Strictly Confidential: (For Internal and Restricted use only)
Senior School Certificate Examination
March 2019
Marking Scheme – Computer Science (SUBJECT CODE: 083)
(SERIES: BVM-1 PAPER CODE – 91)

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 0-70 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.
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++)

1	**(a)**	Differentiate between call by value and call by reference in C++. Give an example to illustrate both.	2
	Ans	Call by value: The formal parameters makes a copy of the actual parameters. It does not make the changes in actual parameter if the changes are done in formal parameters. Call by reference:The formal parameter is an alias of actual parameter. The changes made in the formal parameter are reflected in actual parameter. It is preceded by & **void Calc(int A, int &B)** **{** **A++;** **B+=A;** **}** **void main()** **{ int X=5, Y=10;**	

		`Calc(X,Y);//Calc() is called by passing X by value`
		`//and Y by reference`
		`}`
		
		OR
		`void Calculate(int A, int &B);`
		// A is value parameter
		// B is reference parameter	

		(½ Mark for each correct explanation of Call by Value and Call by reference) ***(½ Mark for each correct example of Call by value and Call by reference)*** ***OR*** ***(Full 2 Marks for correct examples demonstrating the difference between Call by value and Call by reference using appropriate comments or outputs)***	

	(b)	Write the names of the correct header files, which must be included to compile the following code successfully in a C++ compiler:
		`void main()`
		`{`
		`  float Price=90,Amount;`
		`  int Qty;`
		`  cin>>Qty;`
		`  Amount=Price*Qty;`
		`  cout<<setw(10)<<Price<<"x"<<setw(10)<<Qty<<"="`
		`  <<setw(10)<<Amount<<endl;`
		`}`
			1

	Ans	**(i) iostream.h (ii) iomanip.h** **OR** `iomanip.h`	
		(½ Mark for writing each correct header file) ***OR*** ***(Full 1 Mark for mentioning only iomanip.h)*** ***NOTE: Mention of any additional header file to be ignored***	

	(c)	Rewrite the following **C++ program** after removing any/all syntactical error(s) underline each correction done in the code:
		Note: Assume all required header files are already included in the program.
		`typedef int[2][3] Matrix;`
		`void main()`
		`{`
		`  Matrix M={23,45,45},{32,67,76};`
		`  for (int C=0;C<2;I++)`
		`  {`
			2

```
      for (R=0;R<3;R++)
        if (M[C][R]%5==0)
           cout<<M[C,R]<<"*";
      cout<<endl;
   }
}
```

Ans

```
typedef int Matrix[2][3];      //Error 1
void main()
{
  Matrix M={{23,45,45},{32,67,76}}; //Error 2
  for (int C=0;C<2;C++)             //Error 3
  {
     for (int R=0;R<3;R++)     //Error 4
       if (M[C][R]%5==0)
          cout<<M[C][R]<<"*";  //Error 5
     cout<<endl;
  }
}
```

(½ Mark for each correction upto a maximum of 4 corrections)
NOTE:
(1 Mark for only identifying any four errors correctly)

(d) Find and write the output of the following C++ program code:
Note: Assume all required header files are already included in the program. **2**

```
void Changer(char Text[])
{
  for (int C=0;Text[C]!='\0';C++)
    if (Text[C]>='A' && Text[C]<='M')
       Text[C]+=2;
    else if (Text[C]>='U')
       Text[C]='#';
    else
       Text[C]++;
}
void main()
{
  char Str[]="MODULE";
  Changer(Str);
  cout<<Str<<endl;
}
```

Ans **OPF#NG**

(1 Mark for writing OPF as the first three characters)
(1 Mark for writing #NG as the last three characters)
OR
(Only ½ Mark for writing '#' at proper place)

		Note: ***Deduct only ½ Mark for any one incorrect from : OPF as first three characters***	

	(e)	Find and write the output of the following C++ program code:
		Note: Assume all required header files are already included in the program.
		`void Compute(int &P, int Q=10)`
		`{`
		`  P=P*Q;`
		`  Q=P/Q;`
		`  cout<<P<<"#"<<Q<<endl;`
		`}`
		`void main()`
		`{`
		`  int K=15, L=5;`
		`  Compute(K,L);`
		`  Compute(L);`
		`  Compute(K);`
		`}`
			3

	Ans	`75#15`
		`50#5`
		`750#75`	

		(½ Mark for writing each correct value) ***OR*** ***(Only ½ Mark for writing all '#' at proper places)*** ***Note:*** ● ***Deduct only ½ Mark for not considering any or all correct placement of #*** ● ***Deduct only ½ Mark for not considering any or all line break***	

	(f)	Observe 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 Begin.
		Note:
		● Assume all the required header files are already being included in the code.
		● The function random(N) generates any possible integer between 0 and N-1 (both values included)
		`void main()`
		`{ randomize();`
		`  char Txt[]="ABCDEFGH";`
		`  int Begin = random(2) + 2;`
		`  int Last  = random(3)+ Begin;`
			2

```
  for(int C=Begin; C<=Last; C++)
    cout<<Txt[C]<<"#";
}
```

(i) C#D#E#	(ii) E#F#G#
(iii) B#C#D#E#	(iv) F#G#H#

Ans (i) C#D#E#

```
Minimum value of Begin = 2
Maximum value of Begin = 3
```

Part 1:
(1 Mark for writing only the correct option)

Part 2:
(½ Mark for writing correct Minimum value of Begin)
(½ Mark for writing correct Maximum value of Begin)

Note: No marks to be awarded in Part 1, if additional options are mentioned

2. **(a)** Given the following class Furniture and assuming all necessary header file(s) included, answer the questions that follow the code:

```
class Furniture
{
   int Code; char Type[20];
public:
  Furniture(int C)                //Function 1
  {
     Code = C;
  }
  Furniture(char T[])             //Function 2
  {
     strcpy(Type,T);
  }
  Furniture(char T[], int C)      //Function 3
  {
    Code = C;
    strcpy(Type,T);
  }
  Furniture(Furniture &F)         //Function 4
  {
    Code = F.Code + 10;
    strcpy(Type,F.Type);
  }
};
```

		void main()
		{ Furniture F1(5); //Statement I
		Furniture F2(10); //Statement II
		Furniture F3(20, "TABLE"); //Statement III
		_____ ; //Statement IV
		}	

	(i)	Which of the statement(s) out of (I),(II),(III),(IV) is/are incorrect for object(s) of the class Furniture.	1
	Ans	**Statement III is incorrect** OR **Statement III and IV are incorrect**	
		(1 mark for writing correct option) ***(½ mark for only writing Statement IV is incorrect)***	
	(ii)	What is Function 4 known as ? Write the **Statement IV**, that would execute **Function 4.**	1
	Ans	• **Copy Constructor** • **Furniture F4=F1; OR Furniture F4(F1);** **OR** **Furniture F4=F2; OR Furniture F4(F2);** **OR** **Furniture F4=F3; OR Furniture F4(F3);**	
		(½ mark for each correct answer) ***Note: Any object name can be used in place of F4***	

	(b)	Observe the following C++ code and answer the questions (i) and (ii):
		Note: Assume all necessary files are included.
		class Packing
		{
		int L,B;
		public:
		Packing(int TL=10, int TB=20) //Function 1
		{
		L = TB;
		B = TL;
		}
		~Packing() //Function 2
		{
		cout<<"Package Moved "<<endl;
		}
		void Display() //Function 3
		{
		cout<<L<<" & "<<B<<" Units"<<endl;
		}	

		`};`
		`void main()`
		`{`
		`  Packing P(25);`
		`  P.Display();`
		`}`	

	(i)	For the class Packing, what is **`Function 2`** known as ? When is it executed?	1
	Ans	• **Destructor** • **When the object goes out of scope OR mention of correct "}"**	
		(½ Mark for each correct answer)	
	(ii)	What is the output of the above code, on execution ?	1
	Ans	`20 & 25 Units` `Package Moved`	
		(½ Mark for each correct line of output) ***Note: No marks to be deducted for ignoring &***	
		OR	
	(b)	Explain Function Overloading in context of Object Oriented Programming. Also give a supporting example in C++.	2

	Ans	When two or more functions have the same name with different signature , they are said to be overloaded.
		OR
		The ability of a message to be expressed in different forms.
		
