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

- The answers given in the marking scheme are SUGGESTIVE. Examiners are requested to award marks for all alternative correct Solutions/Answers conveying a similar meaning
- All programming questions have to be answered with respect to C++ Language / Python only
- In C++ / Python, ignore case sensitivity for identifiers (Variable / Functions / Structures / Class Names)
- In Python indentation is mandatory, however, 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)**	Write the names of any four fundamental data types of C++ .	2
	Ans	**char, int, float, double, void (Any 4)**	
		(½ Mark each for correctly naming a fundamental data type)	

	(b)	Write the names of the correct header files, which must be included in the following C++ code to compile the code successfully:
		`void main()`
		`{`
		`  char L[]="CS 2018";`
		`  int N=strlen(L);`
		`  cout<< L[N-1];`
		`}`
			1

	Ans	**string.h**	

		iostream.h or iomanip.h or fstream.h	
		(½ Mark for writing each correct answer) ***NOTE: Any additional header file to be ignored***	
	(c)	Rewrite the following **C++ program** after removing any/all syntactical error(s). Note: Assume all required header files are already included in the program. **#define Area(L,B) = L*B** **structure Recta** **{** ** int Length, Breadth;** **};** **void main()** **{** ** Recta R = [10,15];** ** cout<<Area(Length.R,Breadth.R);** **}**	2
	Ans	**#define Area(L,B) L*B** //Error 1 **struct Recta** //Error 2 **{** ** int Length, Breadth;** **};** **void main()** **{** ** Recta R = {10,15};** //Error 3 **cout<<Area(R.Length,R.Breadth);** //Error 4 **}**	
		(½ Mark for correcting each Error and rewriting the statement correctly) ***NOTE:*** ***(1 Mark for correctly identifying all the four errors)*** ***(Ignore any other error pointed out)***	
	(d)	Find and write the output of the following C++ program code: Note: Assume all required header files are already included in the program. **void Alter(char *S1, char *S2)** **{** ** char *T;** ** T=S1;** ** S1=S2;** ** S2=T;** ** cout<<S1<<"&"<<S2<<endl;** **}** **void main()** **{**	2

		`  char X[]="First", Y[]="Second";`
		`  Alter(X,Y);`
		`  cout<<X<<"*"<<Y<<endl;`
		`}`	

	Ans	`Second&First` `First*Second`	
		(1 mark for each correct line of output) ***OR*** ***(½ Mark for writing partially correct value in accordance of the order)*** ***OR*** ***(Only ½ Mark for writing '&' and '*' at proper places)*** ***Note:*** ● ***Deduct only ½ Mark for not considering any or all correct placements of & and **** ● ***Deduct only ½ Mark for not considering any or all line break***	

	(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 Convert(float &X, int Y=2)`
		`{`
		`  X=X/Y;`
		`  Y=X+Y;`
		`  cout<<X<<"*"<<Y<<endl;`
		`}`
		`void main()`
		`{`
		`  float M=15, N=5;`
		`  Convert(M,N);`
		`  Convert(N);`
		`  Convert(M);`
		`}`
			3

	Ans	`3*8`
		`2.5*4`
		`1.5*3`	

		(1 mark for each correct line of output) ***OR*** ***(½ Mark for writing partially correct value in accordance of the order)*** ***Only ½ Mark for writing all '*' at proper places)*** ***Note:*** ● ***Deduct only ½ Mark for not considering any or all correct placements of **** ● ***Deduct only ½ Mark for not considering any or all line break*** ● ***Deduct only ½ mark for ignoring .5 in any or all lines***	

		• ***Writing 3.0 in the first line acceptable as correct answer***	
	(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 **End**. 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();`** **`  int A[]={10,20,30,40,50,60,70,80};`** **`  int Start = random(2) + 1;`** **`  int End = Start + random(4);`** **`  for(int I=Start; I<=End , I++)`** **`    cout<<A[I]<<"$";`** **`}`** **(i)** `10$20$30$` **(ii)** `20$30$40$50$60$` **(iii)** `30$40$50$60$` **(iv)** `40$50$60$70$`	2
	Ans	**`(iii) 30$40$50$60$`** **`Minimum value = 1`** **`Maximum value = 5`**	
		Part 1: ***(1 Mark for writing only the correct option)*** **OR** ***(1 Mark for identifying wrong syntax of for in the code)*** **Part 2:** ***(½ Mark for writing correct Minimum value of End)*** ***(½ Mark for writing correct Maximum value of End)***	

2.	**(a)**	Given the following class Test and assuming all necessary header file(s) included, answer the questions that follow the code:
		`class Test`
		`{`
		`   int Marks; char TName[20];`
		`public:`
		`  Test (int M)                //Function 1`
		`  {`
		`     Marks = M;`
		`  }`
		`  Test (char S[])             //Function 2`
		`  {`	

```
    strcpy(TName,S);
  }
  Test (char S[], int M)      //Function 3
  {
    Marks = M;
    strcpy(TName,S);
  }
  Test (Test &T)              //Function 4
  {
    Marks = T.Marks + 10;
    strcpy(TName,T.TName);
  }
};
void main()
{
  Test T1(10);                  //Statement I
  Test T2(70);                 //Statement II
  Test T3(30, "PRACTICAL");    //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 Test?	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`** • **`Test T4=T1; OR Test T4(T1);`** **`OR`** **`Test T4=T2; OR Test T4(T2);`** **`OR`** **`Test T4=T3; OR Test T4(T3);`**	
		(½ mark for each correct answer) ***Note: Any object name can be used in place of T4***	
	(b)	Observe the following C++ code and answer the questions (i) and (ii). Note: Assume all necessary files are included. **`class Point`** **`{`** **`  int X,Y;`** **`public:`**	

```
  Point(int I=10, int J=20)    //Function 1
  {
     X = J;
     Y = I;
  }
  void Show()                  //Function 2
  {
     cout<<"Points are "<<X<<" & "<<Y<<endl;
  }
  ~Point()                     //Function 3
  {
    cout<<"Points Erased "<<endl;
  }
};

void main()
{
    Point P(5);
    P.Show();
}
```

	(i)	For the class Point, what is **`Function 3`** 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	**`Points are 20 & 5`** **`Points Erased`**	
		(½ Mark for each correct line of output) ***Note: No marks to be deducted for ignoring &***	
		OR	
	(b)	Explain Polymorphism 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 Polymorphism correctly)
(1 mark for writing correct supporting example)
OR
(2 Marks for illustrating the concept of Polymorphism with the help of appropriate example)

(c) Write the definition of a class **GRAPH** in C++ with following description: 4

Private Members

- `XUnit  // integer`
- `YUnit  // integer`
- `Type  // char array of size 20`
- `AssignType()  /* Member function to assign value of Type based upon XUnit and YUnit as follows: */`

Condition	Type
`XUnit = 0  Or  YUnit = 0`	`None`
`XUnit is more than  YUnit`	`Bar`
`XUnit is less than or equal to YUnit`	`Line`

Public Members

- `InXY()  /* Function to allow user to enter values of XUnit and YUnit and then invoke AssignType() to assign value of Type */`
- `OutXY() //Function to display XUnit, YUnit and Type`

Ans

```
class GRAPH
{
  int XUnit, YUnit;
  char Type[20];
  void AssignType();
public :
  void InXY();
  void OutXY();
};
```

```
void GRAPH::AssignType()
{
  if (XUnit==0||YUnit==0)
    strcpy(Type,"None");
  else if (XUnit>YUnit)
    strcpy (Type,"Bar");
  else if (XUnit<= YUnit)     // OR only else
    strcpy(Type,"Line");
}
void GRAPH::InXY()
{
  cin>>XUnit>>YUnit;
  AssignType();
}
void GRAPH::OutXY()
{
  cout<<XUnit<<YUnit<<Type<<endl;
}
```

(½ Mark for declaring class header correctly)
(½ Mark for declaring data members correctly)
(1 Mark for defining AssignType() correctly)
(½ Mark for taking inputs of XUnit and YUnit in InXY())
(½ Mark for invoking AssignType() inside InXY())
(½ Mark for defining OutXY() 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 Ground
{
  int Rooms;
protected:
  void Put();
public:
  void Get();
};
class Middle : private Ground
{
  int Labs;
public:
  void  Take();
  void  Give();
};
class Top : public Middle
{
  int Roof;
```

		`public:`
		`  void In();`
		`  void Out();`
		`};`
		`void main()`
		`{`
		`  Top T;`
		`}`	

	(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 **Give()** of class **Middle**.	

	Ans	`Data Members : Labs`
		`Member Functions : Put(), Get(), Take(),`
		`Give() - 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 members**, which are directly accessible by the member function **Out()** of class **Top**.	

