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Senior School Certificate Examination

September 2020

Marking Scheme - Computer Science (OLD) (SUBJECT CODE: 283)

(SERIES: HMJ/C, PAPER CODE - 491/C, SET 4)

**General Instructions:**

1. You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and the teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully. **Evaluation is a 10 -12 days mission for all of us. Hence, it is necessary that you put in your best efforts in this process.**
2. Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. **However, while evaluating, answers which are based on the latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and marks be awarded to them.**
3. The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
4. If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totaled up and written in the left-hand margin and encircled.
5. If a question does not have any parts, marks must be awarded in the left hand margin and encircled.
6. If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out.
7. No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
8. A full scale of marks **70** (example: **1-70**) has to be used. Please do not hesitate to award full marks if the answer deserves it.
9. Every examiner has to necessarily do evaluation work for full working hours i.e. 8 hours every day and evaluate 25 answer books per day.
10. Ensure that you do not make the following common types of errors committed by the Examiner in the past:-
  - a. Leaving the answer or part thereof unassessed in an answer book.
  - b. Giving more marks for an answer than assigned to it.
  - c. Wrong transfer of marks from the inside pages of the answer book to the title page.
  - d. Wrong question wise totaling on the title page.
  - e. Wrong totaling of marks of the two columns on the title page.
  - f. Wrong grand total.
  - g. Marks in words and figures not tallying.
  - h. Wrong transfer of marks from the answer book to online award list.
  - i. Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.)
  - j. Half or a part of answer marked correct and the rest as wrong, but no marks awarded.
11. While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as (X) and awarded zero (0) Marks.
12. Any unassessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.
13. The Examiners should acquaint themselves with the guidelines given in the Guidelines for spot Evaluation before starting the actual evaluation.
14. Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totaled and written in figures and words.

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*\*These answers are meant to be used by evaluators*



15. The Board permits candidates to obtain a photocopy of the Answer Book on request in an RTI application and also separately as a part of the re-evaluation process on payment of the processing charges.

**Specific Instructions:**

- 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, the 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++)			
Q. No	Part	Question Description	Marks
1	(a)	Identify the valid keywords in C++ from the following : (i) If                      (ii) for                      (iii) case                      (iv) Object (v) struct                      (vi) sub                      (vii) float                      (viii) My_class	[2]
	Ans	(ii) for                      (iii) case                      (v) struct                      (vii) float	
		(½ Mark for writing each correct keyword)	
	(b)	Write the names of the correct header files, which must be included in the following C++ code to compile the code successfully:  <pre>void main() {     int X = random(10);     int Y = random(20);     cout&lt;&lt;"Sum of "&lt;&lt;X&lt;&lt;" and "&lt;&lt;Y&lt;&lt;" = "&lt;&lt;X+Y&lt;&lt;endl; }</pre>	[1]
	Ans	<ul style="list-style-type: none"> <li>• <code>stdlib.h</code></li> <li>• <code>iostream.h</code></li> </ul>	
		(½ Mark for writing each correct header file)	
	(c)	Rewrite the following C++ program after removing any/all syntactical errors with each correction underlined. Note: Assume all required header files are already included in the program.	[2]

	<pre> void main() {     cout&lt;&lt;"Enter two integers ";     cin&gt;&gt;A&gt;&gt;B;     if A &lt;= B         A += B;         B -= 5 ;     else     {         B = B + A;         A - 5 = A;     }     cout&lt;&lt;A&lt;&lt;" : "&lt;&lt; B &lt;&lt; endl; } </pre>	
Ans	<pre> void main() {     <u>int A, B;</u> //Error 1     cout&lt;&lt;"Enter two integers ";     cin&gt;&gt;A&gt;&gt;B;     if <u>( A &lt;= B )</u> //Error 2     { //Error 3         A += B;         B -= 5;     } //Error 3     else     {         B = <u>B + A;</u>         <u>A = A - 5;</u> //Error 4     }     cout&lt;&lt;A&lt;&lt;" : "&lt;&lt; B &lt;&lt; endl; } </pre>	
	<p>(1/2 Marks for writing correction for Error 1)  (1/2 Marks for writing correction for Error 2)  (1/2 Marks for writing correction for Error 3)  (1/2 Marks for writing correction for Error 4)</p> <p><b>NOTE:</b>  (1 mark for only identifying all the errors without writing corrections)</p>	
(d)	<p>Find and write the output of the following C++ program code:  Note: Assume all required header files are already included in the</p>	[2]

	<pre> program.  void ChangeVal(int *M, int N) {     for(int i=0;i&lt;N ; i++)     {         if (*M%5 == 0)             *M /= 5;         if (*M%3 == 0)             *M /= 3;         M++;     } }  void main() {     int Val[]={ 25,8,75,12};     ChangeVal (Val,4);     for(int i=0;i&lt;4; i++)         cout&lt;&lt;Val[i]&lt;&lt;"*";     cout&lt;&lt;endl; } </pre>	
Ans	2#2#7#1#	
	<p><i>(½ Mark for writing each correct value)</i>  OR  <i>(Only ½ Mark for writing all ‘#’ at proper places)</i>  <b>Note:</b>  <i>Deduct only ½ Mark for not considering any or all correct placements of #</i></p>	
(e)	<p>Find and write the output of the following C++ program code:  Note: Assume all required header files are already included in the program.</p> <pre> struct Product {     int X, Y; };  void Change(Product &amp;P) {     P.X += 5; P.Y -= 5; }  void Multiply(int P1, int P2) {     cout&lt;&lt;"First = "&lt;&lt;P1&lt;&lt;" &amp; Second = "&lt;&lt;P2&lt;&lt;endl;     cout&lt;&lt;"Product = "&lt;&lt;P1*P2&lt;&lt;endl; } </pre>	[3]



	<pre> } void main() {     Product P[] = {{7,10},{10,7},{7,7}};     for(int i=0; i&lt;3; i++)     {         Change(P[i]);         Multiply(P[i].X, P[i].Y);     } } </pre>					
Ans	<pre> First = 12 &amp; Second = 5 Product = 60 First = 15 &amp; Second = 2 Product = 30 First = 12 &amp; Second = 2 Product = 24 </pre>					
	<p><i>(½ Mark for writing each correct line of output)</i>  <b>NOTE:</b>  <i>Deduct only ½ Mark for not considering any or all line break</i></p>					
(f)	<p>Look at the following C++ code and find the possible output(s) from the options (i) to (iv) following it. Also, write the minimum and maximum values that can possibly be assigned to the variable End.</p> <p>Note:</p> <ul style="list-style-type: none"> <li>Assume all the required header files are already being included in the code.</li> <li>The function random(N) generates any possible integer between 0 and N-1 (both values included)</li> </ul> <pre> void main() {     randomize();     char Colours[][20] = {"VIOLET", "INDIGO", "BLUE", "GREEN",  "YELLOW", "ORANGE", "RED"};      int End = random(2)+3;     int Begin = random(End)+1;     for(int i= Begin; i&lt;End; i++)         cout&lt;&lt;Colours[i]&lt;&lt;"&amp;"; } </pre> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 2px;">(i) INDIGO&amp;BLUE&amp;GREEN&amp;</td> <td style="width: 50%; padding: 2px;">(ii) VIOLET&amp;INDIGO&amp;BLUE&amp;</td> </tr> <tr> <td style="padding: 2px;">(iii) BLUE&amp;GREEN&amp;YELLOW&amp;</td> <td style="padding: 2px;">(iv) GREEN&amp;YELLOW&amp;ORANGE&amp;</td> </tr> </table>	(i) INDIGO&BLUE&GREEN&	(ii) VIOLET&INDIGO&BLUE&	(iii) BLUE&GREEN&YELLOW&	(iv) GREEN&YELLOW&ORANGE&	[2]
(i) INDIGO&BLUE&GREEN&	(ii) VIOLET&INDIGO&BLUE&					
(iii) BLUE&GREEN&YELLOW&	(iv) GREEN&YELLOW&ORANGE&					



	Ans	(i) INDIGO&BLUE&GREEN& Minimum Value of End= 3 Maximum Value of End= 4	
		(1 mark for writing correct option) (½ Mark for writing Minimum Value of End) (½ Mark for writing Maximum Value of End)	
2.	(a)	Explain Single level inheritance in context of Object Oriented Programming in C++. Also, write a suitable example in C++ to illustrate Single level inheritance.	[2]
	Ans	When a class inherits from a base class it is called Single level inheritance. Example: class Animal {  }; class Mammal : public Animal {  };	
		(1 Mark for writing correct explanation of Single level Inheritance) (1 Mark for writing correct example of Single level Inheritance)	
	(b)	Observe the following C++ code and answer the questions (i), (ii), (iii) and (iv) Note: Assume all necessary files are included.  class Triangle { int S1,S2,S3; public: Triangle(int X=0,int Y =0, int Z=0)       //Function 1 { S1=X; S2=Y; S3=Z; } Triangle(Triangle &T)                   //Function 2 { T.S1 += 15; S1 = T.S1 ; S2 = T.S2; T.S2 +=20; S3 = T.S3;	[2]



	<pre> } void Show() //Function 3 {     cout&lt;&lt;S1&lt;&lt;"#"&lt;&lt;S2&lt;&lt;"#"&lt;&lt;S3&lt;&lt;endl; } };  void main() {     _____ //Statement 1     _____ //Statement 2     _____ //Statement 3 } </pre>	
	(i) Write Statement 1 to declare an object T1 of class Triangle, initialised by values 10 for S1, 20 for S2 and 0 for S3	
Ans	<pre> Triangle T1(10,20); OR Triangle T1(10,20,0); </pre>	
	<i>(1/2 Mark for writing correct declaration)</i>	
	(ii) Write Statement 2 which would invoke Function 2.	
Ans	<pre> Triangle T2(T1); OR Triangle T2=T1; </pre>	
	<i>(1/2 Mark for writing correct declaration)</i>	
	(iii) Write Statement 3 which would invoke Function 3 for the object T1 declared in Statement 1.	
Ans	<pre> T1.Show(); </pre>	
	<i>(1/2 Mark for writing correct statement)</i>	
	(iv) Write the output of the above code after execution of all the three statements - Statement 1, Statement 2 and Statement 3 in the main().	
Ans	25#40#0	
	<i>(1/2 Mark for writing each correct value of the output)</i>	
	OR	
	Write any two differences between a constructor and a destructor function declared inside a class. Illustrate with the help of a suitable example.	[2]
Ans		