		Example:
		`void area(float r)`
		`{`
		`  cout<< 3.14*r*r;`
		`}`
		`void area(int l,int b)`
		`{`
		`  cout<<  l * b;`
		`}`
		`void main()`
		`{ area(3.5);`
		`  area(10,20);`
		`}`
		`  OR`
		`void area(float a);`
		`void area(int a, int b);`	

		(1 mark for explaining Function Overloading correctly) *(1 mark for writing correct supporting example)* *OR* *(2 Marks for illustrating the concept of Function Overloading with the help of appropriate example)*	
	(c)	Write the definition of a class ENVIRONMENT in C++ with following description: Private Members • **City // character of size 20** • **PMLevel // integer** • **Health // character of size 15** • **AssignHealth()/* Member function to assign value of Health based upon PMLevel*/** **PMLevel** | **Health** **Less than or equal to 50** | **Healthy** **More than 50 and less than or equal to 100** | **Moderate** **More than 100** | **Unhealthy** Public Members • **In() /* Function to allow user to enter values of City, PMLevel and then invoke AssignHealth() to assign value of Health */** • **Out() //Function to display all the data members**	4
	Ans	**class ENVIRONMENT** **{** **char City[20];** **int PMLevel;** **char Health[15];** **void AssignHealth();** **public :** **void In();** **void Out();** **};** **void ENVIRONMENT::AssignHealth()** **{** **if (PMLevel<=50)** **strcpy(Health,"Healthy");** **else if (PMLevel<=100)** **strcpy (Health,"Moderate");** **else** **strcpy(Health,"Unhealthy");** **}**	

```
void ENVIRONMENT::In()
{
  gets(City);
  cin>>PMLevel;
  AssignHealth();
}
void ENVIRONMENT::Out()
{
  cout<<City<<PMLevel<<Health<<endl;
}
```

(½ Mark for declaring class header correctly)
(½ Mark for declaring data members correctly)
(1 Mark for defining AssignHealth() correctly)
(½ Mark for taking inputs of City and PMLevel in In())
(½ Mark for invoking AssignHealth() inside In())
(½ Mark for defining Out() 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

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

```
class Complex
{
  int Code;
protected:
  double Area;char Location[20];
public:
  void  Get();void Put();
};

class Block: private Complex
{
  char BCode;
public:
  void  BGet();  void  BPut();
};

class Flat : public Block
{
  int FNo,NOR;
public:
  void FGet();      void FPut();
};

void main()
{
   Flat F;
```

		}	
	(i)	Which type of Inheritance out of the following is illustrated in the above example? – **Single Level Inheritance, Multilevel Inheritance, Multiple Inheritance**	
	Ans	**(i) Multilevel Inheritance**	
		(1 Mark for writing correct option)	
	(ii)	Write the names of **all the members**, which are directly accessible by the member function **BPut()** of class **Block**.	
	Ans	**Data Members : Area, Location, BCode** **Member Functions : Get(), Put(), BGet()** **BPut() – optional**	
		(1 Mark for writing all correct member names) ***NOTE:*** ● ***Marks not to be awarded for partially correct answer*** ● ***Separate specification as Data Members/Member Functions is optional***	
	(iii)	Write the names of **all the data members**, which are directly accessible by the member functions of class **Flat**.	
	Ans	**FNo, NOR**	
		(1 Mark for writing all correct data member names) ***NOTE:*** ***Marks not to be awarded for partially correct answer***	
	(iv)	Write the names of **all the members**, which are directly accessible by the object **F** of class **Flat** declared in the **main()** function.	
	Ans	**FGet(), FPut(), BGet(), BPut()**	
		(1 Mark for writing all correct members) ***NOTE:*** ***Marks not to be awarded for partially correct answers.***	
		OR	
	(d)	Consider the following class Company: **class Company** **{** **int Code;** **char Name[20];** **protected:** **float Turnover;** **public:** **void In(){cin>>Code;gets(Name);cin>>Turnover;}**	

		`void Out(){cout<<Code<<Name<<Turnover<<endl;}`
		`};`
		Write a code in C++ to privately derive another class Branch from base class Company with following members:
		Data Members
		BCode of type long
		BAddress of type character of size 10
		Member Functions
		● A constructor function to assign BCode as 1000.
		● Input() to allow user to enter BCode and BAddress.
		● Output() to display BCode and BAddress.	

	Ans	`class Branch : private Company`
		`{`
		`long BCode;`
		`char BAddress[10];`
		`public:`
		`Branch()`
		`{`
		`BCode = 1000;`
		`}`
		`void Input()`
		`{`
		`cin>>BCode;`
		`gets(BAddress);`
		`}`
		`void Output()`
		`{`
		`cout<< BCode <<BAddress<<endl;`
		`}`
		`};`	

		(½ Mark for declaring* class *Branch) ***(½ mark for inheriting using* :)** ***(½ Mark for private Company)*** ***(½ Mark for declaring data members correctly)*** ***(1 Mark for defining constructor Branch() correctly)*** ***(½ Mark for defining Input() correctly)*** ***(½ Mark for defining Output() correctly)***	
3	**(a)**	Write a user-defined function **`AddSevenNine(int P[], int N)`** in C++, which should find sum of those values in array P, which are ending with 7 or 9. Example: if the array Arr contains 0 1 2 3 4 27 | 18 | 22 | 39 | 9 Then the function should display the output for sum of (27, 39 and 9) as: Sum=75	3

	Ans	**void AddSevenNine(int P[],int N)** **{** **int Sum = 0;** **for(int i=0;i<N;i++)** **if ((P[i]%10==7) || (P[i]%10==9))** **Sum += P[i];** **cout<<"Sum="<<Sum<<endl;** **}**	
		(½ Mark for correctly writing the loop) ***(½ Mark for checking values ending with 7)*** ***(½ Mark for checking ending with 9)*** ***(½ Mark for using || operator between divisibility check)*** ***(½ Mark for finding the sum of elements)*** ***(½ Mark for displaying the sum)*** ***OR*** ***(Full 3 Marks for writing a code giving the same result)***	
		OR	
	(a)	Write a user-defined function **AlterSwap(int R[], int N)** in C++, which should swap contents of the adjacent elements. **N** (which is an even integer) represents the total number of elements in the array **R**. Example: if the array **R** contains the following elements (for **N = 6**) 0 1 2 3 4 5 20 50 70 30 80 90 Then the function should rearrange the array to become 0 1 2 3 4 5 50 20 30 70 90 80 NOTE: ● **DO NOT DISPLAY** the Changed Array contents ● Do not use any other array to transfer the contents of array R.	3
	Ans	**void AlterSwap(int R[],int N)** **{** **for(int i=0; i<=N-2; i+=2)** **{** **int t=R[i];** **R[i]=R[i+1];** **R[i+1]=t;** **}** **}**	
		(½ Mark for initialisation, ½ Mark for correct condition, ½ Mark for change in value of variable of the loop as part of a loop) ***(1½ Mark for swapping elements - ½ mark for each sub-step)*** ***OR*** ***(Full 3 Marks for writing a code giving the same result)***	
	(b)	Write a user-defined function **MakeChange(char T[4][4])** in C++, which	2

		replaces every occurrence of alphabet **'A'** with an alphabet **'X'** in the array. For example: **ORIGINAL ARRAY T** L A Z Y A U R A F L A W H A Z Y **CHANGED ARRAY T** L X Z Y X U R X F L X W H X Z Y NOTE: ● **DO NOT DISPLAY** the Changed Array contents ● Do not use any other array to transfer the contents of array T.	

	Ans	`void MakeChange(char T[4][4])`
		`{`
		`  for(int i=0;i<4;i++)`
		`  for(int j=0;j<4;j++)`
		`  if (T[i][j]=='A')`
		`  T[i][j]='X';`
		`}`	

		(½ Mark for correctly writing loop for traversing rows) ***(½ Mark for correctly writing loop for traversing columns in each row)*** ***(½ Mark for correctly checking element to be 'A')*** ***(½ Mark for correctly replacing element to 'X')*** ***OR*** ***(Full 2 Marks for writing a code giving the same result)***	
		OR	
	(b)	Write a user-defined function **`sumleft(int A[4][4])`** in C++, which find the sum of left diagonal elements: For example: **ORIGINAL ARRAY A** 10 12 20 22 30 32 40 42 50 52 60 62 70 72 80 82 NOTE: ● Sum of left diagonal:184	2

	Ans	`void  sumleft(int A[4][4])`
		`{`
		`  int Sum = 0;`
		`  for(int i=0;i<4;i++)`
		`  Sum += A[i][i]; //OR  Sum += A[i][3-i];`	

		`cout<<"Sum of left diagonal:"<<Sum<<endl;` `}`	
		(½ Mark for initialising Sum with 0) ***(½ Mark for correctly writing loop)*** ***(½ Mark for finding sum of any of the diagonal elements)*** ***(½ Mark for displaying the sum with/without the preceding message)*** ***OR*** ***(Full 2 Marks for writing a code giving the same result)***	
	(c)	Let us assume T[10][15] 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[5][7], if the address of the element T[7][10] is 35000. Also, find the total number of elements which can be stored in the Array T.	3

	Ans	`LOC(T[5][7])= LOC(T[7][10]) + 4(15*(5-7)+(7-10))`
		`= 35000 + 4(15*(-2) + (-3))`
		`= 35000 + 4(-33)`
		`= 35000 - 132`
		`= 34868`
		OR
		
		`LOC(T[I][J]) = Base(T)+W*(NC*(I-LBR)+(J-LBC))`
		`Assuming LBR=0, LBC=0`
		`LOC(T[7][10])= Base(T)+4*(15*7+10)`
		`35000 = Base(T)+4*(105+10)`
		`Base(T) = 35000 - 4*(115)`
		`Base(T) = 35000 - 460`
		`Base(T) = 34540`
		
