SET-4

Series SGN

Code No. 91

Roll No. | | | | | | | |

Candidates must write the Code on the title page of the answer-book.

- Please check that this question paper contains **23** printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains **7** questions.
- **Please write down the Serial Number of the question before attempting it.**
- 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

COMPUTER SCIENCE

Time allowed : 3 hours *Maximum Marks : 70*

General Instructions :

(i) *SECTION A refers to programming language C++.*

(ii) *SECTION B refers to programming language Python.*

(iii) *SECTION C is compulsory for all.*

(iv) *Answer either SECTION A or SECTION B.*

(v) *It is compulsory to mention on the page 1 in the answer book whether you are attempting SECTION A or SECTION B.*

(vi) ***All** questions are compulsory within each section.*

SECTION A
[Only for candidates, who opted for C++]

1. (a) Write the type of C++ tokens (keywords and user defined identifiers) from the following : *2*

(i) `else`

(ii) `Long`

(iii) `4Queue`

(iv) `_count`

(b) The following C++ code during compilation reports errors as follows :

Error: 'ofstream' not declared
Error: 'strupr' not declared
Error: 'strcat' not declared
Error: 'FIN' not declared

Write the names of the correct header files, which must be included to compile the code successfully : *1*

```
void main()
{
   ofstream FIN("WISH.TXT");
   char TEXT2[]="good day";
   char TEXT1[]="John!";

   strupr(TEXT2);
   strcat(TEXT1, TEXT2);
   FIN<<TEXT1<<endl;
}
```

(c) Rewrite the following C++ code after removing any/all syntactical errors with each correction underlined. *2*

Note : Assume all required header files are already included in the program.

```
Typedef Count int;
void main()
{
   Count C;
   cout<<"Enter the count:";
   cin>>C;
   for (K = 1; K<=C; K++)
      cout<< C "*" K <<endl;
}
```

(d) Find and write the output of the following C++ program code : *3*

Note : Assume all required header files are already included in the program.

```
void Revert(int &Num, int Last=2)
{
   Last=(Last%2==0)?Last+1:Last-1;
   for(int C=1; C<=Last; C++)
      Num+=C;
}

void main()
{
    int A=20,B=4;
    Revert(A,B);
    cout<<A<<"&"<<B<<endl;
    B--;
    Revert(A,B);
    cout<<A<<"#"<<B<<endl;
    Revert(B);
    cout<<A<<"#"<<B<<endl;
}
```

(e) Find and write the output of the following C++ program code : *2*

Note : Assume all required header files are already included in the program.

```
#define Modify(N) N*3+10
void main()
{
   int LIST[]={10,15,12,17};
   int *P=LIST, C;
   for(C=3; C>=0; C--)
      LIST[I]=Modify(LIST[I]);

   for (C=0; C<=3; C++)
   {
       cout<<*P<<":";
       P++;
    }
}
```

(f) Look at the following C++ code and find the possible output(s) from the options (i) to (iv) following it. Also, write the highest and lowest values that can be assigned in the array A. *2*

Note :

- Assume all the required header files are already being included in the code.
- The function random(n) generates an integer between 0 and n – 1.

```
void main()
{
  randomize();
  int A[4], C;
  for(C=0; C<4; C++)
     A[C]=random(C+1)+10;
  for(C=3; C>=0; C--)
     cout<<A[C]<<"@";
}
```

(i)	(ii)
13@10@11@10@	15$14$12$10$
(iii)	(iv)
12@11@13@10@	12@11@10@10@

2. (a) Which function(s) out of the following can be considered as overloaded function(s) in the same program ? Also, write the reason for not considering the other(s) as overloaded function(s). *2*

```
void Execute(char A,int B);     // Function 1
void Execute(int A,char B);     // Function 2
void Execute(int P=10);         // Function 3
void Execute();                 // Function 4
int Execute(int A);             // Function 5
void Execute(int &K);           // Function 6
```