Constructor	Destructor									
(Any two) <ul style="list-style-type: none"> <li>• Has same name as the class</li> <li>• Gets invoked by itself whenever an object of the class is declared</li> <li>• Can be overloaded</li> </ul>	(Any two) <ul style="list-style-type: none"> <li>• Has same name as the class prefixed by a tilde symbol ~</li> <li>• Gets invoked by itself whenever the scope of an object gets over</li> <li>• Can not be overloaded</li> </ul>									
<p><b>Example:</b></p> <pre> class Sample {     int D; public:     Sample()    //Constructor     {         D=10;     }     ~Sample()     {         cout&lt;&lt;"Over"&lt;&lt;endl;     } };  void main() {     Sample S;    //Constructor executes } //Destructor executes </pre>										
<p>(1/2 Mark for writing each correct difference of the two)            (1/2 Mark for writing each correct example of the two)</p>										
<p>(c) Write the definition of a class CARGO in C++ with following description:</p> <p><b>Private Members</b></p> <ul style="list-style-type: none"> <li>• Distance // integer</li> <li>• Weight // integer</li> <li>• Charge // float</li> <li>• GetCharge ()            /* Member function to assign value of Charge based upon Distance and Weight as follows: */</li> </ul> <table border="1" data-bbox="379 2418 1699 2682"> <thead> <tr> <th>Distance (Km)</th> <th>Weight (Grams)</th> <th>Charge (Rs)</th> </tr> </thead> <tbody> <tr> <td>&lt;=100</td> <td>&lt;=500</td> <td>150</td> </tr> <tr> <td>&gt;100 and &lt;=500</td> <td>&gt;500 and &lt;=999</td> <td>300</td> </tr> </tbody> </table>	Distance (Km)	Weight (Grams)	Charge (Rs)	<=100	<=500	150	>100 and <=500	>500 and <=999	300	<p>[4]</p>
Distance (Km)	Weight (Grams)	Charge (Rs)								
<=100	<=500	150								
>100 and <=500	>500 and <=999	300								



	<p>Public Members</p> <ul style="list-style-type: none"> <li>• Enter() /* The function should allow a user to enter values of Distance and Weight to assign the value of charge. It must then invoke the GetCharge() to assign value of Charge */</li> <li>• Display() // Function to display all the data members</li> </ul>	
Ans	<pre>class CARGO {     int Distance, Weight;     float Charge;     void GetCharge(); public:     void Enter()     {         cout&lt;&lt;"Enter Distance ";         cin&gt;&gt;Distance;         cout&lt;&lt;"Enter Weight";         cin&gt;&gt;Weight;         GetCharge();     }     void Display()     {         cout&lt;&lt;Distance&lt;&lt;Weight&lt;&lt;Charge&lt;&lt;endl;     } }; void CARGO::GetCharge() {     if(Distance&lt;=100)     {         if (Weight&lt;=500)             Charge=150;     }     else if (Distance&lt;=500)     {         if (Weight&gt;500 &amp;&amp; Weight&lt;=999)             Charge=300;     } }</pre>	
	(1/2 Mark for declaring class header correctly)	



	<p>(½ Mark for declaring data members correctly)  (1 Mark for defining GetCharge() correctly, with any one condition for Distance and Weight checked correctly)  (½ Mark for taking inputs of Distance and Weight in Enter())  (½ Mark for invoking GetCharge() inside Enter())  (½ Mark for defining Display() correctly)  (½ Mark for correctly closing class declaration with a semicolon ; )  NOTE: Marks to be awarded for defining the member functions inside or outside the class</p>	
(d)	<p>Answer the questions (i) to (iv) based on the following:</p> <pre> class Book {     char Bno[20]; protected:     float Price; public:     void GetB();     void ShowB(); };  class Member {     char Mno[20]; protected:     char Name[20]; public:     void GetM();     void ShowM(); };  class Library : public Member, private Book {     char Lname[20]; public:     void GetL();     void ShowL(); };  void main() {     Library L; } </pre>	[4]
	(i) Which type of Inheritance out of the following is illustrated in the above example?	



		- Single Level Inheritance, Multilevel Inheritance, Multiple Inheritance	
Ans		Multiple Inheritance	
		<i>(1 Mark for writing correct inheritance type)</i>	
		(ii) Write the names of all the data members, which are directly accessible by the member function GetL() of class Library.	
Ans		Lname of class Library Name of class Member Price of class Book	
		<i>(1 Mark for writing all correct data members)</i> <b>NOTE:</b> <i>Marks not to be awarded for partially correct answer</i>	
		(iii) Write the names of all the member functions, which are directly accessible by the member function ShowL() of class Library.	
		GetL () of class Library GetM () , ShowM () of class Member GetB () , ShowB () of class Book	
		<i>(1 Mark for writing all correct member functions)</i> <b>NOTE:</b> <i>Marks not to be awarded for partially correct answer</i>	
		(iv) Write the names of all the members, which are directly accessible by the object L of class Library declared in the main() function.	
Ans		GetL () , ShowL () of class Library GetM () , ShowM () of class Member	
		<i>(1 Mark for writing all correct members)</i> <b>NOTE:</b> <i>Marks not to be awarded for partially correct answer</i>	
		<b>OR</b>	
		Consider the following class College, assuming all required header files being included: <pre>class College {     char Cname[20]; protected:     float Fees; public:     void ShowCollege (); };</pre> Write a code in C++ to privately derive another class Faculty from the base class College with the following members:	<b>[4]</b>



#### Data Members

- Total\_seats of type int
- FName of type char array of size 20

#### Member Functions

- A constructor function to assign Total\_seats as 500.
- GetFac() to allow user to enter FName and assign Fees(of the base class College) its value depending upon entered FName as follows:

FName	Fees
Science	35000
Commerce	25000

- ShowFac() to display all the data members which are accessible to it.

Ans

```
class Faculty : private College
{
    int Total_seats;
    char FName[20];
public:
    Faculty()
    {
        Total_seats=500;
    }
    void GetFac()
    {
        gets(FName);
        if(strcmp(FName,"Science")==0)
            Fees=35000;
        else if(strcmp(FName,"Commerce")==0)
            Fees=25000;
    }
    void ShowFac()
    {
        cout<<Total_seats<<"#"<<FName<<"#"<<Fees<<endl;
    }
};
```

*(1/2 Mark for declaring class header correctly)*  
*(1/2 Mark for declaring data members correctly)*  
*(1 Mark for defining Constructor correctly)*  
*(1/2 Mark for taking input of FName in GetTech())*  
*(1/2 Mark for assigning Fees after correct comparison of Branch inside GetFac())*  
*(1/2 Mark for defining ShowFac() correctly)*  
*(1/2 Mark for correctly closing class declaration with a semicolon ; )*



		<b>NOTE: Marks to be awarded for defining the member functions inside or outside the class</b>											
3	(a)	<p>Write the definition of a function <b>Mean(int A[], int N)</b> in C++, which should display the Mean (Average) of all the N number of integers in the array A.</p> <p>Example: if the array A contains following 5 elements (i.e. for N=5)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>25</td> <td>5</td> <td>15</td> <td>10</td> <td>25</td> </tr> </table> <p>Then the function should display the output as follows: <b>Mean = 16</b></p>	0	1	2	3	4	25	5	15	10	25	[2]
0	1	2	3	4									
25	5	15	10	25									
	Ans	<pre>void Mean(int A[], int N) {     int Sum=0,Count=0;     for(int I=0; I&lt;N; I++)     {         Sum += A[I];         Count++;     }     cout&lt;&lt;"Mean of odd elements = "&lt;&lt;Sum/Count&lt;&lt;endl; }</pre>											
		<p>(½ Mark for correct loop) (1 Mark for finding sum of all elements and their count in the array) ( ½ Mark for displaying the mean in correct format)</p>											
		<b>OR</b>											
		<p>Write the definition of a function <b>ChangeConsonant(char Str[])</b> in C++, which should replace every occurrence of a consonant (non vowel letters) with its previous letter (example, replace letter 'b' to 'a' and 'B' to 'A', 'c' to 'b' and 'C' to 'B', 'd' to 'c' and 'D' to 'C', 'f' to 'e' and 'F' to 'E' and so on...). The function should finally display the changed content of the string.</p> <p>Example: if the array Str contains the string : "Elephant"</p> <p>Then the function should rearrange the string to "Ekeogams"</p>	[2]										
	Ans	<pre>void ChangeConsonant(char Str[]) {     for( int I =0; Str[I]!='\0'; I++)     {         switch(Str[I])         {             case 'a': case 'e': case 'i': case 'o': case 'u':             case 'A': case 'E': case 'I': case 'O': case 'U':                 break;         }     } }</pre>											



	<pre>                 default : Str[I]=Str[I]-1;             }         }         cout&lt;&lt;Text&lt;&lt;endl;     } </pre>																	
	<p>(1/2 Mark for correct loop)  (1/2 Mark for correct checking value)  ( 1/2 Mark for changing case)  ( 1/2 Mark for displaying the changed string)</p>																	
(b)	<p>Write the definition for a function <b>SumAlter(int Arr[10][10], int N)</b> in C++, for a square matrix <b>Arr</b> having <b>N</b> rows and <b>N</b> columns, which displays the sum of the elements of alternate rows starting from the second row and the sum of the elements of the alternate columns starting from the second column respectively.</p> <p>For example, if array <b>Arr</b> for <b>N=4</b> contains the following elements:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td>5</td><td>6</td><td>7</td><td>8</td></tr> <tr><td>9</td><td>10</td><td>11</td><td>12</td></tr> <tr><td>13</td><td>14</td><td>15</td><td>16</td></tr> </table> <p>Then, the function should display the following output:  Sum of alternate rows = 84  Sum of alternate columns = 72</p>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	[3]
1	2	3	4															
5	6	7	8															
9	10	11	12															
13	14	15	16															
Ans	<pre> void SumAlter(int Arr[10][10], int N) {     int SumR=0, SumC=0;     for(int I = 1; I&lt;N; I+=2)         for (int J = 0; J&lt;N; J++)         {             SumR += Arr[I][J] ;             SumC += Arr[J][I] ;         }     cout&lt;&lt;"Sum of alternate rows = "&lt;&lt;SumR&lt;&lt;endl;     cout&lt;&lt;"Sum of alternate columns = "&lt;&lt;SumC&lt;&lt;endl; } </pre>																	
	<p>(1/2 Mark for correct outer loop)  (1/2 Mark for correct inner loop)  (1/2 Mark for finding sum of alternate rows)  (1/2 Mark for finding sum of alternate columns)  ( 1/2 Mark for displaying the sum of rows)  ( 1/2 Mark for displaying the sum of rows)</p>																	
	OR																	