	Ans	`Data Members : Roof`
		`Member Functions : Take(), Give(), In(),`
		`Out() - 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***	
	(iv)	Write the names of **all the members**, which are directly accessible by the object **T** of class **Top** declared in the **main()** function.	
	Ans	`Take(), Give(), In() , Out()`	
		(1 Mark for writing all correct members) ***NOTE:*** ***Marks not to be awarded for partially correct answers.***	
		OR	

	(d)	Consider the following class HeadQuarter
		`class HeadQuarter`
		`{`
			4

		`  int Code;`
		`  char Des[20];`
		`protected:`
		`  char Address[40];`
		`public:`
		`  void Get(){cin>>Code;gets(Des);gets(Address);}`
		`  void Put(){cout<<Code<<Des<<Address<<endl;}`
		`};`
		Write a code in C++ to protectedly derive another class FrontOffice from the base class HeadQuarter with following members.
		Data Members
		Location of type character of size 10
		Budget of type double
		Member Functions
		A constructor function to assign Budget as 100000
		Assign() to allow user to enter Location and Budget
		Display() to display Location and Budget	

	Ans	`class FrontOffice : protected HeadQuarter`
		`{`
		`  char Location[10];`
		`  double Budget;`
		`public:`
		`  FrontOffice()`
		`  {`
		`  Budget= 100000;`
		`  }`
		`  void Assign()`
		`  {`
		`  gets(Location);`
		`  cin>>Budget;`
		`  }`
		`  void Display()`
		`  {`
		`  cout<< Location <<Budget<<endl;`
		`  }`
		`};`	

		(½ Mark for declaring **`class FrontOffice`*****)*** ***(½ mark for inheriting using*** **`:`****)*** ***(½ Mark for*** ***`protected HeadQuarter`*****)*** ***(½ Mark for declaring data members correctly)*** ***(1 Mark for defining constructor FrontOffice() correctly)*** ***(½ Mark for defining Assign() correctly)*** ***(½ Mark for defining Display() correctly)***	
3	**(a)**	Write a user-defined function **NoTwoThree(int Arr[], int N)** in C++, which should display the value of all such elements and their corresponding locations in the array **Arr** (i.e the array index), which are **not multiples of 2 or 3. N** represents the total number of elements in the array **Arr,** to be checked. Example: if the array Arr contains	3

		0 1 2 3 4 25 8 12 49 9 Then the function should display the output as: 25 at location 0 49 at location 3	
	Ans	**void NoTwoThree(int Arr[],int N)** **{** **for(int i=0;i<N;i++)** **if ((Arr[i]%2!=0) && (Arr[i]%3!=0))** **cout<<Arr[i]<<" at location "<<i<<endl;** **}** **OR** **void NoTwoThree(int Arr[],int N)** **{** **for(int i=0;i<N;i++)** **if ((Arr[i]%2) && (Arr[i]%3))** **cout<<Arr[i]<<" at location "<<endl;** **}**	
		(½ Mark for correctly writing the loop) ***(½ Mark for checking divisibility by 2)*** ***(½ Mark for checking divisibility by 3)*** ***(½ Mark for using && operator between divisibility check)*** ***(½ Mark for displaying the element)*** ***(½ Mark for displaying the location)*** ***OR*** ***(Full 3 Marks for writing any correct code giving the same result)***	
		OR	
	(a)	Write a user-defined function **ReArrange(int Arr[], int N)** in C++, which should swap the contents of the first half locations of the array **Arr** with the contents of the second half locations. **N** (which is an even integer) represents the total number of elements in the array **Arr**. Example: If the array **Arr** contains the following elements (for **N = 6**) 0 1 2 3 4 5 12 5 7 23 8 10 Then the function should rearrange the array to become 0 1 2 3 4 5 23 8 10 12 5 7 NOTE: ● **DO NOT DISPLAY** the Changed Array contents ● Do not use any other array to transfer the contents of array Arr.	3
	Ans	**void ReArrange(int Arr[],int N)** **{**	

```
  for(int i=0;i<N/2;i++)
  {
    int t=Arr[i];
    Arr[i]=Arr[N/2+i];
    Arr[N/2+i]=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)
(1 ½ Mark for swapping elements - ½ mark for each sub-step)
OR
(Full 3 Marks for writing a code giving the same result)

(b) Write definition for a function **XOXO(char M[4][4])** in C++, which replaces every occurrence of an **X** with an **O** in the array, and vice versa. 2

For example:

ORIGINAL ARRAY M			
X	X	O	X
O	X	O	O
O	O	X	X
X	X	O	O

CHANGED ARRAY M			
O	O	X	O
X	O	X	X
X	X	O	O
O	O	X	X

NOTE:
- **DO NOT DISPLAY** the Changed Array contents
- Do not use any other array to transfer the contents of array M.

Ans

```
void XOXO(char M[4][4])
{
  for(int i=0;i<4;i++)
    for(int j=0;j<4;j++)
      if (M[i][j]=='X')
        M[i][j]='O';
      else if (M[i][j]=='O')
        M[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 replacing array element to 'X')
(½ Mark for correctly replacing array element to 'O')
OR
(Full 2 Marks for writing a code giving the same result)

OR

(b) Write definition for a function **ColSwap(int A[4][4])** in C++, which swaps the contents of the first column with the contents of the third column. 2

For example:

ORIGINAL ARRAY A			
10	15	20	25
30	35	40	45
50	55	60	65
70	75	80	85

CHANGED ARRAY A			
20	15	10	25
40	35	30	45
60	55	50	65
80	75	70	85

NOTE:

- **DO NOT DISPLAY** the Changed Array contents
- Do not use any other array to transfer the contents of array A.

Ans

```
void  ColSwap(int A[4][4])
{
  for(int i=0;i<4;i++)
  {
     int Temp= A[i][0];
     A[i][0]=A[i][2];
     A[i][2]=Temp;
  }
}
```

(½ Mark for correctly writing loop)
(1 ½ Mark for swapping elements - ½ mark for each sub-step)
OR
(Full 2 Marks for writing a code giving the same result)

(c) Let us assume P[20][10] is a two dimensional array, which is stored in the memory along the row with each of its elements occupying 2 bytes, find the address of the element P[10][5], if the address of the element P[5][2] is 25000. 3

Ans

```
LOC(P[10][5]) = LOC(P[5][2]) +2(10*(10-5)+(5-2))
              = 25000 + 2(50 + 3)
              = 25000 + 2(53)
              = 25000 + 106
              = 25106
```

OR

```
LOC(P[I][J]) = Base(P)+W*(NC*(I-LBR)+(J-LBC))
Assuming LBR=0, LBC=0
LOC(P[5][2]) = Base(P)+2*(10*5+2)
25000        = Base(P)+2*(50+2)
Base(P)      = 25000 - 2*(52)
Base(P)      = 25000 - 104
Base(P)      = 24896

LOC(P[10][5])= 24896 + 2*(10*10+5)
             = 24896 + 2*(105)
             = 24896 + 210
             = 25106
```

(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[20][30] is a two dimensional array, which is stored in the memory along the column with each of its elements occupying 2 bytes. Find the address of the element P[5][6], if the base address of the array is 25000.	3

	Ans	`LOC(P[I][J]) = Base(P)+W*((I-LBR)+NR*(J-LBC))`
		`Assuming LBR=0, LBC=0`
		`LOC(P[5][6]) = Base(P)+2*(5+20*6)`
		`= 25000+2*(5+120)`
		`= 25000 + 2*(125)`
		`= 25000 + 250`
		`= 25250`	

		(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(Book B[], int &T)`**, which pops the details of a Book, from the static stack of Book B, at the location T (representing the Top end of the stack), where every Book of the stack is represented by the following structure:
		`struct Book`
		`{`
		`  int  Bno;`
		`  char Bname[20];`
		`};`
			4

	Ans	`void Pop(Book B[],int &T)`
		`{`
		`  if(T!=-1)  // OR if (T>=0) OR if (T>-1)`
		`  {`
		`  cout<<B[T].Bno<<B[T].Bname<<endl;`
		`  T--;  // --T;`
		`  }`
		`  else`
		`  cout<<"Stack Empty";`
		`}`
		OR
		`void Pop(Book B[],int &T)`
		`{`
		`  if(T==-1)  // OR if (T<0)`
		`  cout<<"Stack Empty";`	

```
  else
  {
      cout<<B[T].Bno<<B[T].Bname<<endl;
      T--;          // --T;
  }
}
```

OR

```
void Pop(Book B[],int &T)
{
  if(T==0)
     cout<<"Stack Empty";
  else
  {
    T--;        // --T;
    cout<<B[T].Bno<<B[T].Bname<<endl;
  }
}
```

(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 Books in C++ — 4

```
struct Book
{
  int  Bno;
  char Bname[20];
  Book *Link;
};
```