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

```
class FIRST
{
   int Num1;
public:
   void Display()               //Member Function 1
   {
       cout<<Num1<<endl;
   }
};


class SECOND: public FIRST
{
   int Num2;
public:
   void Display()               //Member Function 2
   {
       cout<<Num2<<endl;
   }
};
void main()
{
   SECOND S;
   _________________              //Statement 1
   _________________              //Statement 2
}
```

(i) Which Object Oriented Programming feature is illustrated by the definitions of classes FIRST and SECOND ? *1*

(ii) Write Statement 1 and Statement 2 to execute Member Function 1 and Member Function 2 respectively using the object S. *1*

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

Private Members

```
- Radius, Height    // float
- Type              // int (1 for Cone,2 for Cylinder)
- Volume            // float
- CalVolume()       // Member function to calculate
                    // volume as per the Type
```

Type	Formula to calculate Volume
1	3.14*Radius*Height
2	3.14*Radius*Height/3

Public Members

```
- GetValues()  // A function to allow user to enter value
               // of Radius, Height and Type. Also, call
               // function CalVolume() from it

- ShowAll()    // A function to display Radius, Height,
               // Type and Volume of Container
```

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

```
class Teacher
{
   int TCode;
protected:
   char Name[20];
public:
   Teacher();
   void Enter(); void Show();
};

class Course
{
   int ID;
protected:
   Char Title[30];
public:
   Course();
   void Initiate();
   void Display();
};

class Schedule : public Course, private Teacher
{
   int DD,MM,YYYY;
public:
   Schedule();
   void Start();
   void View();
};
void main()
{
   Schedule S;
}
```

(i) Which type of Inheritance out of the following is illustrated in the above example ?

Single Level Inheritance, Multilevel Inheritance, Multiple Inheritance

(ii) Write the names of all the members, which are directly accessible by the member function View() of class Schedule.

(iii) Write the names of all the members, which are directly accessible by the object S of class Schedule declared in the main() function.

(iv) What will be the order of execution of the constructors, when the object S of class Schedule is declared inside the main() function ?

3. (a) Write the definition of a function **SumEO(int VALUES[], int N)** in C++, which should display the sum of even values and sum of odd values of the array separately. *2*

Example : If the array VALUES contains

25	20	22	21	53

Then the functions should display the output as :

Sum of even values = 42 (i.e., 20+22)

Sum of odd values = 99 (i.e., 25+21+53)

(b) Write a definition for a function **UpperHalf(int Mat[4][4])** in C++, which displays the elements in the same way as per the example shown below. *3*

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

25	24	23	22
20	19	18	17
15	14	13	12
10	9	8	7

The function should display the content in the following format :

```
25   24   23   22

20   19   18

15   14

10
```

(c) Let us assume Data[20][15] 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 Data[10][5], if the element Data[15][10] is stored at the memory location 15000. *3*

(d) Write the definition of a member function AddPacket() for a class QUEUE in C++, to remove/delete a Packet from a dynamically allocated QUEUE of Packets considering the following code is already written as a part of the program. *4*

```
struct Packet
{
   int      PID;
   char     Address[20];
   Packet   *LINK;
};

class QUEUE
{
   Packet *Front, *Rear;
public:
   QUEUE(){Front=NULL;Rear=NULL;}
   void AddPacket();
   void DeletePacket();
   ~QUEUE();
};
```

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

```
U * V + (W - Z) / X
```

4. (a) A text file named **MATTER.TXT** contains some text, which needs to be displayed such that every next character is separated by a symbol '#'.