		`LOC(T[5][7]) = 34540 + 4*(15*5+7)`
		`= 34540 + 4*(75+7)`
		`= 34540 + 4*(82)`
		`= 34540 + 328`
		`= 34868`	

		(1 Mark for writing correct formula (for Row major) OR substituting formula with correct values) ***(1 Mark for correct step calculations - at least one step of calculation)*** ***(1 Mark for final correct address)*** ***NOTE:*** ***Marks to be awarded for calculating the address assuming LBR and LBC = 1***	
		OR	
	(c)	Let us assume P[16][23] is a two dimensional array, which is stored in the memory along the column with each of its element occupying 4 bytes, find the address of the element P[5][8], if the base address of the array is 35000.	3

	Ans	**LOC(P[I][J]) = Base(P)+W*((I-LBR)+NR*(J-LBC))** **Assuming LBR=0, LBC=0** **LOC(P[5][8]) = Base(P)+4*(5+16*8)** **= 35000 + 4*(5+128)** **= 35000 + 4*(133)** **= 35000 + 532** **= 35532**	
		(1 Mark for writing correct formula (for Column major) OR substituting formula with correct values) ***(1 Mark for correct step calculations - at least one step of calculation)*** ***(1 Mark for final correct address)*** ***NOTE:*** ***Marks to be awarded for calculating the address assuming LBR and LBC = 1***	
	(d)	Write a user-defined function **Pop(Box B[], int &T)**, which pops the details of a Box, from the static stack of Box B, at the location T (representing the Top end of the stack), where every Box of the stack is represented by the following structure. **struct Box** **{** **int Length,Width,Height;** **};**	4

	Ans	**void Pop(Box B[],int &T)**
		{
		if(T!=-1) // OR if (T>=0) OR if (T>-1)
		{
		cout<<B[T].Length<<B[T].Width<<B[T].Height<<endl;
		T--;
		}
		else
		cout<<"Stack Empty";
		}
		OR
		void Pop(Box B[],int &T)
		{
		if(T==-1) // OR if (T<0)
		cout<<"Stack Empty";
		else
		{
		cout<<B[T].Length<<B[T].Width<<B[T].Height<<endl;
		T--;
		}
		}	

		(1 ½ Mark for checking EMPTY/NOT EMPTY condition)	

		(1 Mark for displaying/returning the content of Top element) *(1 ½ Mark for decrementing in the value of T or Top)* ***OR*** *(Full 4 Marks for writing a code giving the same result)*	
		OR	

	(d)	For the following structure of Box in C++
		`struct Box`
		`{`
		`  int  Length,Width,Height;`
		`  Box *Link;`
		`};`
		
		Given that the following declaration of class BoxStack in C++ represents a dynamic stack of Box:
		`class BoxStack`
		`{`
		`  Box *Top; //Pointer with address of the Topmost Box of stack`
		`public:`
		`  BoxStack()`
		`  {`
		`  Top = NULL;`
		`  }`
		`  void Push(); //Function to push a Box into the dynamic stack`
		`  void Pop();  //Function to pop a Box from the dynamic stack`
		`  ~BoxStack();`
		`};`
		Write the definition for the member function void BoxStack::Push(), that pushes the details of a Box into the dynamic stack of BoxStack.
			4

	Ans	`void BoxStack::Push()`
		`{`
		`  Box *T = new Box;`
		`  cin>>T->Length>>T->Width>>T->Height;`
		`  T->Link = Top;`
		`  Top= T;`
		`}`	

		(1 Mark for declaring and initialising T (Temporary Node) using new) *(1 Mark for allowing user to enter Length, Width, Height of T)* *(1 Mark for linking the T link pointer correctly with Top)* *(1 Mark for assigning T to Top)*	
	(e)	Evaluate the following Postfix expression, showing the stack contents.	2

100,2,/,5,2,3,+,*,-

Ans

Element	Stack Contents
100	100
2	100, 2
/	50
5	50, 5
2	50, 5, 2
3	50, 5, 2, 3
+	50, 5, 5
*	50, 25
-	25

Answer = 25
OR
Any other method for evaluating the given postfix expression showing the status of Stack.

(½ Mark for correctly evaluating expression up to each operator)
OR
(1 Mark only to be given for writing correct answer without showing the Stack Status)

OR

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

U - V / W * X + Y

Ans

((U - ((V / W) * X)) + Y)

INFIX	STACK	POSTFIX
(		
(		
U		U
-	-	U
(		
(		
V	-	UV
/	-/	UV
W	-/	UVW
)	-	UVW/
*	-*	UVW/
X	-*	UVW/X
)	-	UVW/X*
)		UVW/X*-

+	+	UVW/X*-
Y	+	UVW/X*-Y
)		UVW/X*-Y+

OR

U - V / W * X + Y

INFIX	STACK	POSTFIX
U		U
-	-	U
V	-	UV
/	-/	UV
W	-/	UVW
*	-*	UVW/
X	-*	UVW/X
+	+	UVW/X*-
Y	+	UVW/X*-Y
		UVW/X*-Y+

OR

Any other method for converting the given **infix** expression to its equivalent **postfix** expression showing stack contents.

(½ Mark for conversion upto each operator illustrating through stack)
OR
(1 Mark for only the final answer as* UVW/X*-Y+*)

4. **(a)** A text file named **WORDS.TXT** contains some text. Write a user-defined function **MAGICWORDS()** in C++ to read and display those words, which is starting with alphabet 'A' (irrespective of upper or lower case). **3**

For example: if the file WORDS.TXT contains:

```
A lot of adorable cute dolls were displayed in Showbiz festival.
Anya had boxes of Pizzaz in her hand
```

The function should display:

```
A
adorable
Anya
```

Ans

```
void MAGICWORDS()
{
  ifstream f("WORDS.TXT");
  char W[20];
  f>>W;
  while(!f.eof())
  {
     if((W[0]=='A')||(W[0]=='a')) //ignore W[0]=='a'
        cout<<W<<endl;
```

```
      f>>W;
    }
    f.close();
}

 OR
void MAGICWORDS()
{
  ifstream f("WORDS.TXT");
  char W[20];
  while(!f.eof())
  {
     f>>W;
     if((W[0]=='A')||(W[0]=='a')) //ignore W[0]=='a'
        cout<<W<<endl;
  }
  f.close();
}
```

(1 Mark for opening WORDS.TXT *correctly)*
(1 Mark for reading each Word (using any method) from the file)
(½ Mark for checking word starting with alphabet 'A' or 'a')
(½ Mark for displaying the word)

OR

(a) A text file named **DRAFT.TXT** contains some text. Write a user-defined function MakeNew() in C++, which transfers lines from **DRAFT.TXT** to **FINAL.TXT**, which are not starting with alphabet 'X'. (3)

For example: if the file **DRAFT.TXT** contains:

```
Completed 3 chapters of Chemistry
XCompleted all chapters of English
Completed 4 chapters of Physics
Completed 5 chapters of English
```

Then the function MakeNew() should transfer the following lines to **FINAL.TXT**:

```
Completed 3 chapters of Chemistry
Completed 4 chapters of Physics
Completed 5 chapters of English
```

Ans

```
void MakeNew()
{
  ifstream f1("DRAFT.TXT");
  ofstream f2("FINAL.TXT");
  char S[80];
  while(f1.getline(S,80))
  {
     if(S[0]!='X')
```

```
        f2<<s<<endl;
  }
  f1.close();
  f2.close();
}
```

(½ Mark for opening DRAFT.TXT *correctly)*
(½ Mark for opening FINAL.TXT *correctly)*
(1 Mark for reading each line (using any method) from the file)
(½ Mark for checking line not starting with alphabet 'X')
(½ Mark for transferring the line to the file FINAL.TXT)

(b) Write a user-defined function TotalPrice() in C++ to read each object of a binary file **STUDENT.DAT**, and count the number of students, who are paying Fee more than 1500. Assume that the file **STUDENT.DAT** is created with the help of objects of class STUDENT, which is defined below: (2)

```
class STUDENT
{
  int Rno;char Name[20]; float Fee;
public:
  float Rfee() { return Fee; }
  void Show()
  {cout<<Rno<<"|"<<Name<<"|"<<Fee<<endl; }
};
```

Ans

```
void TotalPrice()
{
  ifstream f("STUDENT.DAT",ios::binary);
//OR fstream f("STUDENT.DAT",ios::binary|ios::in);
//OR fstream f;
//f.open("STUDENT.DAT",ios::binary|ios::in);
  STUDENT S;
  int C=0;
  while(f.read((char*)&S,sizeof(S)))
    if(S.Rfee()>1500)
      C++;
  cout<<C<<endl; //Ignore
  f.close();
}
```

(½ Mark for opening STUDENT.DAT *correctly)*
(½ Mark for reading each record from the file)
(½ Mark for checking fee above 1500)
(½ Mark for counting students paying fee above 1500)

OR

(b) A binary file HARDWARE.DAT contains records stored as objects of the following class : (2)

```
class HARDWARE
{
  int ID;  char Device[20];  float Price;
public:
  int *GetID() { return ID; }
  float *GetPrice() { return Price;}
  void Display()
  { cout<<ID<<" # "<<Device<<" # "<<Price<<endl;
};
```

Write a user-defined function **Economic()** in C++, which displays the details of those HARDWARE devices from the file HARDWARE.DAT, which are priced less than 2000.