	<p>Write the definition for a function <b>RevAlternate(char S[][20], int N)</b> in C++, which reverses the contents of the strings at every odd index of the array of strings S.</p> <p>For example, for an array S contains 6 strings (for N=6) as follows:</p> <table border="1" data-bbox="491 453 1514 895"> <thead> <tr> <th>ORIGINAL ARRAY S</th> <th>CHANGED ARRAY S</th> </tr> </thead> <tbody> <tr> <td>First</td> <td>First</td> </tr> <tr> <td>Second</td> <td>dnoceS</td> </tr> <tr> <td>Third</td> <td>Third</td> </tr> <tr> <td>Fourth</td> <td>htruoF</td> </tr> <tr> <td>Fifth</td> <td>Fifth</td> </tr> <tr> <td>Sixth</td> <td>htxiS</td> </tr> </tbody> </table> <p>NOTE:</p> <ul style="list-style-type: none"> <li>• DO NOT DISPLAY the Changed Array contents</li> <li>• Do not use any other array to transfer the contents of the array S.</li> </ul>	ORIGINAL ARRAY S	CHANGED ARRAY S	First	First	Second	dnoceS	Third	Third	Fourth	htruoF	Fifth	Fifth	Sixth	htxiS	[3]
ORIGINAL ARRAY S	CHANGED ARRAY S															
First	First															
Second	dnoceS															
Third	Third															
Fourth	htruoF															
Fifth	Fifth															
Sixth	htxiS															
Ans	<pre>void RevAlternate(char S[][20], int N) {     char T[20];     for(int I=1; I&lt;N; I+=2)     {         strrev(S[I]);     } }</pre>															
	<p>(1 Mark for correct loop for N strings)  (1 Mark for accessing the strings at odd index)  (1 Mark for reversing the string content at odd index)</p>															
(c)	<p>Let us assume Q[20][15] is a two dimensional array, which is stored in the memory along the row and each of its element occupies 4 bytes, find the address of the element Q[15][5], if the address of the element Q[5][10] is 25000.</p>	[3]														
Ans	<p>OPTION 1:  ASSUMING LBR=LBC=0  W=4 BYTES,  NUMBER OF NUMBER OF ROWS (M)=20 ,COLUMNS (N)=15  <math>LOC(Q[I][J]) = B + (I*N + J)*W</math>  <math>LOC(Q[5][10]) = B + (5*15+10)* 4</math>  <math>25000 = B + (85*4)</math>  <math>B = 25000 - 340</math>  <math>B = 24660</math>  <math>LOC(Q[15][5]) = 24660 + (15*15+5)* 4</math>  <math>= 24660 + (230*4)</math>  <math>= 24660 + 920</math>  <math>= 25580</math></p>															



	<p><b>OPTION 2:</b>  ASSUMING LBR=5,LBC=10 AND B = 25000  W=4 BYTES ,  NUMBER OF NUMBER OF ROWS (M)=20 ,COLUMNS (N)=15  LOC(Q[I][J]) = B +((I-LBR)*N + (J-LBC))*W  LOC(Q[15][5])= 25000 + ((15-5)*15 + (5-10))*4  = 25000 + (150 - 5) * 4  = 25000 + (145*4)  = 25000 + 580  = 25580</p>	
	<p><i>1 Mark for writing correct formula (for column major)  OR substituting formula with correct values)  (1 Mark for correct step calculations)  (1 Mark for final correct address)</i></p>	
	OR	
	<p>Let us assume N[30][25] is a two dimensional array, which is stored in the memory along the column and each of its element occupies 4 bytes, find the address of the element N[5][10], if the base address of the array is 20000.</p>	[3]
Ans	<p>W = 4 BYTES ,  NUMBER OF ROWS (M)=30 ,  NUMBER OF COLUMNS (N)= 25 ,  Loc of N[5][10]= B+W*(I+J*M)  = 20000 + 4*(5+10*30)  = 20000 + 4*(5+300)  = 20000 + 1220  = 21220</p>	
	<p><i>1 Mark for writing correct formula (for column major)  OR substituting formula with correct values)  (1 Mark for correct step calculations)  (1 Mark for final correct address)</i></p>	
(d)	<p>Write the definition of functions <code>Push(int P[], int &amp;T)</code>, which pushes an integer and <code>Pop(int P[], int &amp;T)</code> which pops an integer from the static stack of integers P, where the top of the stack is represented by index T. The stack should be able to store a maximum of 10 integers. The functions must also check for stack overflow and stack underflow errors.</p>	[4]
Ans	<pre>void Push(int P[], int &amp;T) {     if(T&lt;9)     {         T = T+1;         cout&lt;&lt;" Enter integer";</pre>	





	<pre> cin&gt;&gt;P[T]; } else cout&lt;&lt;"Stack is full "&lt;&lt;endl; }  void Pop(int P[], int &amp;T) { if(T&gt;=0) { cout&lt;&lt;" Integer "&lt;&lt;P[T]&lt;&lt; " Popped"; T = T-1; } else cout&lt;&lt;"Stack is empty "&lt;&lt;endl; } </pre>	
	<p>(1/2 Mark for checking full stack in Push())  (1/2 Mark for displaying overflow error in Push() if the stack is full)  (1/2 Mark for incrementing Top for the stack in Push())  (1/2 Mark for assigning/inputting integer into the incremented Top in Push())  (1/2 Mark for checking empty stack in Pop())  (1/2 Mark for displaying underflow error in Pop() if stack is empty)  (1/2 Mark for displaying/returning integer from the Top in Pop())  (1/2 Mark for decrementing Top for the stack in pop())</p>	
	OR	
	<p>For the following structure of Book in C++</p> <pre> struct Book { int Bno; Book *Link; }; </pre> <p>Given that the following declaration of class BookStack in C++ represents a dynamic stack of Buses:</p> <pre> class BookStack { Book *Top;           //Pointer T to store address of the                     //topmost Node of type Book public: BookStack() { Top = NULL; }  void Push();        //Function to push a Book Node into the                     //dynamic stack void Pop();         //Function to pop a Book Node from the </pre>	[4]



	<pre>//dynamic stack ~BookStack(); };</pre> <p>Write the definition for the member function <code>void BookStack::Pop()</code>, that pops a Book Node from the dynamic stack of BookStack. The function must also check for an underflow error.</p>																					
Ans	<pre>void BookStack::Pop() {     if( Top != NULL)     {         Book *T = Top;         Top = Top-&gt;Link;         cout&lt;&lt;"Book No. " &lt;&lt;T-&gt;Bno&lt;&lt; " Popped";         delete T;     }     else cout&lt;&lt;" Stack Empty " &lt;&lt;endl; }</pre>																					
	<p><i>(½ Mark for checking and displaying empty stack)</i>  <i>(½ Mark for displaying or returning the Bno at the Top)</i>  <i>(1 Mark for assigning the Top Book to a Temporary pointer)</i>  <i>(1 Mark for pointing Top to the next Book)</i>  <i>(1 Mark for deleting the Book stored in the temporary pointer)</i></p>																					
(e)	<p>Evaluate the following Postfix expression, showing the stack contents.  <math>180, 15, 6, *, 30, +, 60, -, /</math></p>	[2]																				
Ans	<table border="1"> <thead> <tr> <th>Element</th> <th>Stack Contents</th> </tr> </thead> <tbody> <tr> <td>180</td> <td>180</td> </tr> <tr> <td>15</td> <td>180, 15</td> </tr> <tr> <td>6</td> <td>180, 15, 6</td> </tr> <tr> <td>*</td> <td>180, 90</td> </tr> <tr> <td>30</td> <td>180, 90, 30</td> </tr> <tr> <td>+</td> <td>180, 120</td> </tr> <tr> <td>60</td> <td>180, 120, 60</td> </tr> <tr> <td>-</td> <td>180, 60</td> </tr> <tr> <td>/</td> <td>3</td> </tr> </tbody> </table> <p>Answer = 3</p>	Element	Stack Contents	180	180	15	180, 15	6	180, 15, 6	*	180, 90	30	180, 90, 30	+	180, 120	60	180, 120, 60	-	180, 60	/	3	
Element	Stack Contents																					
180	180																					
15	180, 15																					
6	180, 15, 6																					
*	180, 90																					
30	180, 90, 30																					
+	180, 120																					
60	180, 120, 60																					
-	180, 60																					
/	3																					
	<p><i>( ½ Mark for correctly evaluating expression up to each operator)</i>  <b>OR</b>  <i>( 1 Mark only to be given for writing correct answer without showing the Stack Status)</i></p>																					
	<p style="text-align: center;"><b>OR</b></p>																					
	<p>Convert the following Infix expression to its equivalent Postfix expression, showing the stack contents for each step of conversion.  <math>P * Q / R - S ^ T</math></p>	[2]																				



Ans

$$(((P * Q) / R) - (S ^ T))$$

Element	Stack	Postfix
(		
(		
(		
P		P
*	*	
Q		PQ
)		PQ*
/	/	
R		PQ*R
)		PQ*R/
-	-	
(		
S		PQ*R/S
^	-^	
T		PQ*R/ST
)	-	PQ*R/ST^
)		PQ*R/ST^-

OR

$$P * Q / R - S ^ T$$

INFIX	STACK	POSTFIX
P		P
*	*	P
Q	*	PQ
/	/	PQ*
R	/	PQ*R
-	-	PQ*R/
S	-	PQ*R/S
^	-^	PQ*R/S
T	-^	PQ*R/ST
		PQ*R/ST^-

(½ Mark for conversion upto each operator illustrating through stack)

OR

(1 Mark for only the final answer as PQ\*R/ST^-)

4.	(a)	A text file named SOLUTION.TXT contains some English sentences. Another text file named TEST.TXT needs to be created such that it replaces every occurrence of 3 consecutive letters 'h', 'i' and 's' (irrespective of their cases) from each word of the file SOLUTION.TXT, with 3 underscores ('_'). For	[3]
----	-----	--	-----