Given that the following declaration of class BookStack in C++ represents a dynamic stack of Books:

```
class BookStack
{
   Book *Top;  //Pointer with address of Topmost Book of
                 Stack
public:
   BookStack()
   {
     Top = NULL;
   }
  void Push(); //Function to push a Book into the dynamic
                 stack
  void Pop();  //Function to pop a Book from the dynamic
                 stack
  ~BookStack();
};
```

		Write the definition for the member function void BookStack::Push(), that pushes the details of a Book into the dynamic stack of BookStack.	
	Ans	**`void BookStack::Push()`** **`{`** **`  Book *T = new Book;`** **`  cin>>T->Bno;`** **`  gets(T->Bname);`** **`  T->Link = Top;`** **`  Top= T;`** **`}`**	
		(1 Mark for declaring and initialising T (Temporary Node) using new) ***(1 Mark for allowing user to enter Bno and Bname of T)*** ***(1 Mark for linking the T link pointer correctly with Top)*** ***(1 Mark for assigning Top to T)***	
	(e)	Evaluate the following Postfix expression, showing the stack contents: **`250,45,9,/,5,+,20,*,-`**	2
	Ans	<table><tr><th>Element</th><th>Stack Contents</th></tr><tr><td>250</td><td>250</td></tr><tr><td>45</td><td>250, 45</td></tr><tr><td>9</td><td>250, 45, 9</td></tr><tr><td>/</td><td>250, 5</td></tr><tr><td>5</td><td>250, 5, 5</td></tr><tr><td>+</td><td>250, 10</td></tr><tr><td>20</td><td>250, 10, 20</td></tr><tr><td>*</td><td>250, 200</td></tr><tr><td>-</td><td>50</td></tr></table> **Answer = 50** **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: **`A + B * C ^ D - E`**	2

Ans **((A + (B * (C ^ D))) - E)**

INFIX	STACK	POSTFIX
(		
(		
A		A
+	+	A
(		
B	+	AB
*	+*	AB
(	+*	AB
C	+*	ABC
^	+*^	ABC
D	+*^	ABCD
)	+*	ABCD^
)	+	ABCD^*
)		ABCD^*+
-	-	ABCD^*+
E	-	ABCD^*+E
)		ABCD^*+E-

OR

A + B * C ^ D - E

INFIX	STACK	POSTFIX
A		A
+	+	A
B	+	AB
*	+*	AB
C	+*	ABC
^	+*^	ABC
D	+*^	ABCD
-	-	ABCD^*+
E	-	ABCD^*+E
		ABCD^*+E-

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* ABCD^*+E-*)

4.	**(a)**	A text file named **MESSAGE.TXT** contains some text. Another text file named **SMS.TXT** needs to be created such that it would store **only the first 150 characters** from the file **MESSAGE.TXT.** Write a user-defined function **LongToShort()** in C++ that would perform the above task of creating **SMS.TXT** from the already existing file **MESSAGE.TXT**.	3

	Ans	**void LongToShort()**
		{
		ifstream f1("MESSAGE.TXT");
		ofstream f2("SMS.TXT");
		int i=0;
		char ch;
		while(!f1.eof())
		{
		f1.get(ch);
		i++;
		if(i<=150)
		f2<<ch;
		}
		f1.close();
		f2.close();
		}
		
		OR
		void LongToShort()
		{
		ifstream f1("MESSAGE.TXT");
		ofstream f2("SMS.TXT");
		char ch;
		for(int i=1;i<=150;i++)
		{
		f1.get(ch);
		f2.put(ch);
		}
		f1.close();
		f2.close();
		}
		
		OR
		void LongToShort()
		{
		ifstream f1("MESSAGE.TXT");
		ofstream f2("SMS.TXT");
		char s[200]; //Any array size >=150 acceptable
		f1.getline(s,151); // f1.getline(s,150);
		f2<<s<<endl;
		f1.close(); f2.close();
		}	

		(½ Mark for opening SMS.TXT *correctly)* *(½ Mark for opening* MESSAGE.TXT *correctly)* *(1 Mark for reading each character /line (using any method) from the file)* *(½ Mark for extracting 150 characters from MESSAGE.TXT)* *(½ Mark for transferring the contents to the file SMS.TXT)*	
		OR	
	(a)	A text file named **CONTENTS.TXT** contains some text. Write a user-defined function LongWords() in C++ which displays all such words of the file whose length is more than 9 alphabets. For example: if the file **CONTENTS.TXT** contains: **"Conditional statements of C++ programming language are if and switch"** Then the function LongWords() should display the output as: **Conditional** **statements** **programming**	3

	Ans	**void LongWords()**
		{
		ifstream f("CONTENTS.TXT");
		char ch[20];
		while(!f.eof())
		{
		f>>ch;
		if(strlen(ch)>9)// OR alphabet and length check
		cout<<ch<<endl;
		}
		f.close();
		}
		OR
		void LongWords()
		{
		ifstream f("CONTENTS.TXT");
		char ch[20];
		while(f>>ch)
		{ if(strlen(ch)>9)// OR alphabet and length check
		cout<<ch<<endl;
		}
		f.close();
		}
		OR
		void LongWords()
		{
		fstream f("CONTENTS.TXT",ios::in);
		char ch[20];
		f>>ch;	

```
  while(!f.eof())
  {
     if(strlen(ch)>9)  // OR alphabet and length check
        cout<<ch<<endl;
     f>>ch;
  }
  f.close();
 }
```

(1 Mark for opening CONTENTS.TXT *correctly)*
(1 Mark for reading each word (using any method) from the file)
(½ Mark for checking the length of the word)
(½ Mark for correctly displaying the word)

(b) Write a user-defined function TotalPrice() in C++ to read each object of a binary file STOCK.DAT, and display the Name from all such records whose Price is above 150. Assume that the file STOCK.DAT is created with the help of objects of class Stock, which is defined below: 2

```
class Stock
{
  char Name[20]; float Price;
public:
  char* RName() { return Name; }
  float RPrice() { return Price; }
};
```

Ans

```
void TotalPrice()
{
  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;
  while(f.read((char*)&S,sizeof(S)))
    if(S.RPrice()>150)
      cout<<S.RName()<<endl;
  f.close();
}
```

(½ Mark for opening STOCK.DAT *correctly)*
(½ Mark for reading each record from the file)
(½ Mark for checking price above 150)
(½ Mark for correctly displaying the name)

OR

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

```
class Doctor
{
  int DNo;  char Name[20];  float Fees;
public:
  int *GetNo() { return DNo; }
```

```
  void Show()
  { cout<<DNo<<" * "<<Name<<" * "<<Fees<<endl;
};
```

Write definition for function **Details(int N)** in C++, which displays the details of the Doctor from the file DOCTORS.DAT, whose DNo matches with the parameter N passed to the function.

Ans

```
void Details(int N)
{
  ifstream f("DOCTORS.DAT",ios::binary);
//OR fstream f("DOCTORS.DAT",ios::binary|ios::in);
//OR fstream f;f.open("DOCTORS.DAT",ios::binary|ios::in);
  Doctor D;
  while(f.read((char*)&D,sizeof(D)))
    if(D.GetNo()==N)
      D.Show();
  f.close();
}
```

(½ Mark for opening* DOCTORS.DAT *correctly)
(1 Mark for reading each record from the file)
(½ Mark for correctly invoking the Show() to display 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 STOCK.DAT exists on the hard disk with the following 5 records for the class STOCK containing Name and Price. 1

Name	Price
Rice	110
Wheat	60
Cheese	200
Pulses	170
Sauce	150

```
void main()
{ fstream File;
  File.open("STOCK.DAT",ios::binary|ios::in);
  Stock S;
  for (int I=1; I<=2; I++)
  {
     File.seekg((2*I-1)*sizeof(S));
     File.read((char*)&S, sizeof(S));
     cout<<"Read : "<<File.tellg()/sizeof(S)<<endl;
  }
  File.close();
}
```

Ans

```
Read : 2
Read : 4
```

		(½ Mark for displaying correct value 2 in first line) *(½ Mark for displaying correct value 4 in second line)* *Note: 1 mark to be given even if 2 and 4 are written*	
		OR	
	(c)	Differentiate between seekg() and tellg().	1

	Ans	**seekg(): This function takes the file get pointer to the specified byte in a file.**
		Eg: f.seekg(30); // It takes a pointer to 30th byte.
		tellg(): This function returns the position of the current get pointer in terms of bytes in a file.
		int n = f.tellg();	