Ans

```
void Economic()
{
  ifstream f("HARDWARE.DAT",ios::binary);
//OR fstream f("HARDWARE.DAT",ios::binary|ios::in);
//OR
//fstream f;
//f.open("HARDWARE.DAT",ios::binary|ios::in);
  HARDWARE H;
  while(f.read((char*)&H,sizeof(H)))
    if(H.GetPrice()<2000)
      H.Display();
  f.close();
}
```

(½ Mark for opening* HARDWARE.DAT *correctly)
(1 Mark for reading each record from the file)
(½ Mark for displaying the record)
NOTE: Full 2 marks if the error in return type has been explicitly mentioned

(c) Find the output of the following C++ code considering that the binary file HARDWARE.DAT exists on the hard disk with the following 5 records for the class HARDWARE as declared in the previous question (4 b). 1

ID	Device	Price
101	Optical Mouse	300
103	Laser Mouse	1100
102	Wireless Keyboard	2200
104	Headphone	1700
105	Wired Keyboard	1000

```
void main()
{
  fstream File;
```

		`File.open("HARDWARE.DAT",ios::binary|ios::in);`
		`HARDWARE H;`
		
		`File.seekg((2*sizeof(H));`
		`File.read((char*)&H, sizeof(H));`
		`File.read((char*)&H, sizeof(H));`
		`cout<<H.GetPrice()<<endl;`
		`cout<<"Record:"<<File.tellg()/sizeof(H)<<endl;`
		
		`File.close();`
		`}`	

	Ans	`1700` `Record : 4`	
		(½ Mark for displaying correct value 1700 in first line) ***(½ Mark for displaying correct value 4 in second line)***	
		OR	
	(c)	Differentiate between tellp() and seekp().	1
	Ans	**tellp(): This function returns the position of the current put pointer in terms of bytes in a file.** **int n = f.tellp();** **seekp(): This function takes the file put pointer to the specified byte in a file.** **Eg: f.seekp(30); // It takes a pointer to 30th byte.**	
		(½ Mark for writing usage of tellp()) ***(½ Mark for writing usage of seekp())***	
SECTION B - [Only for candidates, who opted for Python]			
1	**(a)**	Which of the following are valid operators in Python: (i) ** (ii) */ (iii) like (iv) || (v) is (vi) ^ (vii) between (viii) in	2
	Ans	**(i) `**`** **(v) `is`** **(vi) `^`** **(viii) `in`**	
		(½ mark for each operator)	
	(b)	Name the Python Library modules which need to be imported to invoke the following functions	1
		(i) `search()` **(ii) `date()`**	
	Ans	**(i) re** **(ii) `datetime`**	

		(½ Mark for writing each correct Library module) **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.	2
		25=Val **for I in the range(0,Val)** **if I%2==0:** **print I+1** **Else:** **print I-1**	
	Ans	**Val = 25 #Error 1** **for I in range(0,Val): #Error 2 and Error 3** **if I%2==0:** **print I+1** **else: #Error 4** **print I-1**	
		(½ Mark for each correction, not exceeding 2 Marks) ***OR*** ***(1 mark for identifying the errors, without suggesting corrections)***	
	(d)	Find and write the output of the following python code:	2
		Text1="AISSCE 2018" **Text2=""** **I=0** **while I<len(Text1):** **if Text1[I]>="0" and Text1[I]<="9":** **Val = int(Text1[I])** **Val = Val + 1** **Text2=Text2 + str(Val)** **elif Text1[I]>="A" and Text1[I] <="Z":** **Text2=Text2 + (Text1[I+1])** **else:** **Text2=Text2 + "*"** **I=I+1** **print Text2**	
	Ans	**ISSCE *3129**	
		(½ Mark for mentioning ISS) ***(½ Mark for CE correctly)***	

		(½ Mark for 31) *(½ Mark for 29)* *Note:* ● *½ Mark deduction for not including **	
	(e)	Find and write the output of the following python code:	3

		`def Convert(X=45,Y=30):`
		`  X=X+Y`
		`  Y=X-Y`
		`  print X,"&",Y`
		`  return X`
		`A=250`
		`B=150`
		`A=Convert(A,B)`
		`print A,"&",B`
		`B=Convert(B)`
		`print A,"&",B`
		`A=Convert(A)`
		`print A,"&",B`	

	Ans	`400 & 250`
		`400 & 150`
		`180 & 150`
		`400 & 180`
		`430 & 400`
		`430 & 180`	

		(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 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 values that can be assigned to each of the variables From and To.	2

		`import random`
		
		`VAL=[15,25,35,45,55,65,75,85];`
		`From=random.randint(1,3)`
		`To =random.randint(Start,4)`
		
		`For I in range(From,To+1):`	

		`print VAL[I],"*",` (i) `35 * 45 * 55 * 65 * 75 *` (ii) `35 * 45 * 55 *` (iii) `15 * 25 * 35 * 45 *` (iv) `35 * 45 * 55 * 65 *`	
	Ans	**(ii)** `35 * 45 * 55 *`	
		Minimum value for From:1 **Minimum value for To:1**	
		(1 Mark for writing the correct option) ***OR*** ***(1 Mark for mentioning Error in question as variable Start is missing)*** ***NOTE: No marks to be awarded for writing any additional option(s)*** ***(½ Mark for writing correct Minimum value of From)*** ***(½ Mark for writing correct Minimum value of To)***	
2	**(a)**	What is Overriding Methods in the context of Object Oriented Programming? Illustrate with a suitable example.	2

	Ans	Override means having two methods with the same name but doing different tasks. It means that one of the methods overrides the other.
		`class Rectangle():`
		`  def __init__(self,l,b):`
		`  self.length = l`
		`  self.breadth = b`
		`  def getArea(self):`
		`  print self.length*self.breadth`
		`class Square(Rectangle):`
		`  def __init__(self,side):`
		`  self.side = side`
		`  Rectangle.__init__(self,s,s)`
		`  def getArea(self):`
		`  print self.side*self.side`
		`s = Square(4)`
		`r = Rectangle(2,4)`
		`s.getArea()`
		`r.getArea()`	

		(1 Mark for defining Overriding Methods) ***(1 Mark for writing any suitable example)*** ***OR*** ***(2 Marks if the concept is explained through an example)***	

	(b)	`class Travel:`
		`  Fare = 1000`
		`  Type="AIR"`
		`  def __init__(self,T,F=3000):`
		`  self.Type = T`
		`  self.Fare = F`
		`  def Disp(self):`
		`  print self.Type,Travel.Type`
		`  print self.Fare,Travel.Fare`
		`T1=Travel("BUS",500)`
		`T1.Disp()`
		`Travel.Type="TRAIN"`
		`T2=Travel("AIR")`
		`T2.Disp()`
			2

		Write the output of the above Python code.	

	Ans	`BUS AIR`
		`500 1000`
		`AIR TRAIN`
		`3000 1000`	

		(½ Mark for each correct line of output) *Note:* ***Deduct ½ Mark for not considering any or all line breaks***	
		OR	

	(b)	`class Area:  #Line 1`
		`  def __init__(self):  #Line 2`
		`  self.Length = 20  #Line 3`
		`  self.Breadth = 10  #Line 4`
		`  def Display(self):  #Line 5`
		`  print self.Length,self.Breadth  #Line 6`
		`  def __del__(self):  #Line 7`
		`  print "Area Over"  #Line 8`
		`def Work():  #Line 9`
		`  A=Area()  #Line 10`
		`  A.Display()  #Line 11`
		`Work()  #Line 12`	

	(i)	What are Method/functions mentioned in Line 2 and Line 7 specifically known as?	