	<p>example, if the file SOLUTION.TXT contains the following content:</p> <pre>"This is his history book."</pre> <p>Then TEST.TXT should contain the following:</p> <pre>"T__ is __ _tory book."</pre> <p>Write the definition for function CreateTest() in C++ that would perform the above task of creating TEST.TXT from the already existing file SOLUTION.TXT.</p>	
Ans	<pre>void CreateTest() {     ifstream f1("SOLUTION.TXT");     ofstream f2("TEST.TXT");     char S[80];     while(!f1.eof())     {         f1&gt;&gt;S;         if(strlen(S) &gt;=3)             for(int I=0; S[I]!='\0'; I++)                 if ( S[I]=='h' &amp;&amp; S[I+1]=='i' &amp;&amp; S[I+2]=='s')                     {                         S[I]='_'; S[I+1]='_'; S[I+2]='_';                     }         f2&lt;&lt;S&lt;&lt;" ";     }     f1.close(); //Ignore     f2.close(); //Ignore }</pre>	
	<p><i>(½ Mark for opening SOLUTION.TXT correctly)</i>  <i>(½ Mark for opening TEST.TXT correctly)</i>  <i>(½ Mark for reading each word (using any method) from the file)</i>  <i>(½ Mark for checking whether the word contains 'h', 'i' and 's' consecutively)</i>  <i>(½ Mark for replacing the occurrence of 'h', 'i' and 's' with underscores)</i>  <i>(½ Mark for transferring the word to the file TEST.TXT )</i></p>	
	OR	
	<p>A text file named AGENCIES.TXT contains some text. Write the definition for a function Showsites() in C++ which displays all such words of the file which have more than 9 characters and start with "www." for example: if the file AGENCIES.TXT contains:</p> <pre>"Name: TechnoCraft, Website: www.technocraft.com, Name: DataTech, Website: www.datatech.com"</pre> <p>Then the function Showsites() should display the output as:</p> <pre>www.technocraft.com</pre>	[3]



		www.datatech.com	
Ans		<pre>void Showsites() {     ifstream f("AGENCIES.TXT");     char W[20];     while(!f.eof())     {         f&gt;&gt;W;         if(strlen(W)&gt;9 &amp;&amp; W[0]=='w' &amp;&amp; W[1]=='w' &amp;&amp;             W[2]=='w' &amp;&amp; W[3]=='.')             cout&lt;&lt;W&lt;&lt;endl;     }     f.close(); //Ignore }</pre>	
		<p><i>(1 Mark for opening AGENCIES.TXT correctly)</i>  <i>(1/2 Mark for reading each Word (using any method) from the file)</i>  <i>(1/2 Mark for checking if the length of the word is &gt;9)</i>  <i>(1/2 Mark for checking if the word starts with “www.”)</i>  <i>(1/2 Mark for displaying the word)</i></p>	
(b)		<p>Write a definition for function <b>Billing()</b> in C++ to read each record of a binary file <b>STOCK.DAT</b>, and display the Total Price of all the records in the file. Assume that the file <b>STOCK.DAT</b> is created with the help of objects of class <b>Stock</b>, which is defined below:</p> <pre>class Stock {     char Name[20]; float Price; public:     float RPrice() { return Price; } };</pre>	[2]
Ans		<pre>void Billing() {     ifstream f("STOCK.DAT",ios::binary);     //OR fstream f("STOCK.DAT",ios::binary ios::in);     //OR fstream f;     //f.open("STOCK.DAT",ios::binary ios::in);     Stock S;     float TPrice=0;     while(f.read((char*)&amp;S,sizeof(S)))         TPrice += S.RPrice()     cout&lt;&lt;TPrice&lt;&lt;endl;     f.close(); //Ignore }</pre>	
		<p><i>(1/2 Mark for opening STOCK.DAT correctly)</i>  <i>(1/2 Mark for reading each record from the file)</i>  <i>(1/2 Mark for accumulating Price of all items)</i>  <i>(1/2 Mark for displaying the accumulated Price)</i></p>	



OR

A binary file **ELECTION.DAT** contains records stored as objects of the following class :

```
class Election
{
    char Name[20]; int Count;
public:
    int GetCount() { return Count; }
    char * RName() { return Name; }
};
```

Write the definition for function **LowCount()** in C++, which reads every record from **ELECTION.DAT** and displays every such **Name** whose **Count** is less than 100.

[2]

Ans

```
void LowCount()
{
    ifstream f("ELECTION.DAT",ios::binary);
//OR fstream f("ELECTION.DAT",ios::binary|ios::in);
//OR
//fstream f;
//f.open("ELECTION.DAT",ios::binary|ios::in);
    Election E;
    while(f.read((char*)&E,sizeof(E)))
        if(E.GetCount()<100)
            cout<<E.RName()<<endl;
    f.close(); //Ignore
}
```

*(1/2 Mark for opening ELECTION.DAT correctly)*  
*(1/2 Mark for reading each record from the file)*  
*(1/2 Mark for checking if the Votes for the read record is less than 10)*  
*(1/2 Mark for displaying the Candidate)*

(c)

Considering that a binary file **TRAINS.DAT** contains 100 records of the following class **Train**, find the output of the following C++ code :

```
class Train
{
    int Tno; char FROM[20], TO[20];
public:
    void Get(); void Show();
};
void main()
{ fstream File;
  File.open("TRAINS.DAT",ios::binary|ios::in);
  Train T;
  File.read((char*)&T,sizeof(T));
  File.seekg(25*sizeof(T));
  cout<<"Presently at "<<File.tellg()/sizeof(T)<<endl;
  File.read((char*)&T,sizeof(T));
  cout<<"Now at "<<File.tellg()/sizeof(T)<<endl;
```

[1]



		<pre>File.close(); }</pre>	
	<b>Ans</b>	Presently at 25 Now at 26	
		<i>(1/2 Mark for displaying correct value 25 in first line)</i> <i>(1/2 Mark for displaying correct value 26 in second line)</i>	
		OR	
		Differentiate between seekg() and tellg().	[1]
	<b>Ans</b>	seekg() is used with ifstream file object to position the file get pointer to a desired position in the file. The position is specified in the function parameter as number of bytes counted by default from the beginning of the file to the desired position.  tellg() is used with ifstream file object which return the position of the file get pointer counted from the beginning of the file to the present position.  <pre>ifstream Fil("DIARY.TXT"); File.seekg(20); //places the get pointer at the 20th character cout&lt;&lt;File.tellg(); //displays 20</pre>	
		<i>(1/2 Mark for writing correct usage of seekg())</i> <i>(1/2 Mark for writing correct usage of tellg())</i> OR <i>(1/2 Mark for writing correct example of seekg() with explanation)</i> <i>(1/2 Mark for writing correct example of tellg() with explanation)</i>	
<b>SECTION B - [Only for candidates, who opted for Python]</b>			
1	(a)	Identify the valid keywords in Python from the following: (i) Queue (ii) False (iii) in (iv) Number (v) global (vi) method (vii) import (viii) List	[2]
	<b>Ans</b>	(ii) False (iii) in (v) global (vii) import	
		<i>(1/2 Mark for writing each correct keyword)</i>	
	(b)	Name the Python Library modules which need to be imported to invoke the following functions: (i) floor() (ii) random()	[1]
	<b>Ans</b>	<ul style="list-style-type: none"> <li>• math</li> <li>• random</li> </ul>	
		<i>(1/2 Mark for writing each correct module name)</i>	
	(c)	Rewrite the following code in Python after removing all syntax error(s). Underline each correction done in the code.	[2]
		<pre>W = raw_input('Enter a word')</pre>	



	<pre>If W &lt;&gt; 'HELLO':     print W + 2 else     print W * 2</pre>	
Ans	<pre>W = raw_input('Enter a word') if W != 'HELLO' :           #Error 1, Error 2     print W + '2'           #Error 3 else :                       #Error 4     print W * 2</pre>	
	<p><i>(1/2 Marks for writing correction for Error 1)</i>  <i>(1/2 Marks for writing correction for Error 2)</i>  <i>(1/2 Marks for writing correction for Error 3)</i>  <i>(1/2 Marks for writing correction for Error 4)</i>  <b>NOTE:</b>  <i>(1 mark for only identifying all the errors without writing corrections)</i></p>	
(d)	Find and write the output of the following python code:	[2]
	<pre>def ChangeVal(M,N):     for i in range(N):         if M[i]%5 == 0 :             M[i] //= 5         if M[i]%3 == 0 :             M[i] //= 3 Val=[25,8,75,12] ChangeVal(Val,4) for N in Val :     print N,'#',</pre>	
Ans	5 # 8 # 5 # 4 #	
	<p><i>(1/2 Mark for writing each correct value)</i>  <b>OR</b>  <i>(Only 1/2 Mark for writing all '#' at proper places)</i>  <b>Note:</b>  <i>Deduct only 1/2 Mark for not considering any or all correct placements of #</i></p>	
(e)	Find and write the output of the following python code:	[3]
	<pre>def Assign(P=30,Q=40):     P=P+Q     Q=P-Q     print P, '@',Q     return P  A=100 B=150 A=Assign(A,B)</pre>	





		<pre>Print A, '@,B B=Assign(B) Print A,'@',B</pre>					
	Ans	<pre>250 @ 100 250 @ 150 190 @ 150 250 @ 190</pre>					
		<p><i>(1½ Mark for writing each correct 2 lines of output)</i>  <b>NOTE:</b>  <i>Deduct only ½ Mark for not considering any or all line break</i></p>					
	(f)	<p>What possible outputs(s) are expected to be displayed on screen at the time of execution of the program from the following code? Also specify the minimum and maximum values that can be assigned to the variable End .</p>	[2]				
		<pre>import random Rainbow = ["VIOLET", "INDIGO", "BLUE", "GREEN",            "YELLOW", "ORANGE", "RED"] End = randrange(2)+3 Begin = randrange(End)+1 for i in range(Begin,End):     print Rainbow[i], "&amp;"</pre> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;">(i) INDIGO&amp;BLUE&amp;GREEN&amp;</td> <td style="width: 50%; padding: 5px;">(ii) VIOLET&amp;INDIGO&amp;BLUE&amp;</td> </tr> <tr> <td style="width: 50%; padding: 5px;">(iii) BLUE&amp;GREEN&amp;YELLOW&amp;</td> <td style="width: 50%; padding: 5px;">(iv) GREEN&amp;YELLOW&amp;ORANGE&amp;</td> </tr> </table>	(i) INDIGO&BLUE&GREEN&	(ii) VIOLET&INDIGO&BLUE&	(iii) BLUE&GREEN&YELLOW&	(iv) GREEN&YELLOW&ORANGE&	
(i) INDIGO&BLUE&GREEN&	(ii) VIOLET&INDIGO&BLUE&						
(iii) BLUE&GREEN&YELLOW&	(iv) GREEN&YELLOW&ORANGE&						
	Ans	<p>(i) INDIGO&amp;BLUE&amp;GREEN&amp;  <i>Minimum Value of End = 3</i>  <i>Maximum Value of End = 4</i></p>					
		<p><i>(1 mark for writing correct option)</i>  <i>(½ Mark for writing Minimum Value of End)</i>  <i>(½ Mark for writing Maximum Value of End)</i></p>					
2	(a)	<p>What is method/function overriding in Python. Write a Python code to illustrate how to invoke a base class overridden method inside an inherited class.</p>	[2]				
	Ans	<p>Method overriding is a feature of Object-oriented programming by which the behavior of methods inherited from a base class can be changed according to specific needs. Here, the method in a derived class has the same name and the same number of arguments as the base class.</p> <p>Base class's method is called <b>overridden method</b> and the derived class method is called <b>overriding method</b>.</p> <pre>class Animal:</pre>					