		(½ Mark for writing usage of seekg()) *(½ Mark for writing usage of tellg())* ***OR*** *(1 Mark for illustrating the concept of seekg() and tellg() with the help of appropriate example)*	
SECTION B - [Only for candidates, who opted for Python]			
1	**(a)**	Write the names of any four data types available in Python.	2
	Ans	**Numbers** **Integer** **Boolean** **Floating Point** **Complex** **None** **Sequences** **Strings** **Tuple** **List** **Sets** **Mappings** **Dictionary**	
		(½ mark each for writing correct data types)	
	(b)	Name the Python Library modules which need to be imported to invoke the following functions	1
		(i) **sqrt()** (ii) **start()**	
	Ans	**(i) math** **(ii) re**	
		(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
		250 = Number **WHILE Number<=1000:** **if Number=>750:** **print Number** **Number=Number+100** **else** **print Number*2** **Number=Number+50**	
	Ans	**Number = 250** **while Number<=1000:** **if Number>=750:** **print Number** **Number = Number+100** **else:** **print Number*2** **Number = Number+50**	
		(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
		Msg1="WeLcOME" **Msg2="GUeSTs"** **Msg3=""** **for I in range(0,len(Msg2)+1):** **if Msg1[I]>="A" and Msg1[I]<="M":** **Msg3=Msg3+Msg1[I]** **elif Msg1[I]>="N" and Msg1[I]<="Z":** **Msg3=Msg3+Msg2[I]** **else:** **Msg3=Msg3+"*"** **print Msg3**	
	Ans	**G*L*TME**	
		(1 Mark for characters - ½ for G and L , ½ for TME) ***(½ Mark for each * at proper places)***	
	(e)	Find and write the output of the following python code:	3
		def Changer(P,Q=10): **P=P/Q** **Q=P%Q** **print P,"#",Q** **return P**	

```
A=200
B=20
A=Changer(A,B)
print A,"$",B
B=Changer(B)
print A,"$",B
A=Changer(A)
print A,"$",B
```

Ans

```
10 # 10
10 $ 20
2 # 2
10 $ 2
1 # 1
1 $ 2
```

(½ mark for each correct line of output)

Note:

- *Deduct ½ Mark for not writing any or all '#' OR '$' 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 BEGIN and LAST. 2

```
import random

VALUES=[10,20,30,40,50,60,70,80];
BEGIN=random.randint(1,3)
LAST =random.randint(BEGIN,4)

for I in range(BEGIN,LAST+1):
    print VALUES[I],"-",
```

(i) 30 - 40 - 50 -	**(ii)** 10 - 20 - 30 - 40 -
(iii) 30 - 40 - 50 - 60 -	**(iv)** 30 - 40 - 50 - 60 - 70 -

Ans **(i)** 30-40-50-

Minimum value for BEGIN:1
Minimum value for LAST:1

(1 Mark for writing the correct options)

NOTE: No marks to be awarded for writing any other option

(½ Mark for writing correct Minimum value of BEGIN)
(½ Mark for writing correct Minimum value of LAST)

2	(a)	Write four features of object oriented programming.	2
	Ans	**Encapsulation**: combining of data and the functions associated with that data in a single unit **DataHiding**: the mechanism of hiding the data of a class from the outside world **Abstraction**: providing only essential information to the outside world and hiding their background details **Inheritance**: forming a new class (derived class) from an existing class (called the base class). **Polymorphism**: ability to use an operator or function in various forms. **NOTE:** Any four from the above	
		(½ mark each for writing every correct OOP feature)	

	(b)	`class Box:` `#Line 1`
		`    L = 10` `#Line 2`
		`    Type="HARD"` `#Line 3`
		`    def __init__(self,T,TL=30):` `#Line 4`
		`        self.Type = T` `#Line 5`
		`        self.L    = TL` `#Line 6`
		`    def Disp(self):` `#Line 7`
		`        print self.Type,Box.Type` `#Line 8`
		`        print self.L,Box.L` `#Line 9`
		`B1=Box("SOFT",20)` `#Line 10`
		`B1.Disp()` `#Line 11`
		`Box.Type="FLEXI"` `#Line 12`
		`B2=Box("HARD")` `#Line 13`
		`B2.Disp()` `#Line 14`
			2

		Write the output of the above Python code.	

	Ans	`SOFT HARD`
		`20 10`
		`HARD FLEXI`
		`30 10`	

		(½ for writing each correct line of output) ***Note: Deduct ½ Mark if end of lines not considered***	
		OR	

	(b)	`class Target:` `#Line 1`
		`    def __init__(self):` `#Line 2`
		`        self.X  = 20` `#Line 3`
		`        self.Y  = 24` `#Line 4`
			2

```
    def Disp(self):                 #Line 5
        print self.X,self.Y         #Line 6
    def __del__(self):              #Line 7
        print "Target Moved"        #Line 8
def One():                          #Line 9
    T=Target()                      #Line 10
    T.Disp()                        #Line 11
One()                               #Line 12
```

(i) What are Methods/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 **Line 10**

(1 Mark for writing the correct line number 10)

(c) Define a class HOUSE in Python with following specifications: 4

Instance Attributes

```
- Hno            # House Number
- Nor            # Number of Rooms
- Type           # Type of the House
```

Methods/function

```
- AssignType()   # To assign Type of House
                 # based on Number of Rooms as follows:
```

Nor	Type
<=2	LIG
==3	MIG
>3	HIG

```
- Enter()        # To allow user to enter value of
                 # Hno and Nor. Also, this method should
                 # call AssignType() to assign Type
- Display()      # To display Hno, Nor and Type
```

Ans

```
class HOUSE:   # class HOUSE( ): / class HOUSE(Object):
  def __init__(self):          # def __init__(self,A,B,C):
    self.Hno=0            #    self.Hno=A
    self.Nor=0            #    self.Nor=B
    self.Type=""          #    self.Type=C
```

```
  def AssignType(self):
    if self.Nor <= 2:
      self.Type="LIG"
    elif self.Nor ==3:
      self.Type="MIG"
    else:
      self.Type="HIG"
  def Enter(self):
    self.Hno = input("Enter House Number")
    self.Nor = input("Enter Number of rooms")
    self.AssignType()    # OR    AssignType(self)
  def Display(self):
    print self.Hno
    print self.Nor
    print self.Type
```

(½ Mark for correct syntax for class header)
(½ Mark for correct declaration of instance attributes)
(1 Mark for correct definition of AssignType() function)
(1 Mark for correct definition of Enter() with proper invocation of AssignType( ))
(1 Mark for correct definition of Display())

NOTE:
Deduct ½ Mark if AssignType() is not invoked properly inside Enter() function

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

```
class Furniture(object):          #Line 1
   def __init__(self,Q):          #Line 2
       self.Qty = Q
   def GetMore(self,TQ):          #Line 3
       self.Qty =self.Qty+TQ
   def FRDisp(self):              #Line 4
       print self.Qty
class Fixture(object):            #Line 5
   def __init__(self,TQ):         #Line 6
       self.Qty=TQ
   def GetMore(self,TQ):          #Line 7
       self.Qty =self.Qty+TQ
   def FXDisp(self):              #Line 8
       print self.Qty
class Flat(Furniture,Fixture):    #Line 9
   def __init__(self,fno):        #Line 10
       self.Fno=fno
       Q=0
       if self.Fno<100:
         Q=10
```

```
        else:
          Q=20
        Furniture.__init__(self,Q):#Line 11
        Fixture.__init__(self,Q):  #Line 12
    def More(self,Q):               #Line 13
        Furniture.GetMore(self,Q)
        Fixture.GetMore(self,Q)

    def FLDisp(self):              #Line 14
        print self.Fno,
        Furniture.FRDisp(self)
        Fixture.FXDisp(self)
FL=Flat(101)                       #Line 15
FL.More(2)
FL.FLDisp()
```

	(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	`101 24` `24`	
		(½ Mark for writing each correct value of first line of output) ***(1 Mark for writing correct value of second line of output)*** ***Note: Deduct ½ Mark if end of lines not considered***	
	(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 Furniture Line 12 calls the constructor of the parent class Fixture	
		(½ mark for each correct answer)	
		OR	
	(d)	Define inheritance. Show brief python examples of Single Level, Multiple and Multilevel Inheritance.	4

	Ans	**The capability of one class to inherit the data and functions of another class is called as Inheritance. The class which inherits is called the child/ derived/ sub class and the class from which it inherits is called the Parent/ base/ super class.**
		
		Example of Single level Inheritance
		`class A:`
		`  pass`
		`class B(A):`	

		pass **Example of Multiple Inheritance** **class A:** **pass** **class B:** **pass** **class C(A,B):** **pass** **Example of Multilevel Inheritance** **class A:** **pass** **class B(A):** **pass** **class C(B):** **pass**	
		(1 mark for definition of Inheritance. 1 mark each for correct examples of Single, Multiple and Multilevel Inheritance)	
3	**(a)**	Consider the following randomly ordered numbers stored in a list 106, 104, 106, 102, 105, 10 Show the content of 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	106, 104, 106, 102, 105, 10 **I Pass** (10), 104, 106, 102, 105, (106) **II Pass** 10, (102), 106, (104), 105, 106 **III Pass** 10, 102, (104), (106), 105, 106	
		(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 106, 104, 106, 102, 105, 107 Show the content of list after the First, Second and Third pass of the bubble sort method used for arranging in **descending order**.	3

		Note: Show the status of all the elements after each pass very clearly encircling the changes.	
	Ans	106, 104, 106, 102, 105, 107 **I Pass** 106, 106, 104, 105, 107, (102) **II Pass** 106, 106, 105, 107, (104), 102 **III Pass** 106, 106, 107, (105), 104, 102	
		(1 mark for each correct pass) ***OR*** ***(2½ Marks to be awarded for all the correct passes without encircling)***	

	(b)	Write definition of a method/function **AddOddEven(VALUES)** to display sum of odd and even values separately from the list of VALUES.
		