	Ans	**Line 2 - Constructor** **Line 7 - Destructor**	
		(½ Mark for correct name of Line 2 method) ***(½ Mark for correct name of Line 7 method)***	
	(ii)	Mention the line number of the statement, which will call and execute the Method/function shown in Line 2.	
	Ans	**B=Area()**	
		(1 Mark for writing the correct statement)	
	(c)	Define a class ENVIRONMENT in Python with following specifications	4
		Instance Attributes • **City // String** • **PMLevel // integer** • **Health // String** **Methods/Functions** • **AssignHealth() # To assign value of # Health based upon PMLevel**	

PMLevel	Health
Less than/equal to 50	Healthy
More than 50 and less than/equal to 100	Moderate
More than 100	Unhealthy

- **In() # To allow user to enter values # of City, PMLevel and then invoke # AssignHealth() to assign value # of Health**
- **Out() #To display all the Attributes**

Ans

```
class ENVIRONMENT: # class ENVIRONMENT( ): / class
ENVIRONMENT(Object):
  def __init__(self):     # def __init__(self,A,B,C):
    self.City=""          #     self.City=A
    self.PMLevel=0        #     self.PMLevel=B
    self.Health=""        #     self.Health=C
  def AssignHealth(self):
    if self.PMLevel <= 50:
      self.Health="Healthy"
    elif self.PMLevel <=100:
      self.Health="Moderate"
    else:
      self.PMLevel="Unhealthy"
  def Enter(self):
    self.City = input("Enter City")
```

```
    self.PMLevel  = input("Enter PMLevel")
    self.AssignHealth()    # OR    AssignHealth(self)
  def Display(self):
    print self.City
    print self.PMLevel
    print self.Health
```

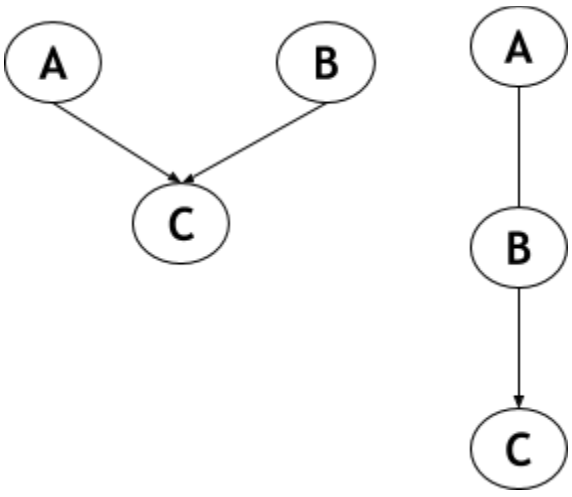
- *(½ Mark for correct syntax for class header)*
- *(½ Mark for correct declaration of instance attributes)*
- *(1 Mark for correct definition of AssignHealth() function)*
- *(1 Mark for correct definition of Enter() with proper invocation of AssignHealth( ))*
- *(1 Mark for correct definition of Display())*
- *NOTE:*
- *Deduct ½ Mark if AssignHealth() is not invoked properly inside Enter() function*

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

```
class Head1(object):              #Line 1
   def __init__(self,tp):         #Line 2
       self.P = tp
   def Change(self,tp):           #Line 3
       self.P = tp + self.P
   def Print1(self):              #Line 4
       print self.P
class Head2(object):              #Line 5
   def __init__(self,tq):         #Line 6
       self.Q=tq
   def Change(self,tq):           #Line 7
       self.Q =2*tq + self.Q
   def Print2(self):              #Line 8
       print self.Q

class Tail(Head1,Head2):          #Line 9
   def __init__(self,tr):         #Line 10
       self.R=tr
       Count=0
       if self.R==0:
         Count=10
       else:
         Count=20
       Head1.__init__(self,Count)  #Line 11
       Head2.__init__(self,Count)  #Line 12
   def ChangeAll(self,c):         #Line 13
       Head1.Change(self,c)
       Head2.Change(self,c)
   def PrintAll(self):            #Line 14
```

```
        print self.R,
        Head1.Print1(self)
        Head2.Print2(self)
T=Tail(0)                              #Line 15
T.ChangeAll(7)
T.PrintAll()
```

	(i)	Write the type of the inheritance illustrated in the above.	1
	Ans	Multiple Inheritance	
		(1 Mark for writing correct Inheritance type)	
	(ii)	Find and write the output of the above code.	2
	Ans	`0 17` `24`	
		(1 Mark each for writing correct line of output)	
	(iii)	What is the difference between the statements shown in Line 11 and Line 12?	1
	Ans	Line 11 calls the constructor of the parent class Head1 Line 12 calls the constructor of the parent class Head2	
		(½ mark for each correct answer)	
		OR	
	(d)	Differentiate between Multiple and Multilevel inheritance in Python. Illustrate the difference between the two using suitable Python codes for each.	4
	Ans	**Multiple Inheritance: When more than one Base Classes are inherited by a single class, it is known as Multiple Inheritance.** **Multi Level Inheritance: When more than one generations of Classes are inherited, it is known as Multi Level Inheritance.** 	

		<table><tr><td><pre>class A():
		  def __init__(self):
		  self.a = 0
		  def Out(self):
		  print self.a
		class B(A):
		  def __init__(self):
		  self.b=0
		  def Out(self):
		  print self.b
		class C(B):
		  def __init__(self):
		  self.c=0
		  def Out(self):
		  print self.c</pre></td><td><pre>class A():
		  def __init__(self):
		  self.a = 0
		  def Out(self):
		  print self.a
		class B():
		  def __init__(self):
		  self.b=0
		  def Out(self):
		  print self.b
		class C(A,B):
		  def __init__(self):
		  self.c=0
		  def Out(self):
		  print self.c</pre></td></tr></table>	

		(½ Mark each for defining/pictorial representation of Multiple and Multi Level Inheritance) ***(½ Mark each for illustrating Multiple and Multi Level Inheritance in Python)***	
3	**(a)**	Consider the following randomly ordered numbers stored in a list `60, 40, 70, 20, 50, 10` Show the content of list after the First, Second and Third pass of the bubble sort method used for arranging in **descending order**? Note: Show the status of all the elements after each pass very clearly encircling the changes.	3
	Ans	60, 40, 70, 20, 50, 10 I Pass 60, 70, 40, 50, 20, (10) II Pass 70, 60, 50, 40, (20) 10 III Pass 70, 60, 50, (40, 20, 10	
		(1 mark for each correct pass) ***OR***	

		(2½ Marks to be awarded for all the correct passes without encircling)	
		OR	
	(a)	Consider the following randomly ordered numbers stored in a list `70, 30, 60, 20, 15, 10` Show the content of the list after the First, Second and Third pass of the selection sort method used for arranging in **ascending order**? Note: Show the status of all the elements after each pass very clearly encircling the changes.	3
	Ans	70, 30, 60, 20, 15, 10 **I Pass** (10), 30, 60, 20, 15, (70) **II Pass** 10, (15), 60, 20 (30), 70 **III Pass** 10, 15, (20), (60), 30, 70	
		(1 mark for each correct pass with encircling) ***OR*** ***(2½ Marks to be awarded for all the correct passes without encircling)***	
	(b)	Write definition of a method/function **TenTimesEven(VALUES)** to add and display the sum of ten times of the even values present in the list of **VALUES**. For example, If the Nums contain `[5,2,3,6,3,4]` The method/function should display Twice of Odd Sum: `120` (i.e. `2x10 + 6x10 + 4x10`)	3

	Ans	`def TenTimesEven(VALUES):`
		`  se=0`
		`  for i in range(6): # range(0,6):`
		`  if VALUES[i]%2==0:`
		`  se=se+VALUES[i]*10`
		`  print "Even Sum:",se`
		
		OR
		
		`def TenTimesEven(VALUES):`
		`  so=0`
		`  for i in range(6): # range(0,6):`
		`  if VALUES[i]%2!=0:`
		`  so=so+VALUES[i]*10`	

		`print "Odd Sum:",so`	
		(½ mark for function header) *(½ mark for initializing so (sum) with 0)* *(½ mark for reading each element of the list using a loop)* *(½ mark for checking whether the value is even or odd)* *(½ mark for adding it to the sum)* *(½ mark for printing or returning the sum)*	
		OR	
	(b)	Write definition of a method/function **EndingA(Names)** to search and display those strings from the list of Names, which are ending with 'A'. For example, If the Names contain `["JAYA","KAREEM","TARUNA","LOVISH"]` The method/function should display **JAYA** **TARUNA**	3

	Ans	`def Ending(Names):`
		`  for N in Names:`
		`  if N[len(N)-1]=='A':`
		`  print N`	

		(½ Mark for function header) *(1 Mark for correct loop)* *(1 Mark for checking for last character)* *(½ mark for printing the value of N)*	
	(c)	Write **InsertQ(Customer)** and **DeleteQ(Customer)** methods/functions in Python to add a new Customer and delete a Customer from a list of Customer names, considering them to act as insert and delete operations of the Queue data structure.	4

	Ans	`def InsertQ(queue):`
		`  a=input("enter customer name: ")`
		`  queue.append(a)`
		`def DeleteQ(queue):`
		`  if (queue==[]):`
		`  print "Queue empty"`
		`  else:`
		`  print "Deleted element is: ",queue[0]`
		`  del queue[0]`
		OR
		`class queue:`
		`  Customer=[]`
		`  def InsertQ(self):`
		`  a=input("Customer name: ")`	

```
    queue.Customer.append(a)
  def DeleteQ(self):
    if (queue.Customer==[]):
      print "Queue empty"
    else:
      print "Deleted element : ",queue.Customer[0]
        del queue.Customer[0]
```