	<pre> def sound(self):                                //Overridden Method     print('Animal makes sound.')  class Dog(Animal):                               //Overriding Method     def sound(self):         print('Dog barks.')  D = Dog() D.sound()  Output of the above program: Dog barks. </pre>	
	<p><i>(1 Mark for writing the correct explanation of Method Overriding)</i>  <i>(1 Mark for writing correct example illustrating Method Overriding)</i></p>	
(b)	<p>Write the output of the given Python code:</p> <pre> class Volume(object):     Length=10     Breadth=20     Height = 5     def __init__(self,X=20,Y=30, Z=10):         self.Length = X         self.Breadth = Y         self.Height = Z     def ShowVol(self):         print self.Length*self.Breadth*self.Height         print Volume.Length*Volume.Breadth*Volume.Height  V1 = Volume(15,30,10) V1.ShowVol() Volume.Height = 20 V2=Volume(30,40) V2.ShowVol() </pre>	[2]
Ans	<pre> 4500 1000 12000 4000 </pre>	
	<p><i>(1/2 Mark for writing each correct value of the output)</i></p>	
	<p style="text-align: center;">OR</p>	
	<pre> class Triangle(object):     def __init__(self,N1=3,N2=4, N3=5):    #Function 1         self.Side1 = N1         self.Side2 = N2 </pre>	[2]



	<pre> self.Side3 = N3 def ShowSides(self):     print self.Side1,self.Side2,self.Side3 def __del__(self):     print "Nothing to Show"  def Workit():     _____     _____  Workit() </pre>										
	(i) Write the missing Statement 1 which will invoke the Function 1 for an object T of the class Triangle with values for Side1 as 10, Side2 as 15 and Side3 as 20, and the missing Statement 2 which will invoke the Function 2 for the object T.										
Ans	T=Triangle(10,15,20) T.ShowSides()										
	(1/2 Mark for writing correct Statement 1) (1/2 Mark for writing correct Statement 2)										
	(ii) Write the output for the above Python code after the missing Statement 1 and Statement 2 are correctly written.										
Ans	10 15 20 Nothing to Show										
	(1/2 Mark for writing each correct line of the output)										
	(c) Write the definition of a class CARGO in Python with following description:	[4]									
	<p><b>Instance Attributes</b></p> <ul style="list-style-type: none"> <li>Distance</li> <li>Weight</li> <li>Charge</li> </ul> <p><b>Methods/Functions</b></p> <ul style="list-style-type: none"> <li>GetCharge() <ul style="list-style-type: none"> <li># to assign value of Charge based upon Distance and Weight as follows:</li> </ul> </li> </ul> <table border="1"> <thead> <tr> <th>Distance (Km)</th> <th>Weight (Grams)</th> <th>Charge (Rs)</th> </tr> </thead> <tbody> <tr> <td>&lt;=100</td> <td>&lt;=500</td> <td>150</td> </tr> <tr> <td>&gt;100 and &lt;=500</td> <td>&gt;500 but &lt;=999</td> <td>300</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>Enter() # The function should allow a user to enter values of Distance and Weight.</li> </ul>	Distance (Km)	Weight (Grams)	Charge (Rs)	<=100	<=500	150	>100 and <=500	>500 but <=999	300	
Distance (Km)	Weight (Grams)	Charge (Rs)									
<=100	<=500	150									
>100 and <=500	>500 but <=999	300									



		<pre> # to assign the value of Charge # It must then call the GetCharge() to # assign value of Charge  • Display() # Function to display Distance, Weight # and Charge </pre>	
Ans		<pre> class CARGO(object): # class CARGO( ):/ class CARGO: def __init__(self): # def __init__(self,A,B,C):     self.Distance=0 # self.Distance=A     self.Weight=0 # self.Weight=B     self.Charge=0 # self.Charge=C  def GetCharge(self):     if self.Distance &lt;= 100:         if self.Weight &lt;=500 :             self.Charge=150         else:             if self.Distance&gt;100 and self.Distance&lt;=500 :                 if self.Weight&gt;=500 and self.Weight&lt;=999 :                     self.Charge=300 def Enter(self):     self.Distance = input("Enter Distance ")     self.Weight = input("Enter Weight ")     self.GetCharge() # OR Enter(self)  def Display(self):     print self.Distance     print self.Weight     print self.Charge </pre>	
		<p>(1/2 Mark for correct syntax for class header)  (1/2 Mark for correct declaration of instance attributes in constructor)  (1 Mark for correct definition of GetCharge() function)  (1 Mark for correct definition of Enter() with proper invocation of GetCharge( ))  (1 Mark for correct definition of Display())  <b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• Deduct 1/2 Mark if GetCharge() is not invoked properly inside Enter() function</li> </ul>	
	(d)	Answer the questions (i) to (iii) based on the following:	
		class Book(object):	



```

def __init__(self,B_No,B_Price):
    self.Bno = B_No
    self.Price = B_Price
def GetB(self,B_No,B_Price):
    self.Bno = B_No
    self.Price = B_Price
def ShowB(self):
    print self.Bno, self.Price,

class Member(object):
    def __init__(self,M_Num,M_Name):
        self.Mno=M_Num
        self.Mname=M_Name
    def GetM(self,M_Num,M_Name):
        self.Mno=M_Num
        self.Mname=M_Name
    def ShowM(self):
        print self.Mno,self.Mname

class Library(Book,Member):
    def __init__(self,L_Name,B,P,M,N):           #Function 1
        self.Lname=L_Name
        Book.__init__(self,B,P)
        Member.__init__(self,M,N)
    def GetL(self,L_Name,B,P,M,N):           #Function 2
        self.Lname=L_Name
        Book.GetB(self,B,P)
        Member.GetM(self,M,N)
    def ShowL(self):
        print self.Lname,
        Book.ShowB(self)
        Member.ShowM(self)

L=Library('First',101,150,901,'Roshni')
L.ShowL()
L.GetL('Second',102,200,902,'Simran')
L.ShowL()

```

(i) Write the type of inheritance illustrated in the above Python code.

1



	<b>Ans</b> Multiple Inheritance	
	<i>(1 Mark for writing the correct Inheritance type)</i>	
	(ii) Write the output of the above code.	2
	<b>Ans</b> First 101 150 901 Roshni Second 102 200 902 Simran	
	<i>(1 Mark for writing each correct line of the output)</i>	
	(iii) What is the difference between the Function 1 and Function 2, although their definitions are the same.	1
	<b>Ans</b> Function 1 is constructor of class School. It gets executed by itself when an object of class School is declared. Function 2 is function/method of class School. It needs to be invoked using an object of the class School to get executed.	
	<i>(1/2 Mark for correct explanation of Function 1)</i> <i>(1/2 Mark for correct explanation of Function 2)</i>	
	OR	
	Consider the following class Shape in Python: <pre>class Company(object):     CName=""     Area=0     def __init__(self,N):         Company.CName=N         Company.Area=20     def ShowCompany(self):         print self.CName,self.Area</pre>	4
	Write a code in Python derive another class Department from the class Company with the following : <ul style="list-style-type: none"> <li>• Attribute DName initialised with an empty string</li> <li>• Attribute DArea initialised with 0</li> </ul> <b>Class methods/functions</b> <ul style="list-style-type: none"> <li>• A constructor function which should first invoke the class Company's constructor passing Company name(for CName) as parameter.</li> <li>• GetDept() to allow user to enter DName and DArea and then add the entered value of DArea (of the class Department) to the attribute Area (of the class Company).</li> <li>• ShowDept() which should display the CName, Area of class Company followed by DName and DArea of class Department.</li> </ul>	
	<b>Ans</b> <code>class Department(Company):</code>	



		<pre> DName="" DArea=0 def __init__(self,N):          #Function 1     Company.__init__(self,N)  def GetDept(self):            #Function 2     self.DName=raw_input('Enter Department Name: ')     self.DArea=int(raw_input('Enter Department Area: '))      Company.Area += self.DArea  def ShowDept(self):     print Company.CName, Company.Area, self.DName, self.DArea </pre>	
		<p><i>(1/2 Mark for correct syntax for class header)</i>  <i>(1/2 Mark for correct declaration and initialisation of the attributes)</i>  <i>(1 Mark for correct definition of the constructor)</i>  <i>(1 Mark for correct definition of GetTech() function)</i>  <i>(1 Mark for correct definition of ShowTech() )</i></p>	
3	(a)	<p>Consider the following randomly ordered numbers stored in a list  325, 215, 74, 465, 520, 132, 97</p> <p>Show the content of list after the First, Third and Fourth pass of the Bubble sort method used for arranging in <b>ascending order</b>?</p> <p>Note: Show the status of all the elements after each pass very clearly encircling the changes.</p>	[3]
	Ans	<p>First Pass &gt; 215, 74, 325, 465, 132, 97, (520)</p> <p>Third Pass &gt; 74, 215, 132, 97, (325), 465, 520</p> <p>Fourth Pass &gt; 74, 132, 97, (215), 325, 465, 520</p>	
		<p><i>(1 mark for each correct pass)</i>  OR  <i>(2 1/2 Marks to be awarded for all the correct passes without encircling)</i></p>	
		OR	
		<p>Consider the following randomly ordered numbers stored in a list  325, 215, 74, 465, 520, 132, 97</p> <p>Show the content of the list after the Second, Third and Fourth pass of the Insertion sort method used for arranging in <b>descending order</b>?</p>	[3]



		Note: Show the status of all the elements after each pass very clearly encircling the changes.																					
	Ans	<p><b>Second Pass</b> &gt; 220, 245, 305, 453, 564, (190), 120</p> <p><b>Third Pass</b> &gt; 245, 305, 453, 564, (220), 190, 120</p> <p><b>Fourth Pass</b> &gt; 305, 453, 564, (245), 220, 190, 120</p>																					
		<p>(1 mark for each correct pass)  OR  (2½ Marks to be awarded for all the correct passes without encircling)</p>																					
	(b)	<p>Write the definition of a function <b>AddPrev(A, N)</b> in Python, which should add every previous value of list A to the next value and assign the sum at the index of the next value. The list A contains N number of integers.</p> <p>The function should finally display the entire content of the changed list.  Example: if the list A contains following 10 elements (i.e. for N=10)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td> </tr> <tr> <td>9</td><td>5</td><td>15</td><td>10</td><td>25</td><td>12</td><td>5</td><td>9</td><td>5</td><td>12</td> </tr> </table> <p>Then the function should display the output as follows:  9 # 14 # 29 # 39 # 64 # 76 # 81 # 90 # 95 # 107 #</p>	0	1	2	3	4	5	6	7	8	9	9	5	15	10	25	12	5	9	5	12	[3]
0	1	2	3	4	5	6	7	8	9														
9	5	15	10	25	12	5	9	5	12														
	Ans	<pre>def AddPrev(A, N):     for I in range(1,N):         A[I] += A[I - 1]     for I in A:         print I, '#',</pre>																					
		<p>( 1 mark for reading each element of the list using a loop)  ( 1 mark for adding every previous value to the next value of the list)  ( 1 mark for displaying the changed content of the list according to the format)  Note:  Deduct ½ Mark if all values are not displayed in the same line separated by a '#'</p>																					
		OR																					
		Write the definition of a function <b>ChangeEvenOdd(Num, N)</b> in Python,	[3]																				





