes (computers on the network) and it may do so without any user intervention.</td></tr></table>	

		OR Any other correct difference between Trojan Horse and Computer Worm	
		(1 Mark for writing correct difference between Trojan Horse and Computer Worm) ***OR*** ***(½ Mark for writing correct explanation of Trojan Horse)*** ***OR*** ***(½ Mark for writing correct explanation of Computer Worm)***	
	(f)	**Categories the following under Client side and Server Side script category?** **(i) VB Sript** **(ii) ASP** **(iii) JSP** **(iv) Java Script**	1
	Ans	<table><tr><th>Client Side Scripts</th><th>Server Side Scripts</th></tr><tr><td>VB Script</td><td>ASP</td></tr><tr><td>Java Script</td><td>JSP</td></tr></table> ***(1 Mark for correct answer)*** ***OR*** ***(½ Mark for any two correct client/server side script names)***	
	(g)	Uplifting Skills Hub India is a knowledge and skill community which has an aim to uplift the standard of knowledge and skills in the society. It is planning to setup its training centers in multiple towns and villages pan India with its head offices in the nearest cities. They have created a model of their network with a city, a town and 3 villages as follows. As a network consultant, you have to suggest the best network related solutions for their issues/problems raised in (i) to (iv), keeping in mind the distances between various locations and other given parameters.	



Shortest distances between various locations:

VILLAGE 1 to B_TOWN	2 KM
VILLAGE 2 to B_TOWN	1.0 KM
VILLAGE 3 to B_TOWN	1.5 KM
VILLAGE 1 to VILLAGE 2	3.5 KM
VILLAGE 1 to VILLAGE 3	4.5 KM
VILLAGE 2 to VILLAGE 3	2.5 KM
A_CITY Head Office to B_HUB	25 Km

Number of Computers installed at various locations are as follows:

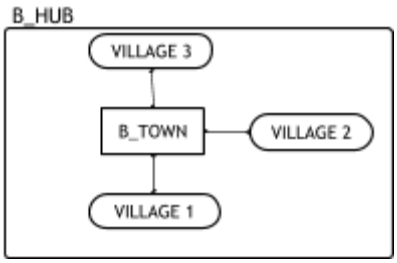
B_TOWN	120
VILLAGE 1	15
VILLAGE 2	10
VILLAGE 3	15
A_CITY OFFICE	6

Note:

- In Villages, there are community centers, in which one room has been given as training center to this organization to install computers.
- The organization has got financial support from the government and top IT companies.

(i) Suggest the most appropriate location of the SERVER in the B_HUB (out of the 4 locations), to get the best and effective connectivity. Justify your answer. 1

Ans B_TOWN. Since it has the maximum number of computers and is closest to all other locations.

		(½ Mark for writing correct location name) ***(½ Mark for writing any one correct justification)***	
	(ii)	Suggest the best wired medium and draw the cable layout (location to location) to efficiently connect various locations within the B_HUB.	1
	Ans	Best Wired Medium : Optical Fibre	
		 ***(½ Mark for writing the correct best wired medium name)*** ***(½ Mark for drawing the correct cable layout)***	
	(iii)	Which hardware device will you suggest to connect all the computers within each location of B_HUB?	1
	Ans	**Switch OR Hub** ***(1 Mark for writing any one of the above answers)***	
	(iv)	Which service/protocol will be most helpful to conduct live interactions of Experts from Head Office and people at all locations of B_HUB?	1
	Ans	**Videoconferencing OR VoIP OR any other correct service/protocol** ***(1 Mark for writing any one of the above answers)***	