(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 "Queue empty")
(½ mark for displaying the value to be deleted)
(½ mark for deleting value from list)

OR

(c) Write **MakePush(Package)** and **MakePop(Package)** methods/functions in Python to add a new Package and delete a Package from a List of Package Description, considering them to act as push and pop operations of the Stack data structure. [4]

Ans

```
def MakePush(Package):
  a=input("enter package title : ")
  Package.append(a)
def MakePop(Package):
  if (Package==[]):
    print "Stack empty"
  else:
    print "Deleted element:",Package.pop()
```

OR

```
class Stack:
  Package=[]
  def MakePush(self):
    a=input("enter package title : ")
    Stack.Package.append(a)
  def MakePop(self):
    if (Stack.Package==[]):
      print "Stack empty"
    else:
      print "Deleted element:",Stack.Package.pop()
```

(½ mark for MakePush() header)
(½ mark for accepting a value from user)
(½ mark for adding value in list)
(½ mark for MakePop() header)
(½ mark for checking empty list condition)
(½ mark for displaying "Stack empty")
(½ mark for displaying the value to be deleted)
(½ mark for deleting value from list)

	(d)	Write a python method/function **Scroller(Lineup)** to scroll all the elements of a list **Lineup** by one element ahead and moving the last element to the first. Also, display the changed content of the list. For Example: If the list has following values in it **[25,30,90,110,16]** After changing the list content should be displayed as **[16,25,30,90,110]**	2
	Ans	**def Scroller(Lineup):** **K=Lineup[len(Lineup)-1]** **del Lineup[len(Lineup)-1]** **Lineup=[K]+Lineup** **print Lineup**	
		(½ mark for function header) ***(½ mark for Storing the last element in temporary variable)*** ***(½ mark for Deleting Last element)*** ***(½ mark for adding value from temporary variable to the beginning of list)*** ***(½ mark for displaying the list with changed content - if the earlier marks <2)*** ***OR*** ***(Full 2 Marks to awarded for using any alternative method for performing the same)***	
		OR	
	(d)	Write a python method/function **REVERSAR(Number)** to find a new number **Reverse** from **Number** with each of the digits of Number in reversed order and display the content of **Reverse** on screen. For Example: If the value of **Number** is **3451** The method/function should be displayed as **1543**	2
	Ans	**def REVERSAR(Number):** **S=0** **while Number>0:** **S=S*10+Number%10** **Number=Number/10** **print(S)**	
		(½ mark for function header) ***(½ mark for the correct loop)*** ***(½ mark for updating the reverse expression)*** ***(½ mark for Number=Number/10)***	

		(½ mark for displaying the list with reversed content - if the earlier marks <2)	
	(e)	Evaluate the following Postfix expression, showing the stack contents. **46,2,/,5,3,*,-,20,+**	2
	Ans		

Element	Stack Contents
46	46
2	46, 2
/	23
5	23, 5
3	23, 5, 3
*	23, 15
-	8
20	8, 23
+	31

Answer = 31
OR
Any other method for evaluating the given postfix expression showing the status of Stack.

		(½ Mark for correctly evaluating expression up to each operator) **OR** ***(1 Mark only to be given for writing correct answer without showing the Stack Status)***	
		OR	
	(e)	Convert the following Infix expression to its equivalent Postfix expression, showing the stack contents for each step of conversion. **J + K / L - M * N**	2
	Ans	**((J + (K / L)) - (M * N))**	

INFIX	STACK	POSTFIX
(		
(		
J		J
+	+	J
(		
K	+	JK
/	+/	JK
L	+/	JKL
)	+	JKL/
)		JKL/+

		–	**–**	**JKL/+**
		(		
		M	**–**	**JKL/+M**
		*****	**–***	**JKL/+M**
		N	**–***	**JKL/+MN**
		)	**–**	**JKL/+MN***
		)		**JKL/+MN*–**

OR

J + K / L – M * N

INFIX	STACK	POSTFIX
J		J
+	+	J
K	+	JK
/	+/	JK
L	+/	JKL
–	–	JKL/+
M	–	JKL/+M
*	–*	JKL/+M
N	–*	JKL/+MN
		JKL/+MN*–

OR

Any other method for converting the given **infix** expression to its equivalent **postfix** expression showing stack contents.

(½ Mark for conversion upto each operator illustrating through stack)
OR
(1 Mark for only the final answer as JKL/+MN*–)

4	(a)	Write a statement in Python to open a text file MARKER.TXT so that existing content can be read from it.	1

	Ans	`file= open("MARKER.TXT","r")`
		OR
		`file= open("MARKER.TXT","r+")`	

		(1 mark for correct statement)	
		OR	
	(a)	Write a statement in Python to open a text file DATA.TXT so that new contents can be written in it.	

	Ans	`file= open("DATA.TXT","w")`
		OR
		`file= open("DATA.TXT","w+")`	

		(1 mark for correct statement)	

	(b)	Write a method/function **ABLINES()** in python to read contents from a text file LINES.TXT, to display those lines, which are either starting with an alphabet 'A' or starting with alphabet 'B'. For example: If the content of the file is _____ **A BOY IS PLAYING OUTSIDE** **THE PLAYGROUND IS BIG** **BANYAN TREE IS IN THE GROUND** _____ The method/function should display **A BOY IS PLAYING OUTSIDE** **BANYAN TREE IS IN THE GROUND**	2
	Ans	**def ABLINES():** **file=open('LINES.TXT','r')** **lines = file.readlines()** **for w in lines:** **if w[0]=="A" or w[0]=="B":** **print w** **file.close()**	
		(½ Mark for opening the file) ***(½ Mark for reading all lines, and using loop)*** ***(½ Mark for checking condition)*** ***(½ Mark for printing lines)***	
		OR	
	(b)	Write a method/function SHORTWORDS() in python to read lines from a text file WORDBANK.TXT, and display those words, which are lesser than 5 characters. For example: If the content of the file is _____ **HAPPY JOY WELCOME KITE** **LOVELY POSITIVE FUN** _____ The method/function should display **JOY** **KITE** **FUN**	2
	Ans	**def SHORTWORDS():** **c=0** **file=open('WORKBANK.TXT','r')** **line = file.read()** **word = line.split()** **for w in word:** **if len(w)<5:**	

		`print w` `file.close()`	
		(½ Mark for opening the file) *(½ Mark for reading line and/or splitting)* *(½ Mark for checking condition)* *(½ Mark for printing word)*	

	(c)	Considering the following definition of class MEDICINES, write a method/function MildMedicine() in python to search and display Mname and Type from a pickled file MEDI.DAT, for the MEDICINES, whose type is "MILD".
		
		`class MEDICINES:`
		`  def __init__(self,MN,T):`
		`  self.Mname=MN`
		`  self.Type=T`
		`  def MDisplay(self):`
		`  print self.Mname,">>",self.Type`
			3

	Ans	`def MildMedicine():`
		`  M=MEDICINES()`
		`  file=open('MEDI.DAT','rb')`
		`  try:`
		`  while True:`
		`  S=pickle.load(file)`
		`  if M.Mname=="MILD":`
		`  S.MDisplay()`
		`  except EOFError:`
		`  pass`
		`  file.close()`	

		(½ Mark for correct function header) *(½ Mark for opening the file MEDI.DAT correctly)* *(½ Mark for correct loop)* *(½ Mark for correct load())* *(½ Mark for correct checking of Mname)* *(½ Mark for displaying the record)* ***Note: Marks should not be deducted if try except is not used***	
		OR	

	(c)	Considering the following definition of class STUDENT, write a method/function MERIT() in python to search and display all the content from a pickled file STUDENT.DAT, where Marks of STUDENT is more than 75.
		
		`class STUDENT:`
		`  def __init__(self,N,M):`
		`  self.Name=N`
		`  self.Marks=M`
		`  def Display(self):`
		`  print self.Name,">>",self.Marks`
			3

	Ans	`def MERIT():`	

```
S=STUDENT()
file=open('STUDENT.DAT','rb')
try:
   while True:
     S=pickle.load(file)
     if S.Marks > 75:
       S.Display()
except EOFError:
   pass
file.close()
```

(½ Mark for correct function header)
(½ Mark for opening the file STUDENT.DAT correctly)
(½ Mark for correct loop)
(½ Mark for correct load())
(½ Mark for correct checking of Marks)
(½ Mark for displaying the record)

Note: Marks should not be deducted if try except is not used

SECTION C - (For all the candidates)

5 (a) Observe the following tables carefully and answer the questions that follow: 2

TABLE:FARMER

FNO	NAME
101	Ramya Sarkar
102	Ram Dhyan
103	Gagan Hari
104	Ram Dhyan

Which attribute out of the two attributes FNO and NAME in table FARMER should be considered as Primary Key? Give reason for your selection of the same.