	<p>which should add 1 to every even number and subtract 1 from every odd number. The function should finally display the changed content of the list Num.</p> <p>Example: if the list Num contains following 10 elements (i.e. for N=10)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td> </tr> <tr> <td>25</td><td>12</td><td>5</td><td>10</td><td>9</td><td>5</td><td>15</td><td>9</td><td>5</td><td>12</td> </tr> </table> <p>Then the function should display the output as follows:</p> <p>24 13 4 11 8 4 14 8 4 13</p>	0	1	2	3	4	5	6	7	8	9	25	12	5	10	9	5	15	9	5	12	
0	1	2	3	4	5	6	7	8	9													
25	12	5	10	9	5	15	9	5	12													
Ans	<pre>def ChangeEvenOdd(Num, N):     for I in range(N):         if Num[I]%2 == 0:             Num[I] = Num[I] + 1         else:             Num[I] = Num[I] - 1     for I in Num:         print I,</pre>																					
	<p>( ½ mark for reading each element of the list using a loop)          ( 1 mark for checking whether each element of Num is even or odd)          ( ½ mark for incrementing the element by 1 if an even is found)          ( ½ mark for decrementing the element by 1 if an odd is found)          ( ½ mark for displaying the changed content of the list Num according to the format)</p>																					
(c)	Write functions in Python for PushS(List) and for PopS(List) for performing Push and Pop operations with a stack of List containing integers. The function must check for Empty Stack.	[4]																				
Ans	<pre>def PushS(List):     N=int(raw_input('Enter integer to push: '))     List.append(N)  def PopS(List):     if (List==[]):         print "Stack empty"     else:         print "Deleted element:",List.pop()</pre>																					
	<p>(½ Mark for writing correct PushS() header)          (½ Mark for taking input of an integer)          (1 Mark for adding the integer into the List)          (½ Mark for writing correct PopS() header)</p>																					



		(1/2 Mark for checking empty list condition and displaying "Stack empty") (1 Mark for displaying and deleting value from the list)	
		OR	
		Write functions in Python for InsertQ(Names) and for RemoveQ(Names) for performing insertion and removal operations with a queue of list which contains names of students. The function must check for Empty Queue.	[4]
	Ans	<pre>def InsertQ(Names):     Name=raw_input("enter Name to be inserted: ")     Names.append(Name)  def DeleteQ(Names):     if (Names==[]):         print "Queue empty"     else:         print "Deleted Player's Name is: ",Names[0]         del (Names[0])</pre>	
		(1/2 Mark for writing correct InsertQ header) (1/2 Mark for accepting a Name from user) (1/2 Mark for adding the Name into the list) (1/2 Mark for writing correct DeleteQ header) (1/2 Mark for checking empty queue condition) (1/2 Mark for displaying "Queue empty") (1/2 Mark for displaying the Name to be deleted) (1/2 Mark for deleting the Name from the list)	
	(d)	Write a python method/function SwapParts(Word) to swap the first part and the second part of the string Word. Assuming there are an even number of letters the string Word. The function should finally display the changed Word. For example, if Word = 'Elephant', then the function should convert Word to 'hantElep' and display the output as: Changed Word is hantElep	[2]
	Ans	<pre>def SwapParts(Word):     first = Word[:len(Word)//2]     last = Word[len(Word)//2:]     Word = last+first     print "Changed Word is " + Word</pre>	
		( 1 mark for correctly assigning the new word to the string Word) ( 1 mark for displaying the changed Word)	
		OR	



	Write a python method/function <b>Noun2Adj (Word)</b> which checks if the string Word ends with the letter 'y'. If so, it replaces the last letter 'y' with the string 'iful' and then displays the changed Word. For example if the Word is "Beauty", then the Word should be changed to "Beautiful". Otherwise it should display <b>Not ending with "y"</b>	[2]																				
Ans	<pre>def Noun2Adj (Word) :     if Word[-1] == 'y' :         first = Word[:-1]         last = 'iful'         Word = first+last         print Word     else:         print 'Not ending with "y"'</pre>																					
	<p>( 1/2 mark for comparing the last letter of the Word with 'y')</p> <p>( 1/2 mark for changing the last letter 'y' with 'iful' if a match is found)</p> <p>( 1/2 mark for printing the changed Word ending with 'iful')</p> <p>( 1/2 mark for printing 'Not ending with "y" if there is a mismatch)</p>																					
(e)	Evaluate the following Postfix expression, showing the stack contents. 180,15,6,*,30,+ ,60,-,/	[2]																				
Ans	<table border="1"> <thead> <tr> <th>Element</th> <th>Stack Contents</th> </tr> </thead> <tbody> <tr> <td>180</td> <td>180</td> </tr> <tr> <td>15</td> <td>180, 15</td> </tr> <tr> <td>6</td> <td>180, 15, 6</td> </tr> <tr> <td>*</td> <td>180, 90</td> </tr> <tr> <td>30</td> <td>180, 90, 30</td> </tr> <tr> <td>+</td> <td>180, 120</td> </tr> <tr> <td>60</td> <td>180, 120, 60</td> </tr> <tr> <td>-</td> <td>180, 60</td> </tr> <tr> <td>/</td> <td>3</td> </tr> </tbody> </table> <p>Answer = 3</p>	Element	Stack Contents	180	180	15	180, 15	6	180, 15, 6	*	180, 90	30	180, 90, 30	+	180, 120	60	180, 120, 60	-	180, 60	/	3	
Element	Stack Contents																					
180	180																					
15	180, 15																					
6	180, 15, 6																					
*	180, 90																					
30	180, 90, 30																					
+	180, 120																					
60	180, 120, 60																					
-	180, 60																					
/	3																					
	<p>( 1/2 Mark for correctly evaluating expression up to each operator)</p> <p>OR</p> <p>( 1 Mark only to be given for writing correct answer without showing the Stack Status)</p>																					
	OR																					
	Convert the following Infix expression to its equivalent Postfix expression, showing the stack contents for each step of conversion. <b>P * Q / R - S ^ T</b>	[2]																				



Ans	(((P * Q) / R) - (S ^ T))		
	<b>Element</b>	<b>Stack</b>	<b>Postfix</b>
	(		
	(		
	(		
	P		P
	*	*	
	Q		PQ
	)		PQ*
	/	/	
	R		PQ*R
	)		PQ*R/
	-	-	
	(		
	S		PQ*R/S
^	-^		
T		PQ*R/ST	
)	-	PQ*R/ST^	
)		PQ*R/ST^-	
OR			
P * Q / R - S ^ T			
	<b>INFIX</b>	<b>STACK</b>	<b>POSTFIX</b>
	P		P
	*	*	P
	Q	*	PQ
	/	/	PQ*
	R	/	PQ*R
	-	-	PQ*R/
	S	-	PQ*R/S
	^	-^	PQ*R/S
	T	-^	PQ*R/ST
			PQ*R/ST^-
	<i>(1/2 Mark for conversion upto each operator illustrating through stack)</i>		
	<i>OR</i>		
	<i>(1 Mark for only the final answer as PQ*R/ST^-)</i>		
4	(a)	What is a <b>NameError</b> in Python?	[1]
	Ans	<b>NameError</b> is a syntax error raised when a local or global name used in a Python code is not found.	



	(1 mark for writing correct explanation)	
	OR	
	What is a <code>TypeError</code> in Python?	[1]
Ans	<code>TypeError</code> is a syntax error raised, when an operation or function is applied to an object of inappropriate type in a Python code.	
	(1 mark for writing correct explanation)	
(b)	<p>A text file named <code>SOLUTION.TXT</code> contains some English sentences. Another text file named <code>TEST.TXT</code> needs to be created such that it replaces every occurrence of 3 consecutive letters 'h', 'i' and 's' (irrespective of their cases) from each word of the file <code>SOLUTION.TXT</code>, with 3 underscores ('_'). For example, if the file <code>SOLUTION.TXT</code> contains the following content:</p> <p><code>"This is his history book."</code></p> <p>Then <code>TEST.TXT</code> should contain the following:</p> <p><code>"T__ is __ _tory book."</code></p> <p>Write the definition for function <code>CreateTest()</code> in Python that would perform the above task of creating <code>TEST.TXT</code> from the already existing file <code>SOLUTION.TXT</code>.</p>	[3]
Ans	<pre>def CreateTest():     file1=open('SOLUTION.TXT','r')     file2=open('TEST.TXT','w')     lines = file1.readlines()     for line in lines:         line=line.replace("his","__")         file2.write(line)     file1.close()     file2.close()</pre>	
	<p>(1/2 Mark for opening <code>SOLUTION.TXT</code> file to read)  (1/2 Mark for opening <code>TEST.TXT</code> file to write)  (1/2 Mark for reading the lines)  (1/2 Mark for iterating through every line of the lines read)  (1/2 Mark for replacing 'his' with '_')  (1/2 Mark to write the word into <code>TEST.TXT</code>)</p>	
	OR	
	<p>A text file named <code>AGENCIES.TXT</code> contains some text. Write the definition for a function <code>Showsites()</code> in Python which displays all such words of the file which have more than 9 characters and start with "<code>www.</code>", for example: if the file <code>AGENCIES.TXT</code> contains:</p> <p><code>"Name: TechnoCraft, Website: www.technocraft.com,  Name: DataTech, Website: www.datatech.com"</code></p>	[3]