		For example,
		If the VALUES contain `[15,26,37,10,22,13]`
		The function should display
		`Even Sum: 58`
		`Odd Sum: 65`
			3

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

		(½ mark for function header) ***(½ mark for initializing so (sum odd) and se (sum even) with 0)*** ***(½ mark for reading each element of the list using a loop)*** ***(½ mark for checking whether the value is odd/even)*** ***(½ mark for adding it to the sum)*** ***(½ mark for printing or returning the value)***	
		OR	
	(b)	Write definition of a method/function **HowMany(ID,Val)** to count and display number of times the value of Val is present in the list ID. For example, If the ID contains `[115,122,137,110,122,113]` and Val contains `122` The function should display `122 found 2 Times`	3

	Ans	`def HowMany(ID,Val):`
		`  c=0`
		`  for i in ID:`
		`  if i==Val:`
		`  c=c+1`
		`  print Val,"found",c,"Times"`	

		(½ mark for function header) ***(½ mark for initializing c (count) with 0)*** ***(½ mark for reading each element of the list using a loop)*** ***(½ mark for checking whether i is equal to the Val)*** ***(½ mark for increasing the value of c)*** ***(½ mark for printing or returning the value)***	
	(c)	Write **QueueUp(Client)** and **QueueDel(Client)** methods/function Python to add a new Client and delete a Client from a List of Clients names, considering them to act as insert and delete operations of the Queue data structure.	4

	Ans	`def QueueUp(queue):`
		`  a=input("enter client name: ")`
		`  queue.append(a)`
		`def QueueDel(queue):`
		`  if (queue==[]):`
		`  print "Queue empty"`
		`  else:`
		`  print "Deleted element is: ",queue[0]`
		`  del queue[0]`
		
		OR
		`class queue:`
		`  Client=[]`
		`  def QueueUp(self):`
		`  a=input("enter client name: ")`
		`  queue.Client.append(a)`	

```
  def QueueDel(self):
    if (queue.Client==[]):
      print "Queue empty"
    else:
      print "Deleted element is: ",queue.Client[0]
        del queue.Client[0]
```

(½ mark for QueueUp() header)
(½ mark for accepting a value from user)
(½ mark for adding value in list)
(½ mark for QueueDel 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 **PushOn(Book)** and **Pop(Book)** methods/functions in Python to add a new Book and delete a Book from a List of Book titles, considering them to act as push and pop operations of the Stack data structure. 4

Ans

```
def PushOn(Book):
  a=input("enter book title : ")
  Book.append(a)
def Pop(Book):
  if (Book==[]):
    print "Stack empty"
  else:
    print "Deleted element:",Book.pop()
```

OR

```
class Stack:
  Book=[]
  def PushOn(self):
    a=input("enter book title : ")
    Stack.Book.append(a)
  def Pop(self):
    if (Stack.Book==[]):
      print "Stack empty"
    else:
      print "Deleted element:",Stack.Book.pop()
```

(½ mark for PushOn() header)
(½ mark for accepting a value from user)
(½ mark for adding value in list)
(½ mark for Pop() 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 **Swapper(Numbers)** to swap the first half of the 2

		content of a list Numbers with second half of the content of list Numbers and display the swapped values. Note: Assuming that the list has even number of values in it For Example: If the list Numbers contain **[35,67,89,23,12,45]** After swapping the list content should be displayed as **[23,12,45,35,67,89]**	
	Ans	**def Swapper(Numbers):** ** mid=len(Numbers)/2** ** for i in range(0,mid):** ** Numbers[i],Numbers[mid+i]=Numbers[mid+i],Numbers[i]** ** print Numbers** **OR** **def Swapper(Numbers):** ** mid=len(Numbers)/2** ** for i in range(0,mid):** ** T=Numbers[i]** ** Numbers[i]=Numbers[mid+i]** ** Numbers[mid+i]=T** ** print Numbers**	
		(½ mark for function header) ***(½ mark for loop)*** ***(½ mark for swapping values)*** ***(½ mark for displaying list)***	
		OR	
	(d)	Write a python method/function **Count3and7(N)** to find and display the count of all those numbers which are between 1 and N, which are either divisible by 3 or by 7. For Example: If the value of N is **15** The sum should be displayed as **7** (as 3,6,7,9,12,14,15 in between 1 to 15 are either divisible by 3 or 7)	2
	Ans	**def Count3and7(N):** ** c=0** ** for i in range(1,N+1):** ** if i%3==0 or i%7==0:** ** c=c+1** ** print c**	
		(½ mark for function header) ***(½ mark for loop)***	

		(½ mark for divisibility check and counting values) *(½ mark for displaying list)*	
	(e)	Evaluate the following Postfix expression, showing the stack contents: `250,45,9,/,5,+,20,*,-`	2
	Ans	<table><tr><th>Element</th><th>Stack Contents</th></tr><tr><td>250</td><td>250</td></tr><tr><td>45</td><td>250, 45</td></tr><tr><td>9</td><td>250, 45, 9</td></tr><tr><td>/</td><td>250, 5</td></tr><tr><td>5</td><td>250, 5, 5</td></tr><tr><td>+</td><td>250, 10</td></tr><tr><td>20</td><td>250, 10, 20</td></tr><tr><td>*</td><td>250, 200</td></tr><tr><td>-</td><td>50</td></tr></table> **Answer = 50** **OR** **Any other method for evaluating the given postfix expression showing the Stack Status.**	
		(½ Mark for evaluation till each operator) *OR* *(1 Mark for only writing the correct answer without showing stack status)*	
		OR	
	(e)	Convert the following Infix expression to its equivalent Postfix expression, showing the stack contents for each step of conversion: `A + B * C ^ D - E`	2
	Ans	`((A + (B * (C ^ D))) - E)` <table><tr><th>INFIX</th><th>STACK</th><th>POSTFIX</th></tr><tr><td>(</td><td></td><td></td></tr><tr><td>(</td><td></td><td></td></tr><tr><td>A</td><td></td><td>A</td></tr><tr><td>+</td><td>+</td><td>A</td></tr><tr><td>(</td><td></td><td></td></tr><tr><td>B</td><td>+</td><td>AB</td></tr><tr><td>*</td><td>+*</td><td>AB</td></tr><tr><td>(</td><td>+*</td><td>AB</td></tr></table>	

C	+*	ABC	
^	+*^	ABC	
D	+*^	ABCD	
)	+*	ABCD^	
)	+	ABCD^*	
)		ABCD^*+	
-	-	ABCD^*+	
E	-	ABCD^*+E	
)		ABCD^*+E-	

OR

A + B * C ^ D - E

INFIX	STACK	POSTFIX
A		A
+	+	A
B	+	AB
*	+*	AB
C	+*	ABC
^	+*^	ABC
D	+*^	ABCD
-	-	ABCD^*+
E	-	ABCD^*+E
		ABCD^*+E-

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* ABCD^*+E-*)

4	(a)	Write a statement in Python to open a text file WRITEUP.TXT so that new content can be written in it.	1