Ans **Primary Key: FNO**
Reason: Unique values for identification of each tuple/record

(1 Mark for writing correct attribute)
(1 Mark for writing correct reason)

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

Table: FACULTY

FCODE	FNAME	Gender	Room	Subject	JoinDate
F1001	Hari Charan Jha	Male	101	English	2000-10-11
F1004	Merry Jose	Female	202	Programming	2003-11-30

F1002	Fardeen Khan	Male	301	Web Design	2001-09-06
F1005	Priya Maheshwari	Female	302	Web Design	2004-12-15
F1009	Tanya Santan	Female	203	Programming	2006-12-31
F1006	Amar Anshul	Male	208	Data Structure	2005-05-02

Table: SCHEDULE

CCODE	PCODE1	FCODE2	FCODE3	FCODE4
C1	F1009	F1002	F1001	F1005
C2	F1001	F1009	F1005	F1006
C3	F1006	F1001	F1004	F1002
C4	F1002	F1006	F1009	F1001

NOTE: All Dates are given in 'YYYY-MM-DD' format

(i) To display details of all Male faculties from the FACULTY table

Ans
```
SELECT * FROM FACULTY WHERE Gender='Male';
```

(½ Mark for correct SELECT statement)
(½ Mark for correct WHERE clause)

(ii) To display the FCODE, FNAME and GENDER of all faculties, who are either teaching subject "Programming" or teaching subject "Web Design".

Ans
```
SELECT FCODE, FNAME, Gender FROM FACULTY
WHERE  SUBJECT='Programming' OR SUBJECT='Web Design';
```

OR
```
SELECT FCODE, FNAME, Gender FROM FACULTY
WHERE  Subject IN('Programming','Web Design');
```

(½ Mark for correct SELECT statement)
(½ Mark for correct WHERE clause)

(iii) To display FCODE, FNAME, JOINDATE, ROOM of all faculty members in descending order of the ROOM numbers.

Ans
```
SELECT FCODE, FNAME, JOINTDATE, ROOM FROM FACULTY
 ORDER BY ROOM DESC;
```

(½ Mark for correct SELECT statement)
(½ Mark for correct ORDER BY clause)

(iv) To add a new faculty member with the following details:

F1010	Anish Mohanty	M	209	Data Structure	2019-03-22

Note: While writing the answers of the following output questions, consider

		the original data as given in the above tables (i.e., without considering the changes done by part iv of this question)	
	Ans	`INSERT INTO FACULTY VALUES ('F1010', 'Anish Mohanty', 'M', 209, 'Data Structure', '2019-03-22');`	
		• *(½ Mark for correct INSERT statement)* • *(½ Mark for correct inserting correct values)*	
	(v)	`SELECT COUNT(FCODE1),COUNT(FCODE2) FROM SCHEDULE WHERE FCODE1='F1009' OR FCODE2='F1009';`	

	Ans	`COUNT(FCODE1)` `COUNT(FCODE2)`
		`2` `2`
		
		OR
		`COUNT(FCODE1)` `COUNT(FCODE2)`
		`1` `1`
		
		OR
		FCODE1 is not an attribute of SCHEDULE	

		(½ Mark for writing correct output) ***OR*** *(½ Mark for writing FCODE1 not present OR statement conveying similar meaning)*	
	(vi)	`SELECT CCODE,FCODE3,FNAME FROM FACULTY,SCHEDULE WHERE FACULTY.FCODE=SCHEDULE.FCODE3 AND FACULTY.FCODE='F1001';`	
	Ans	`CCODE` `FCODE3` `FNAME` `C1` `F1001` `Hari Charan Jha`	
		(½ Mark for correct output) *NOTE: Values may be written in any order*	
	(vii)	`SELECT GENDER,COUNT(*) FROM FACULTY GROUP BY GENDER;`	

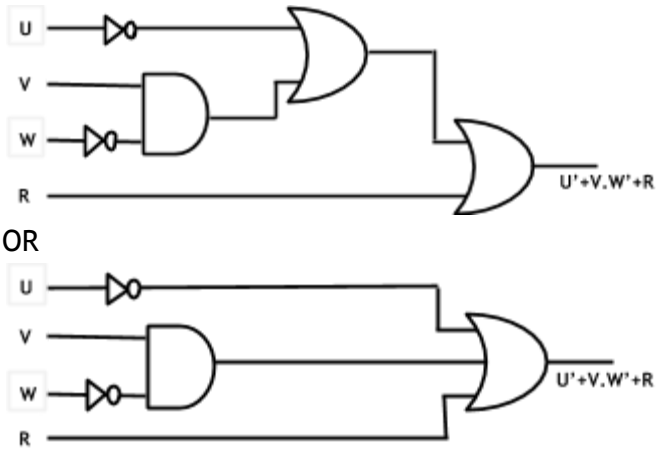
	Ans	`GENDER` `COUNT(*)`
		`Male` `3`
		`Female` `3`	

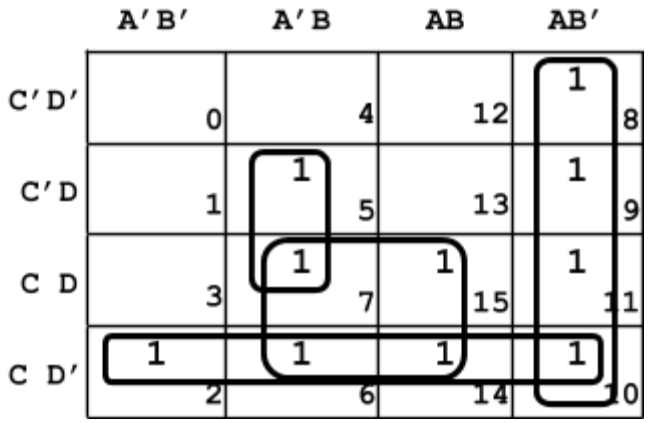
		(½ Mark for correct output) *NOTE: Values may be written in any order*	
	(viii)	`SELECT MIN(ROOM) FROM FACULTY WHERE JOINDATE>'2004-12-15';`	
	Ans	`MIN(ROOM)` `203`	
		(½ Mark for correct output)	
6	(a)	Verify the following using truth table.	2

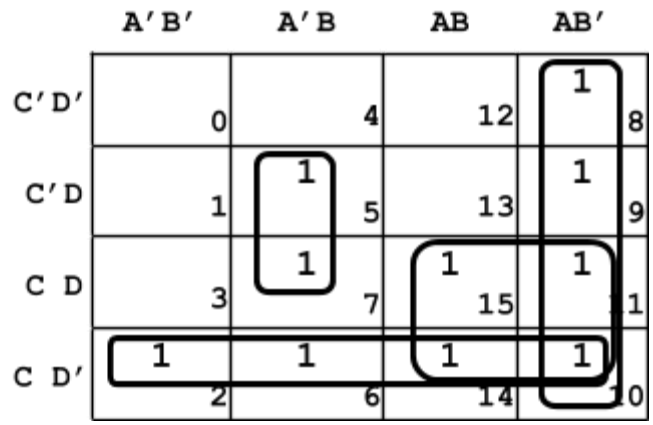
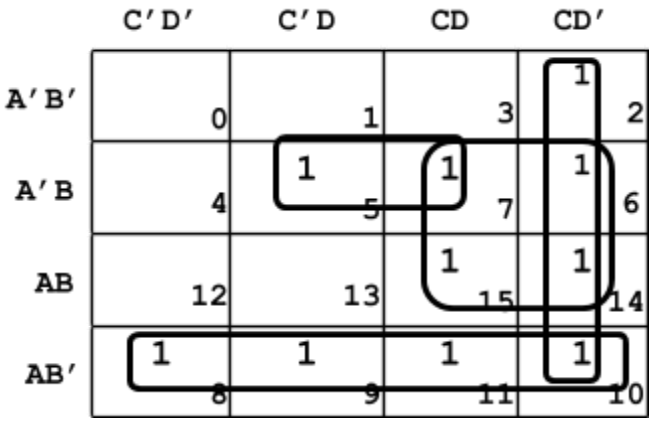
		(i) X.(X+Y) =X (ii) X+X'.Y=X+Y	
	Ans	Verification using truth table **(i)** (ii)	