	Then the function Showsites () should display the output as: www.technocraft.com www.datatech.com	
Ans	<pre>def Showsites():     file=open('AGENCIES.TXT','r')     lines = file.readlines()     for line in lines:         words = line.split()         for w in words:             if len(w)&gt;9 and w[:4]== 'www.' :                 print w     file.close()</pre>	
	<p><i>(½ Mark for opening AGENCIES.TXT file to read)</i>  <i>(½ Mark for reading all the lines)</i>  <i>(½ Mark for iterating through each line of the lines read)</i>  <i>(½ Mark for reading every word of each line)</i>  <i>(½ Mark to check every word beginning with 'www.')</i>  <i>(½ Mark to display the matched word)</i></p>	
(c)	<p>Write a definition for function Billing () in Python to read each record of a pickled file STOCK.DAT, and display the Total Price of all the records in the file. Assume that the file STOCK.DAT is created with the help of objects of class Stock, which is defined below:</p> <pre>class Stock(object):     def __init__(self, N='',P=0):         self.SName=N         self.Price=P</pre>	[2]
Ans	<pre>import pickle def Billing():     file=open('STOCK.DAT','rb')     IRec=pickle.load(file) #To read the object from file     Totprice=0     for I in IRec:         Totprice+=I[1]     print Totprice     file.close()</pre>	
	<p><i>(½ Mark for opening the file STOCK.DAT correctly)</i>  <i>(½ Mark for correct load())</i>  <i>(½ Mark for writing correct loop to iterate through all loaded records)</i>  <i>(½ Mark to calculate and display the total price of all products)</i></p>	
	OR	



	<p>A pickled file <b>ELECTION.DAT</b> contains records stored as objects of the following class :</p> <pre>class Election(object):     def __init__(self, N,C):         self.Name=N         self.Count=C</pre> <p>Write the definition for function <b>LowCount()</b> in Python, which reads every record from <b>ELECTION.DAT</b> and displays every such <b>Name</b> whose <b>Count</b> is less than 10.</p>	[2]
--	--	-----

Ans	<pre>import pickle def LowCount():     file=open('ELECTION.DAT','rb')     ERec=pickle.load(file) #To read the object from file     for E in ERec:         if E[1]&lt;10:             print E[0]     file.close()</pre>	
-----	--	--

	<p><i>(1/2 Mark for opening the file ELECTION.DAT correctly)</i>  <i>(1/2 Mark for correct load())</i>  <i>(1/2 Mark for writing correct loop to iterate through all loaded records)</i>  <i>(1/2 Mark for checking Count &lt;10 and displaying Name for the matching record)</i></p>	
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**SECTION C - (For all the candidates)**

5	(a)	Observe the following table <b>EMPLOYEES</b> and <b>DEPARTMENT</b> carefully and answer the questions that follow:	[2]
---	-----	--	-----

TABLE: EMPLOYEES				TABLE: DEPARTMENT	
ENO	ENAME	DOJ	DNO	DNO	DNAME
E1	NUSRAT	2001-11-21	D3	D1	ACCOUNTS
E2	KABIR	2005-10-25	D1	D2	HR
				D3	ADMIN

		(i) What is the Degree of the table <b>EMPLOYEES</b> ? What is the cardinality of the table <b>DEPARTMENT</b> ?	
--	--	---	--

Ans	<p>Degree of the table <b>EMPLOYEES</b> = 4          Cardinality of the table <b>DEPARTMENT</b> = 3</p>	
-----	---	--

		<p><i>(1/2 Mark for writing correct Degree of the table EMPLOYEES)</i>  <i>(1/2 Mark for writing correct Cardinality of the table DEPARTMENT)</i></p>	
--	--	---	--

		(ii) Write the result of a Cartesian Product operation performed upon the tables <b>EMPLOYEES</b> and <b>DEPARTMENT</b> upon the common attribute <b>DNO</b> from both tables.	
--	--	--	--

Ans	<table border="1"> <thead> <tr> <th>ENO</th> <th>ENAME</th> <th>DOJ</th> <th>DNO</th> <th>DNO</th> <th>DNAME</th> </tr> </thead> <tbody> <tr> <td>E2</td> <td>KABIR</td> <td>2005-10-25</td> <td>D1</td> <td>D1</td> <td>ACCOUNTS</td> </tr> </tbody> </table>	ENO	ENAME	DOJ	DNO	DNO	DNAME	E2	KABIR	2005-10-25	D1	D1	ACCOUNTS	
ENO	ENAME	DOJ	DNO	DNO	DNAME									
E2	KABIR	2005-10-25	D1	D1	ACCOUNTS									



E1	NUSRAT	2001-11-21	D3	D3	ADMIN
----	--------	------------	----	----	-------

(1/2 Mark for writing the correct result of the Cartesian Product with or without column headings)

- (b) Write SQL queries for (i) to (iv) and write outputs for SQL queries (v) to (viii), which are based on the following two tables CUSTOMERS and PURCHASES : [6]

Table: CUSTOMERS		
CNO	CNAME	CITIES
C1	SANYAM	DELHI
C2	SHRUTI	DELHI
C3	MEHER	MUMBAI
C4	SAKSHI	CHENNAI
C5	RITESH	INDORE
C6	RAHUL	DELHI
C7	AMEER	CHENNAI
C8	MINAKSHI	BANGALORE
C9	ANSHUL	MUMBAI

Table: PURCHASES			
SNO	QTY	PUR_DATE	CNO
S1	15	2018-12-25	C2
S2	10	2018-11-10	C1
S3	12	2018-11-10	C4
S4	7	2019-01-12	C7
S5	11	2019-02-12	C2
S6	10	2018-10-12	C6
S7	5	2019-05-09	C8
S8	20	2019-05-09	C3
S9	8	2018-05-09	C9
S10	15	2018-11-12	C5
S11	6	2018-08-04	C7

(i) To display details of all CUSTOMERS whose CITIES are neither Delhi nor Mumbai

Ans `SELECT * FROM CUSTOMERS WHERE CITIES NOT IN ('DELHI', 'MUMBAI');`  
OR  
`SELECT * FROM CUSTOMERS WHERE CITIES <> 'DELHI' AND CITIES <> 'MUMBAI';`

(1/2 Mark for correct SELECT statement)  
(1/2 Mark for correct WHERE clause)

(ii) To display the CNAME and CITIES of all CUSTOMERS in ascending order of their CNAME.

Ans `SELECT CNAME, CITIES FROM CUSTOMERS ORDER BY CNAME;`

(1/2 Mark for correct SELECT statement)  
(1/2 Mark for correct ORDER BY clause)

(iii) To display the number of CUSTOMERS along with their respective CITIES in each of the CITIES.

Ans `SELECT COUNT(*), CITIES FROM CUSTOMERS GROUP BY CITIES;`

(1/2 Mark for correct SELECT statement)  
(1/2 Mark for correct GROUP BY clause)

(iv) To display details of all PURCHASES made (PUR\_DATE) in the year 2019





	Ans	SELECT * FROM PURCHASES WHERE PUR_DATE BETWEEN '2019-01-01' AND '2019-12-31'; OR SELECT * FROM PURCHASES WHERE PUR_DATE >= '2019-01-01' AND PUR_DATE<= '2019-12-31';	
		(1/2 Mark for correct SELECT statement) (1/2 Mark for correct WHERE clause)	
		(v) SELECT COUNT(DISTINCT CITIES) FROM CUSTOMERS;	
	Ans	<u>COUNT(DISTINCT CITIES)</u> 5	
		(1/2 Mark for writing correct output in any order and with or without column headings)	
		(vi) SELECT MAX(PUR_DATE) FROM PURCHASES WHERE QTY <10;	
	Ans	<u>MAX(PUR_DATE)</u> 2019-05-09	
		(1/2 Mark for writing correct output in any order and with or without column headings)	
		(vii) SELECT CITIES FROM CUSTOMERS GROUP BY CITIES HAVING COUNT(*) = 2;	
	Ans	<u>CITIES</u> CHENNAI MUMBAI	
		(1/2 Mark for writing correct output in any order and with or without column headings)	
		(viii) SELECT CNAME, QTY, PUR_DATE FROM CUSTOMERS, PURCHASES WHERE CUSTOMERS.CNO = PURCHASES.CNO AND QTY IN (10,20);	
	Ans	<u>CNAME</u> <u>QTY</u> <u>PUR_DATE</u> SANYAM            10                            2018-11-10 RAHUL              10                            2018-10-12 MEHER              20                            2019-05-09	
		(1/2 Mark for writing correct output in any order and with or without column headings)	
6	(a)	State any one of the Absorption Laws of Boolean Algebra and verify it using truth table.	[2]
	Ans	For every $X, Y \in B$ $X + X.Y = X$ $X . (X + Y) = X$ ( by Duality ) $X + X'.Y = X + Y$ $X . (X' + Y) = X.Y$ ( by Duality )	



	<p>Verification of <math>X + X.Y = X</math></p> <table border="1"> <thead> <tr> <th>X</th> <th>Y</th> <th>X.Y</th> <th>X+X.Y</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> <td>1</td> </tr> </tbody> </table>	X	Y	X.Y	X+X.Y	0	0	0	0	0	1	0	0	1	0	0	1	1	1	1	1																	
X	Y	X.Y	X+X.Y																																			
0	0	0	0																																			
0	1	0	0																																			
1	0	0	1																																			
1	1	1	1																																			
	<p>(1 Mark for correctly stating any one Absorption Law) (1 Mark for correctly verifying the stated Absorption Law)</p>																																					
	<p>(b) Draw the Logic Circuit of the following Boolean Expression: <math>A' . B + B' . C'</math></p>	[2]																																				
Ans																																						
	<p>(1/2 Mark for drawing Logic circuit for <math>(A'.B)</math> correctly) (1/2 Mark for drawing Logic circuit for <math>B'.C'</math> correctly) (1 Mark for drawing Logic circuit for <math>(A'.B + B'.C')</math> correctly)</p>																																					
	<p>(c) Derive a Canonical SOP expression for a Boolean function F, represented by the following truth table:</p> <table border="1"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> <th>F(X, Y, Z)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td>1</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> <td>1</td> </tr> </tbody> </table>	X	Y	Z	F(X, Y, Z)	0	0	0	1	0	0	1	1	0	1	0	0	0	1	1	0	1	0	0	0	1	0	1	0	1	1	0	1	1	1	1	1	[1]
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Ans	<p><math>F(X, Y, Z) = X' . Y' . Z' + X' . Y' . Z + X . Y . Z' + X . Y . Z</math> OR <math>F(X, Y, Z) = \sum (0, 1, 6, 7)</math></p>																																					
	<p>(1 Mark for correctly writing the SOP form) OR (1/2 Mark for any two correct terms) Note: Deduct 1/2 mark if wrong variable names are written in the expression</p>																																					
	<p>(d) Reduce the following Boolean Expression to its simplest form using K-Map:</p>	[3]																																				
	<p><math>F(A, B, C, D) = \sum (5, 6, 7, 10, 11, 13, 14, 15)</math></p>																																					



Ans

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

OR

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

Minimal expression :  $A.C + B.D + B.C$

(1/2 Mark for drawing K-Map and correctly plotting 1s in the given cells)