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

		(1 mark for correct statement)	
		OR	
	(a)	Write a statement in Python to open a text file README.TXT so that existing content can be read from it.	1
	Ans	`file= open("README.TXT","r")` **OR**	

		file= open("README.TXT","r+")	
		(1 mark for correct statement)	
	(b)	Write a method/function **ISTOUPCOUNT()** in python to read contents from a text file WRITER.TXT, to count and display the occurrence of the word "IS" or "TO" or "UP". For example: If the content of the file is _____ **IT IS UP TO US TO TAKE CARE OF OUR SURROUNDING. IT IS NOT POSSIBLE ONLY FOR THE GOVERNMENT TO TAKE RESPONSIBILITY** _____ The method/function should display **Count of IS TO and UP is 6**	2
	Ans	**def ISTOUPCOUNT():** **c=0** **file=open('WRITER.TXT','r')** **line = file.read()** **word = line.split()** **for w in word:** **if w=="IS" or w=="TO" or w=="UP":** **c=c+1** **print "Count of IS TO and UP is ",c** **file.close()**	
		(½ Mark for opening the file) ***(½ Mark for reading all lines, and dividing it into words)*** ***(½ Mark for checking condition and incrementing count)*** ***(½ Mark for displaying count)***	
		OR	
	(b)	Write a method/function **AEDISP()** in python to read lines from a text file WRITER.TXT, and display those lines, which are starting either with A or starting with E. For example: If the content of the file is _____ **A CLEAN ENVIRONMENT IS NECESSARY FOR OUR GOOD HEALTH.** **WE SHOULD TAKE CARE OF OUR ENVIRONMENT.** **EDUCATIONAL INSTITUTIONS SHOULD TAKE THE LEAD.** _____ The method should display **A CLEAN ENVIRONMENT IS NECESSARY FOR OUR GOOD HEALTH.** **EDUCATIONAL INSTITUTIONS SHOULD TAKE THE LEAD.**	2
	Ans	**def AEDISP():** **file=open('WRITER.TXT','r')** **lines = file.readlines()**	

		`for w in lines:`
		`  if w[0]=="A" or w[0]=="E":`
		`  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)*	

	(c)	Considering the following definition of class STOCK, write a method/function **COSTLY()** in python to search and display Name and Price from a pickled file STOCK.DAT, where Price of the items are more than 1000.
		`class Stock:`
		`  def __init__(self,N,P):`
		`  self.Name=N`
		`  self.Price=P`
		`  def Show(self):`
		`  print self.Name,"@",self.Price`
			3

	Ans	`def COSTLY():`
		`  S=STOCK()`
		`  file=open('STOCK.DAT','rb')`
		`  try:`
		`  while True:`
		`  S=pickle.load(file)`
		`  if S.Price > 1000:`
		`  S.Show()`
		`  except EOFError:`
		`  pass`
		`  file.close()`	

		(½ Mark for correct function header) *(½ Mark for opening the file STOCK.DAT correctly)* *(½ Mark for correct loop)* *(½ Mark for correct load())* *(½ Mark for correct checking of Price)* *(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 DOCTORS, write a method/function **SPLDOCS()** in python to search and display all the content from a pickled file DOCS.DAT, where Specialisation of DOCTORS is "CARDIOLOGY".
		`class DOCTORS:`
		`  def __init__(self,N,S):`
		`  self.Name=N`
		`  self.Specialisation=S`
		`  def Disp(self):`
		`  print self.Name,"#",self.Specialisation`
			3

Ans

```
def SPLDOCS():
  D=DOCTORS()
  file=open('DOCS.DAT','rb')
  try:
     while True:
       D=pickle.load(file)
       if D.Specialisation == 'CARDIOLOGY':
          D.Disp()
  except EOFError:
    pass
  file.close()
```

(½ Mark for correct function header)
(½ Mark for opening the file DOCS.DAT correctly)
(½ Mark for correct loop)
(½ Mark for correct load())
(½ Mark for correct checking of Specialisation)
(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 Write SQL queries for (i) to (iv) and write outputs for SQL queries (v) to (viii), which are based on the table given below: 8

Table: TRAINS

TNO	TNAME	START	END
11096	Ahimsa Express	Pune Junction	Ahmedabad Junction
12015	Ajmer Shatabdi	New Delhi	Ajmer Junction
1651	Pune Hbj Special	Pune Junction	Habibganj
13005	Amritsar Mail	Howrah Junction	Amritsar Junction
12002	Bhopal Shatabdi	New Delhi	Habibganj
12417	Prayag Raj Express	Allahabad Junction	New Delhi
14673	Shaheed Express	Jaynagar	Amritsar Junction
12314	Sealdah Rajdhani	New Delhi	Sealdah
12498	Shane Punjab	Amritsar Junction	New Delhi
12451	Shram Shakti Express	Kanpur Central	New Delhi
12030	Swarna Shatabdi	Amritsar Junction	New Delhi

Table: PASSENGERS

PNR	TNO	PNAME	GENDER	AGE	TRAVELDATE
P001	13005	R N AGRAWAL	MALE	45	2018-12-25
P002	12015	P TIWARY	MALE	28	2018-11-10
P003	12015	S TIWARY	FEMALE	22	2018-11-10

P004	12030	S K SAXENA	MALE	42	2018-10-12
P005	12030	S SAXENA	FEMALE	35	2018-10-12
P006	12030	P SAXENA	FEMALE	12	2018-10-12
P007	13005	N S SINGH	MALE	52	2018-05-09
P008	12030	J K SHARMA	MALE	65	2018-05-09
P009	12030	R SHARMA	FEMALE	58	2018-05-09

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

(i) To display details of all Trains which Start from New Delhi

Ans
```
SELECT * FROM TRAINS WHERE START='New Delhi';
```

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

(ii) To display the PNR, PNAME, GENDER and AGE of all Passengers whose AGE is below 50.

Ans
```
SELECT PNR, PNAME, GENDER, AGE
FROM PASSENGERS WHERE  AGE < 50;
```

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

(iii) To display total number of MALE and FEMALE Passengers .

Ans
```
SELECT GENDER, COUNT(*)
FROM PASSENGERS GROUP BY GENDER;
OR
SELECT GENDER, COUNT(GENDER)
FROM PASSENGERS GROUP BY GENDER;
```

(½ Mark for correct SELECT statement)
(½ Mark for correct GROUP BY/additional COUNT clause)

(iv) To display details of all Passengers travelling in Trains whose TNO is 12015

Ans
```
SELECT * FROM PASSENGERS
WHERE TNO=12015;
```

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

(v)
```
SELECT MAX(TRAVELDATE), MIN(TRAVELDATE) FROM PASSENGERS
WHERE GENDER = 'FEMALE';
```

Ans

MAX(TRAVELDATE)	MIN(TRAVELDATE)
2018-11-10	2018-05-09

(½ Mark for correct MAX(TRAVELDATE))
(½ Mark for correct MIN(TRAVELDATE))

	(vi)	SELECT END, COUNT(*) FROM TRAINS GROUP BY END HAVING COUNT(*)>1;	
	Ans	END COUNT(*) Habibganj 2 Amritsar Junction 2 New Delhi 4	
		(1 Mark for correct output) *NOTE: Values may be written in any order*	
	(vii)	SELECT DISTINCT TRAVELDATE FROM PASSENGERS;	
	Ans	DISTINCT TRAVELDATE 2018-12-25 2018-11-10 2018-10-12 2018-05-09	
		(1 Mark for correct output) *NOTE: Values may be written in any order*	
	(viii)	SELECT TNAME, PNAME FROM TRAINS T,PASSENGERS P WHERE T.TNO = P.TNO AND AGE BETWEEN 50 AND 60;	
	Ans	TNAME PNAME Amritsar Mail N S SINGH Swarna Shatabdi R SHARMA	
		(1 Mark for correct output)	
6	(a)	State any one Distributive Law of Boolean Algebra and verify it using truth table.	2
	Ans	Distributive Law: A+BC=(A+B)(A+C) Verification using truth table	

A	B	C	BC	A+BC	A+B	A+C	(A+B).(A+C)
0	0	0	0	0	0	0	0
0	0	1	0	0	0	1	0
0	1	0	0	0	1	0	0
0	1	1	1	1	1	1	1
1	0	0	0	1	1	1	1
1	0	1	0	1	1	1	1
1	1	0	0	1	1	1	1
1	1	1	1	1	1	1	1

OR
A(B+C)=AB+AC
Verification using truth table

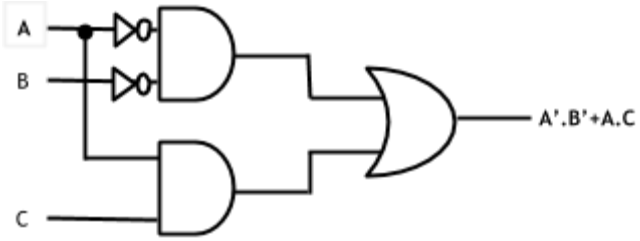
A	B	C	B+C	A. (B+C)	A.B	A.C	AB+AC
0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0
0	1	0	1	0	0	0	0
0	1	1	1	0	0	0	0
1	0	0	0	0	0	0	0
1	0	1	1	1	0	1	1
1	1	0	1	1	1	0	1
1	1	1	1	1	1	1	1

(1 Mark for stating any one Distributive Law correctly)
(1 Mark for correctly verifying the stated Law using Truth Table