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

X	X′	Y	X+Y	X′. Y	X+X′.Y
0	1	0	0	0	0
0	1	1	1	1	1
1	0	0	1	0	1
1	0	1	1	0	1

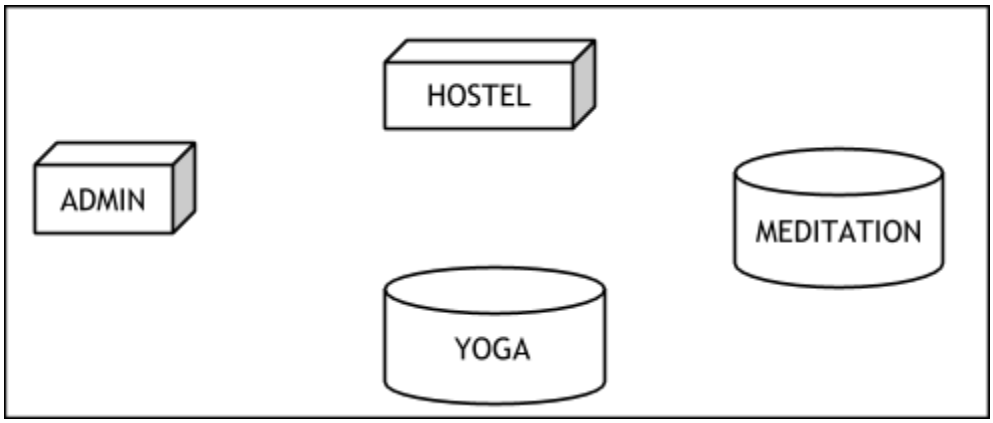
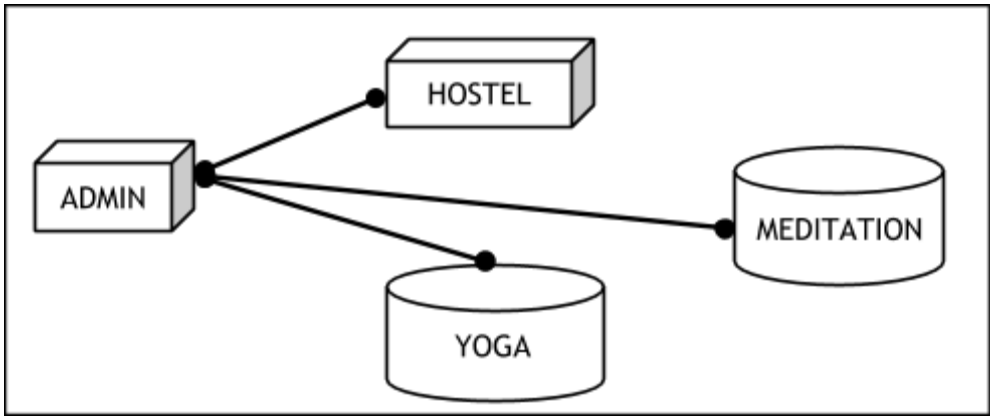
		(1 Mark for correctly verifying the X.(X+Y) =X using Truth Table) ***(1 Mark for correctly verifying the X+X'.Y=X+Y using Truth Table)***	
	(b)	Draw the Logic Circuit of the following Boolean Expression: **U′+ V.W′ + R**	2
	Ans	 OR 	
		(Full 2 Marks for drawing the Logic Circuit for the expression correctly) ***OR*** ***(1 Mark for drawing Logic circuit for (V. W') correctly)*** ***(½ Mark for drawing Logic circuit for (U' +R) correctly)***	
	(c)	Derive a Canonical POS expression for a Boolean function F, represented by the following truth table:	1

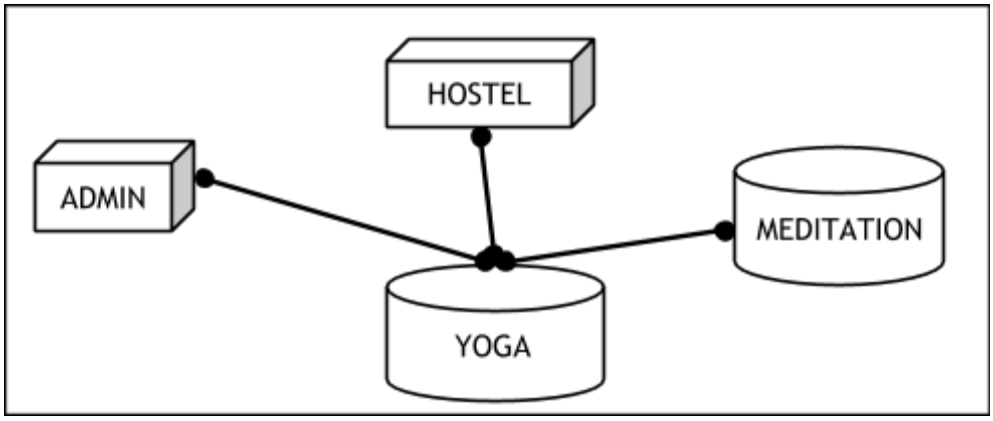
		<table><tr><th>P</th><th>Q</th><th>R</th><th>F(P,Q,R)</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td></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>0</td></tr></table>	
	Ans	**F(P,Q,R)=(P+Q+R) . (P+Q′+R′) . (P′+Q+R′) . (P′+Q′+R′)** **OR** **F(P,Q,R)= Π(0,3,5,7)**	
		(1 Mark for correctly writing the POS form) ***OR*** ***(½ Mark for any two correct terms)*** ***Note: Deduct ½ mark if wrong variable names are written in the expression***	
	(d)	Reduce the following Boolean Expression to its simplest form using K-Map:	3
		F(A,B,C,D) = ∑(2,5,6,7,8,9,10,11,14,15)	
		 **Minimal expression : CD’ + AB’ +BC + A’BD**	

		 **Minimal expression : CD' + AB' +AC + A'BD**  **Minimal expression : CD' + AB' +BC + A'BD**	
		(½ Mark for drawing K-Map and correctly plotting 1s in the given cells) ***(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 used*** ● ***Deduct ½ mark if 0 is mentioned in place of 1***	
7	**(a)**	Priyam Chattopadhyay found one file XYX.EXE in his computer and he has been informed by his computer expert friend that he should not execute the file and not to send to anyone as it is infected and unless he runs or opens, it won't cause any harm. Which of the following type category of infection it will be considered? Also, mention, what he should do to prevent this infection? (i) Virus (ii) Worm (iii) Trojan Horse	2
	Ans	(i) Virus OR (iii) Trojan Horse **Use an antivirus application to prompt him about threats and to disinfect the affected files.**	
		(1 Mark for writing any correct answer Virus OR Trojan Horse) ***(1 Mark for writing any correct preventive measure)***	
	(b)	Ravi Jayaraman wants a client/server protocol, in which e-mail is	1

		received and held by him on his computer from Internet server. Regularly, it should check his mail-box on the email server and download mails to his computer. Which protocol out of the following will be ideal for the same? (i) POP3 (ii) SMTP (iii) VoIP (iv) HTTP	
	Ans	(i) POP3	
		(1 Mark for writing correct answer) ***(½ Mark for writing SMTP)***	
	(c)	Give two differences between 2G and 3G telecommunication technologies	1
	Ans	**2G :** **3G:** **Better Voice Services** **Improved Data Services with Multimedia** **Basic Data Services** **Mobile Broadband** **Speed: 64 kbps** **Speed:2 mbps** **Used normally for Text chats** **Used normally for Video conferencing**	
		(½ Mark for writing each correct difference upto any two differences)	
	(d)	Write the expanded names for the following abbreviated terms used in Networking and Communications: (i) PPP (ii) HTTP (iii) GSM (iv) FTP	2
	Ans	(i) Point-to-Point Protocol (ii) HyperText Transfer Protocol (iii) Global System for Mobile Communication (iv) File Transfer Protocol	
		(½ Mark each for writing correct expansion)	
	(e)	Evolving World Centre is a charitable trust responsible for providing yoga and meditation training to young and old persons for helping the society to have good health and also spreading peace in the society. The centre is planning to make full use of technology tools and modern gadgets in the centre for 100% utilisation of the resources. The centre has four different wings spread out in approximately 20000 square metre of area. The physical distances between these wings and the number of computer systems to be installed in these wings are given as follows. You as a network expert have to answer the queries as raised by their administrators in (i) to (iv). Shortest distances between various wings in metres:	

YOGA wing to ADMIN wing	50
YOGA wing to HOSTEL wing	70
YOGA wing to MEDITATION wing	50
ADMIN wing to HOSTEL wing	60
ADMIN wing to MEDITATION wing	100

		HOSTEL wing to MEDITATION wing | 70 Number of Computers installed at various locations are as follows: HOSTEL | 20 ADMIN | 110 MEDITATION | 45 YOGA | 50  	
	(i)	Suggest the most suitable wing out of the four to install the main server of this centre to get efficient connectivity.	1
	Ans	ADMIN (Maximum number of computers) OR YOGA (Closest proximity to all buildings) **NOTE: Justification is optional**	
		(1 Mark for writing correct location)	
	(ii)	Suggest by drawing the best cable layout for effective wing to wing network connectivity of all the wings of this centre.	1
	Ans	 **OR**	

			
		(1 Mark for drawing/writing the layout correctly)	
	(iii)	Suggest, which device will be best suited for connecting multiple computer systems installed in each of the wings out of the following: ● Modem ● Switch ● Gateway ● Router	1
	Ans	**Switch OR Modem OR Router**	
		(1 Mark for writing any/all correct device(s))	
	(iv)	Suggest best communication medium to provide most efficient and effective connectivity between the wings out of the following: **Co-axial Cable, Ethernet Cable, Optical Fibre, Single Pair Telephone Cable.**	1
	Ans	**Optical Fibre or Ethernet Cable**	
		(1 Mark for writing the correct network cable)	