( 1/2 Mark each for 3 groupings)

( 1 Mark for writing final expression in reduced/minimal form)

Note:

Deduct 1/2 mark if wrong variable names are used

7 (a) A CEO of a car manufacturing company ElectroCars Ltd. located at Mumbai wants to have an annual meeting with his counterparts located at Delhi and Chennai where he would like to show as well as see and discuss the presentations prepared at the three locations for the financial year. Which communication technology out of the following is best suited for taking such an online demonstration?  
 (i) Chat (ii)Teleconferencing (iii) Video Conferencing

Ans (iii) Video Conferencing

( 1 Mark for writing the correct option)

(b) Match the Telecommunication Technologies listed in the first column of the following table with their corresponding features listed in the second column of the table:

Technology	Feature
1G	<ul style="list-style-type: none"> <li>• IP based Protocols (LTE)</li> <li>• True Mobile Broadband</li> </ul>
2G	<ul style="list-style-type: none"> <li>• Improved Data Services with Multimedia</li> </ul>



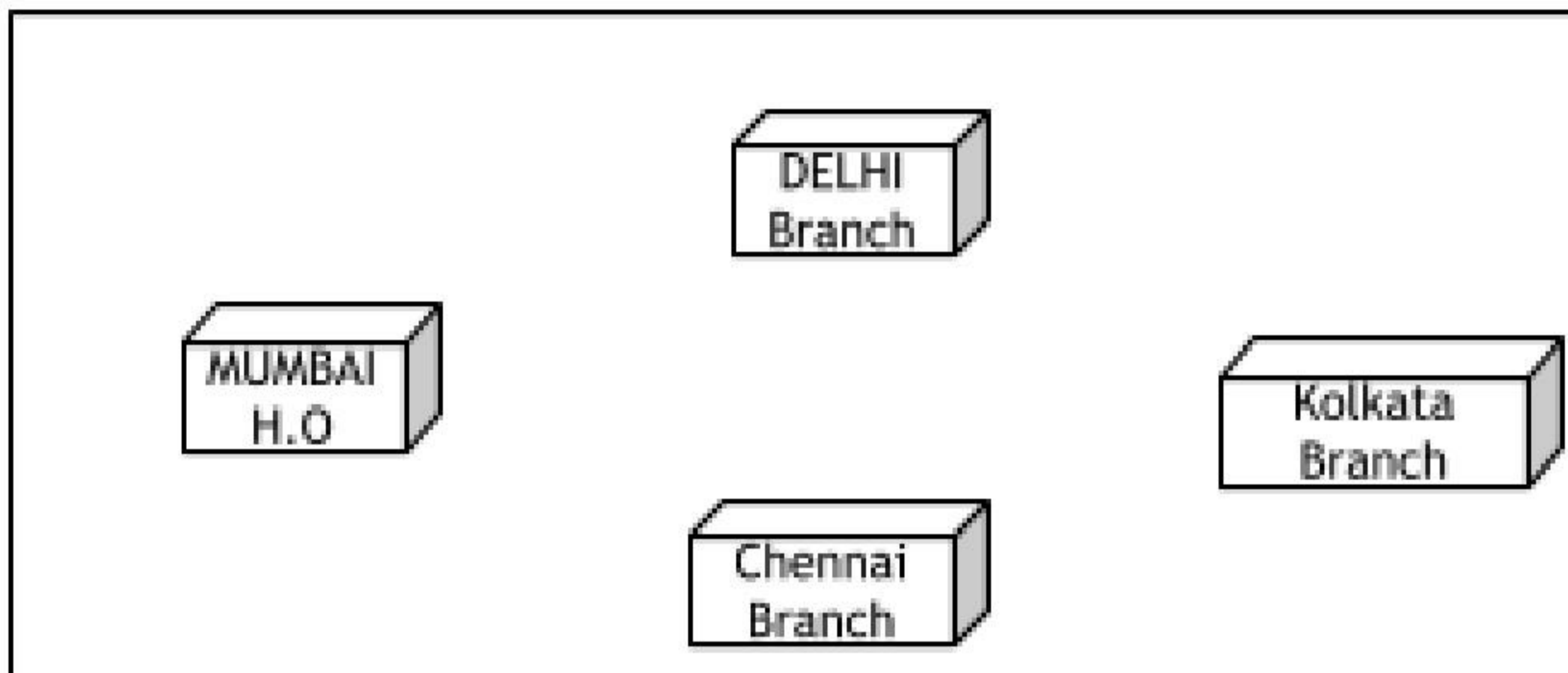
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		<b>(1/2 Mark for writing each correct match)</b>											
	<b>(c)</b>	Write the names of one client side and one server side scripting language.	[1]										
	<b>Ans</b>	Vbscript or Javascript : Client side (Any one only) ASP or JSP : Server side (Any one only)											
		<b>(1/2 Mark for writing correct one client side scripting language)</b> <b>(1/2 Mark for writing correct one server side scripting language)</b>											
	<b>(d)</b>	Write the expanded names for the following abbreviated terms used in Networking and Communications: (i) PPP (ii) PAN (iii) FTP (iv) WLL	[2]										
	<b>Ans</b>	(i) PPP : Point to Point Protocol (ii) PAN : Personal Area Network (iii) FTP : File Transfer Protocol (iv) WLL : Wireless in Local Loop											
		<b>(1/2 Mark for writing each correct expansion)</b>											
	<b>(e)</b>	<b>CASE STUDY BASED QUESTION</b>											
		Helping Hands is an NGO with its head office at Mumbai and branches located at Delhi, Kolkata and Chennai. Their Head Office located at Delhi needs a communication network to be established between the head office and all the branch offices. The NGO has received grant approval from the central government for setting up the network. The physical distances between the branch offices and the head office and the number of computers to be installed in each of these branch offices and the head office are given below. As a network expert you have to suggest the best possible solutions for the queries as raised by the NGO. as given in (i) to (iv).	[4]										
		Distances between various locations in Kilometres:											
		<table border="1"> <tr> <td>Mumbai H.O. to Delhi</td> <td>1420</td> </tr> <tr> <td>Mumbai H.O. to Kolkata</td> <td>1640</td> </tr> </table>	Mumbai H.O. to Delhi	1420	Mumbai H.O. to Kolkata	1640							
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Mumbai H.O. to Chennai	2710
Delhi to Kolkata	1430
Delhi to Chennai	1870
Chennai to Kolkata	1750

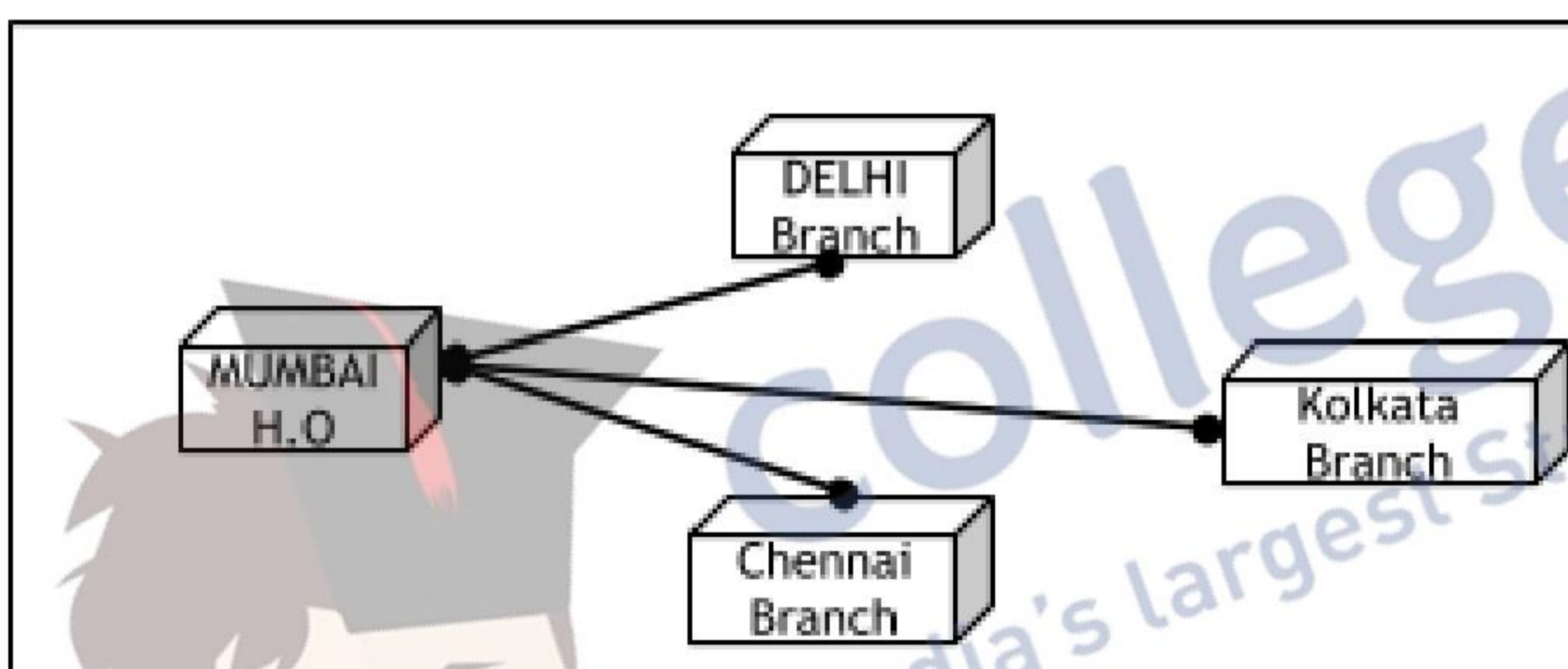
Number of Computers installed at various locations are as follows:

Mumbai H.O	2500
Delhi branch	1200
Kolkata branch	1300
Chennai branch	1100



(i) Suggest the drawing the best cable layout for effective network connectivity of all the Branches and the Head Office for communicating data.

Ans



**(1 Mark for drawing the correct layout)**

(ii) Suggest the most suitable location to install the main server of this NGO to communicate data with all the offices.

Ans Mumbai H.O

**(1 Mark for writing the correct location)**

(iii) Write the name of the type of network out of the following, which will be formed by connecting all the computer systems across the network:

- (A) WAN                      (B)MAN                      (C) LAN                      (D) PAN

Ans (A) WAN

**(1 Mark for writing the correct option)**

(iv) Suggest the most suitable medium for connecting the computers installed across the network out of the following:

- (A) Optical Fibre (B) Telephone wires (C) Radio Waves (D) Ethernet cable

Ans (A) Optical Fibre

**(1 Mark for writing the correct option)**