(b) Draw the Logic Circuit of the following Boolean Expression: 2

A′.B′ + A.C

Ans



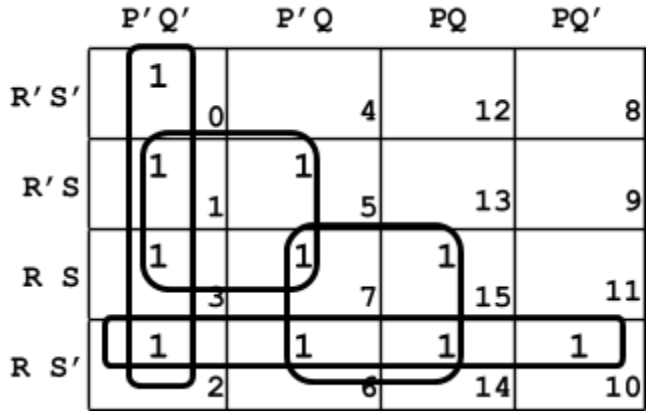
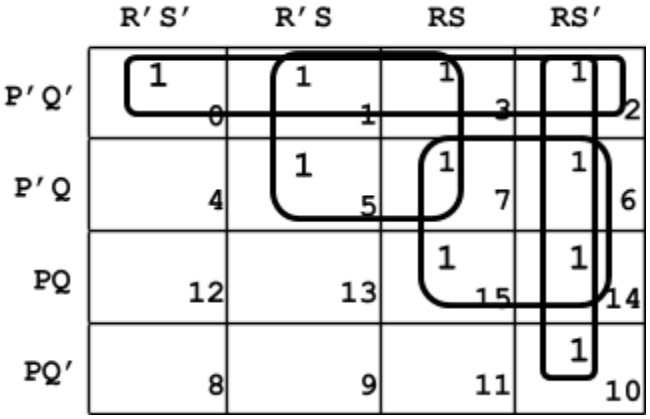
(Full 2 Marks for drawing the Logic Circuit for the expression correctly)
OR
(½ Mark for drawing Logic circuit for (A'.B') correctly)
(½ Mark for drawing Logic circuit for (A.C) correctly)

(c) Derive a Canonical POS expression for a Boolean function F, represented by the following truth table: 1

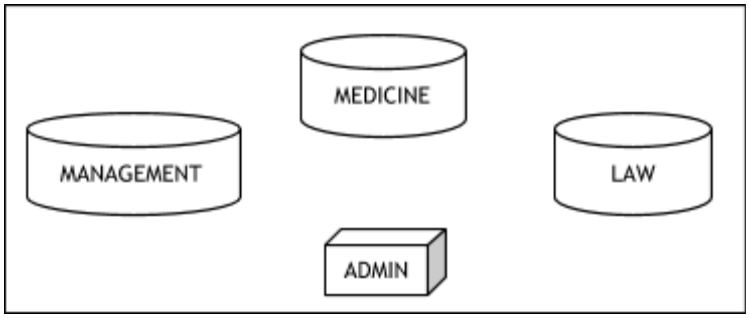
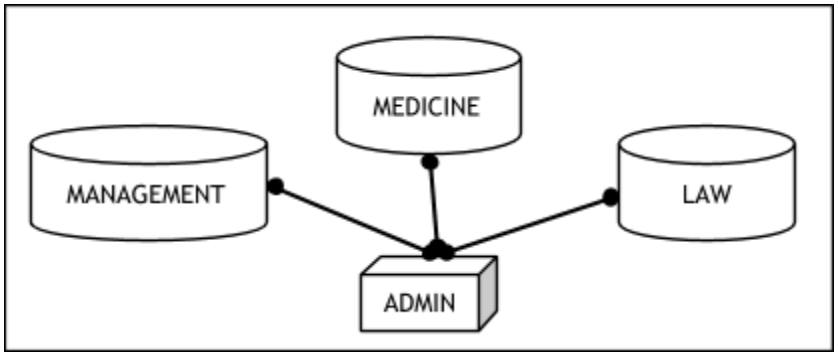
X	Y	Z	F(X,Y,Z)
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	0

Ans **F(X,Y,Z)=(X+Y+Z′).(X+Y′+Z′).(X′+Y′+Z).(X′+Y′+Z′)**
OR
F(X,Y,Z)= Π(1,3,6,7)

(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(P,Q,R,S) = ∑(0,1,2,3,5,6,7,10,14,15)	
	Ans	 **Minimal expression : P'Q' + RS' +QR + P'S** **OR**  **Minimal expression : P'Q' + RS' +QR + P'S**	
		(½ Mark for plotting the 1s in K Map correctly) ***(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***	
7	**(a)**	Damodar Mohan has been informed that there had been a backdoor entry to his computer, which has provided access to his system through a malicious user/programs, allowing confidential and personal information to be subjected to theft. It happened because he clicked a link provided in one of the pop-ups from a website announcing him to be winner of prizes worth 1 Million Dollars. Which of the following has caused this out of the following? (i) Virus (ii) Worm (iii) Trojan Horse Also mention what he should do to prevent this infection.	2
	Ans	**(iii) Trojan Horse or (i) Virus** **Use an antivirus application to prompt him about threats or avoid clicking on unverified links.**	
		(1 Mark for writing any correct answer Trojan Horse/Virus) ***(1 Mark for writing any correct preventive measure)***	

	(b)	Tarini Wadhawa is in India and she is interested in communicating with her uncle in Australia. She wants to show one of her own designed gadgets to him and also wants to demonstrate its working without physically going to Australia. Which protocol out of the following will be ideal for the same? (i) POP3 (ii) SMTP (iii) VoIP (iv) HTTP	1
	Ans	**(iii) VoIP OR (iv) HTTP OR (ii) SMTP (if sent by mail)**	
		(1 Mark for writing any/all correct answer(s))	
	(c)	Give two differences between 3G and 4G telecommunication technologies.	1
	Ans	● **Higher download/upload speeds in 4G compared to 3G** ● **Greater bandwidth and flexibility in 4G compared to 3G** ● **3G is Voice+Data whereas 4G is only Data with voice overriding**	
		(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) MBPS (ii) WAN (iii) CDMA (iv) WLL	2
	Ans	**(i) MBPS - Mega Bytes per Second OR Mega Bits per second** **(ii) WAN - Wide Area Network** **(iii) CDMA - Code Division Multiple Access** **(iv) WLL - Wireless in Local Loop**	
		(½ Mark each for writing correct expansion)	
	(e)	Jonathan and Jonathan Training Institute is planning to set up its centre in Amritsar with four specialised blocks for Medicine, Management, Law courses along with an Admission block in separate buildings. The physical distances between these blocks and the number of computers to be installed in these blocks are given below. You as a network expert have to answer the queries raised by their board of directors as given in (i) to (iv).	
		Shortest distances between various locations in metres: Admin Block to Management Block — 60 Admin Block to Medicine Block — 40 Admin Block to Law Block — 60 Management Block to Medicine Block — 50 Management Block to Law Block — 110 Law Block to Medicine Block — 40 Number of Computers installed at various locations are as follows: Admin Block — 150 Management Block — 70 Medicine Block — 20 Law Block — 50	

			
	(i)	Suggest the most suitable location to install the main server of this institution to get efficient connectivity.	1
	Ans	**Admin Block**	
		(1 Mark for writing correct location)	
	(ii)	Suggest the devices to be installed in each of these buildings for connecting computers installed within the building out of the following: ● Modem ● Switch ● Gateway ● Router	1
	Ans	**Switch OR Modem OR Router**	
		(1 Mark for writing any/all correct device(s))	
	(iii)	Suggest by drawing the best cable layout for effective network connectivity of the blocks having server with all the other blocks.	1
	Ans		
		(1 Mark for drawing the any correct layout)	
	(iv)	Suggest the most suitable wired medium for efficiently connecting each computer installed in every building out of the following network cables: ● Coaxial Cable ● Ethernet Cable ● Single Pair Telephone Cable.	1
	Ans	**Ethernet Cable**	
		(1 Mark for writing the correct network cable)	

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.
		`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;`
		`}`
			2

	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
```

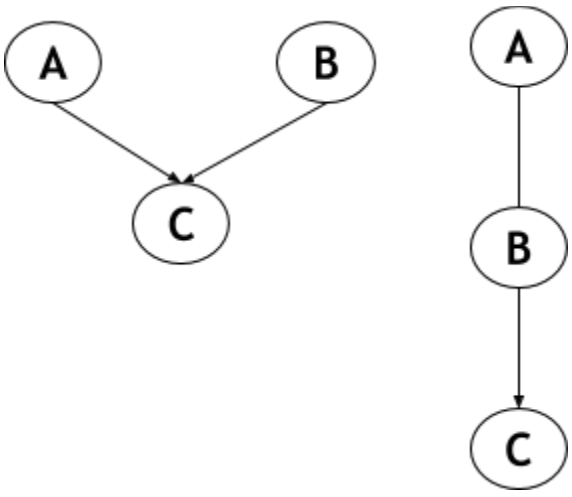
- *(½ Mark for correct syntax for class header)*
- *(½ Mark for correct declaration of instance attributes)*
- *(1 Mark for correct definition of AssignHealth() function)*
- *(1 Mark for correct definition of Enter() with proper invocation of AssignHealth( ))*
- *(1 Mark for correct definition of Display())*
- *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)

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

(ii)

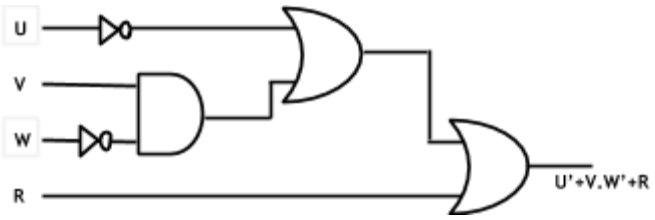
X	X′	Y	X+Y	X′. Y	X+X′.Y
0	1	0	0	0	0
0	1	1	1	1	1
1	0	0	1	0	1
1	0	1	1	0	1

(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)

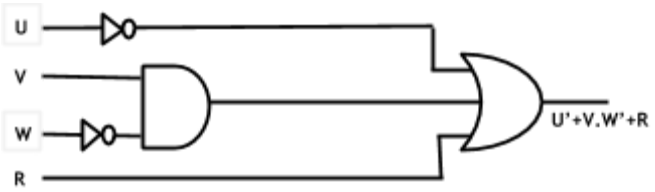
(b) Draw the Logic Circuit of the following Boolean Expression: 2

U′+ V.W′ + R

Ans

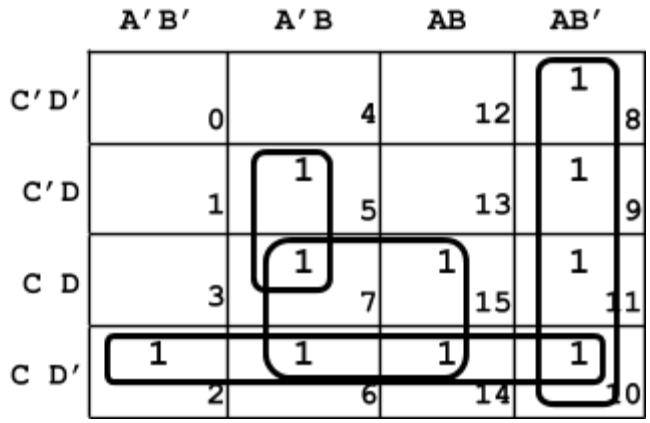


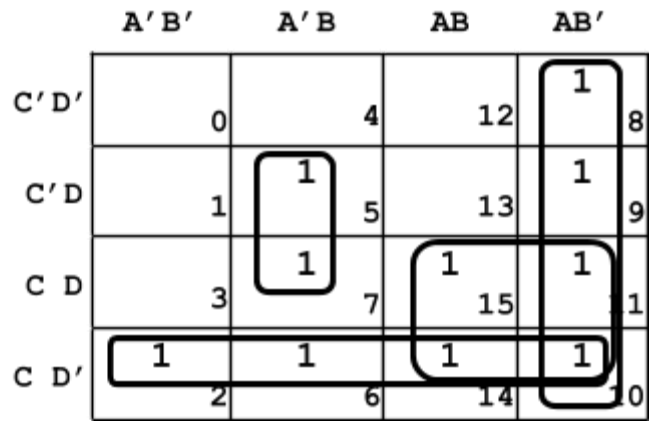
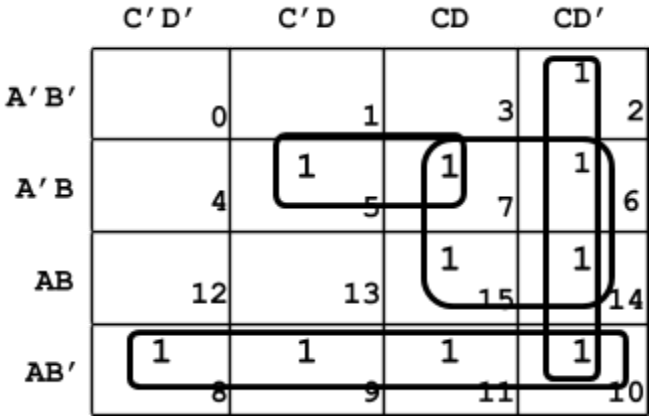
OR



(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)

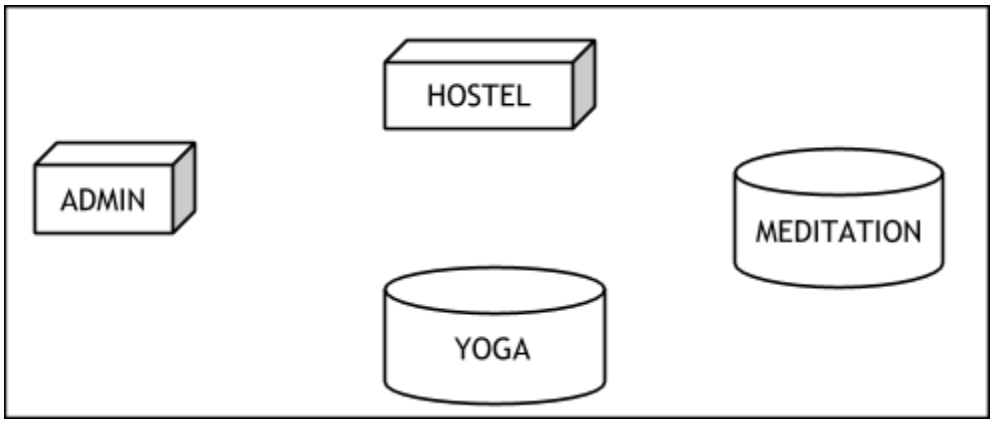
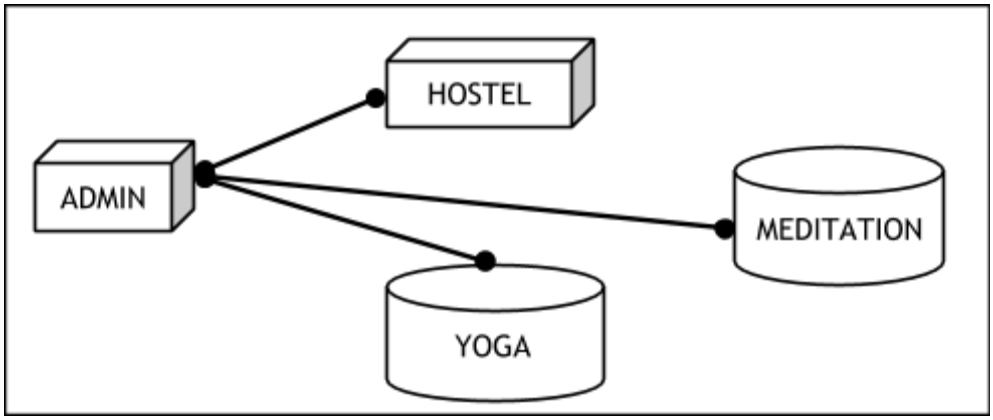
(c) Derive a Canonical POS expression for a Boolean function F, represented by the following truth table: 1

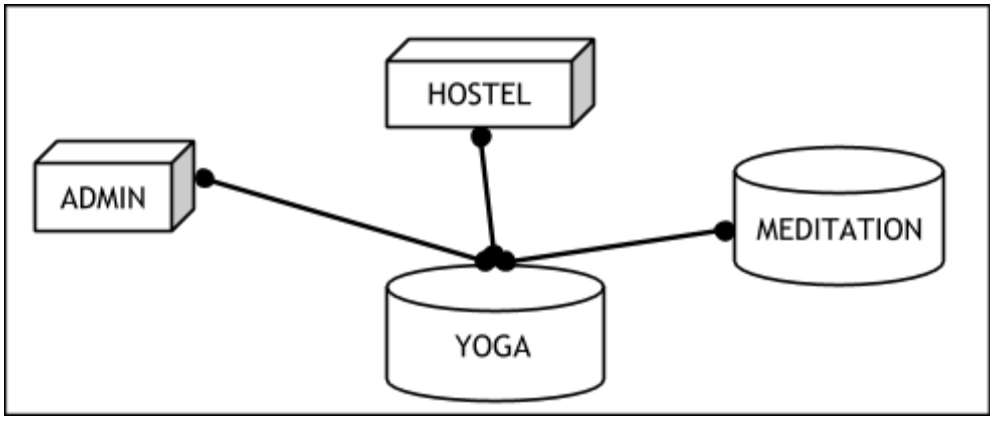
		<table><tr><th>P</th><th>Q</th><th>R</th><th>F(P,Q,R)</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td></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)	