Write a function definition for **HashDisplay()** in C++ that would display the entire content of the file **MATTER.TXT** in the desired format. *3*

Example :

If the file MATTER.TXT has the following content stored in it :

```
THE WORLD IS ROUND
```

The function **HashDisplay()** should display the following content :

```
T#H#E# #W#O#R#L#D# #I#S# #R#O#U#N#D#
```

(b) Write a definition for a function TotalTeachers( ) in C++ to read each object of a binary file SCHOOLS.DAT, find the total number of teachers, whose data is stored in the file and display the same. Assume that the file SCHOOLS.DAT is created with the help of objects of class SCHOOLS, which is defined below : *2*

```
class SCHOOLS
{
   int SCode;          //School Code
   char SName[20];     //School Name
   int NOT;            //Number of Teachers in the school

public:
   void Display()
   {cout<<SCode<<"#"<<SName<<"#"<<NOT<<endl;}
   int RNOT(){return NOT;}
};
```

(c) Find the output of the following C++ code considering that the binary file SCHOOLS.DAT exists on the hard disk with the following records of 10 schools of the class SCHOOLS as declared in the previous question (4 b). *1*

SCode	SName	NOT
1001	Brains School	100
1003	Child Life School	115
1002	Care Share School	300
1006	Educate for Life School	50
1005	Guru Shishya Sadan	195
1004	Holy Education School	140
1010	Play School	95
1008	Innovate Excel School	300
1011	Premier Education School	200
1012	Uplifted Minds School	100

```
void main()
{
   fstream SFIN;
   SFIN.open("SCHOOLS.DAT",ios::binary|ios::in);
   SCHOOLS S;
   SFIN.seekg(5*sizeof(S));
   SFIN.read((char*)&S, sizeof(S));
   S.Display();
   cout<<"Record :"<<SFIN.tellg()/sizeof(S) + 1<<endl;
   SFIN.close();
}
```

SECTION B

[Only for candidates, who opted for Python]

1. (a) Differentiate between Syntax Error and Run-Time Error. Also, write a suitable example in Python to illustrate both. *2*

(b) Name the Python Library modules which need to be imported to invoke the following functions : *1*

(i) **sin()**

(ii) **search()**

(c) Rewrite the following code in Python after removing all syntax error(s). Underline each correction done in the code. *2*

```
Val = int(rawinput("Value:"))
Adder = 0

for C in range(1,Val,3)
    Adder+=C
    if C%2=0:
        Print C*10
    Else:
        print C*
print Adder
```

(d) Find and write the output of the following Python code : *2*

```
Data  = ["P",20,"R",10,"S",30]
Times = 0
Alpha = ""
Add   = 0
for C in range(1,6,2):
   Times = Times + C
   Alpha = Alpha + Data[C-1]+"$"
   Add   = Add + Data[C]
   print Times,Add,Alpha
```

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

```
class GRAPH:
   def __init__(self,A=50,B=100):
      self.P1=A
      self.P2=B
   def Up(self,B):
      self.P2 = self.P2 – B
   def Down(self,B):
      self.P2 = self.P2 + 2*B
   def Left(self,A):
      self.P1 = self.P1 – A
   def Right(self,A):
      self.P1 = self.P1 + 2*A
   def Target(self):
      print "(",self.P1.":",self.P2,")"
G1=GRAPH(200,150)
G2=GRAPH()
G3=GRAPH(100)
G1.Left(10)
G2.Up(25)
G3.Down(75)
G1.Up(30)
G3.Right(15)
G1.Target()
G2.Target()
G3.Target()
```

(f) What possible output(s) are expected to be displayed on screen at the time of execution of the program from the following code ? Also specify the maximum values that can be assigned to each of the variables BEGIN and LAST. *2*

```
import random
POINTS=[20,40,10,30,15];
POINTS=[30,50,20,40,45];

BEGIN=random.randint(1,3)
LAST=random.randint(2,4)
for C in range(BEGIN,LAST+1):
  print POINTS[C],"#",
```

(i) **20#50#30#**	(ii) **20#40#45#**
(iii) **50#20#40#**	(iv) **30#50#20#**

2. (a) What is the advantage of super( ) function in inheritance ? Illustrate the same with the help of an example in Python. *2*

(b) *2*

```
class Vehicle:                          #Line 1
    Type = 'Car'                        #Line 2
    def __init__(self, name):           #Line 3
        self.Name = name                #Line 4
    def Show(self):                     #Line 5
        print self.Name,Vehicle.Type    #Line 6

V1=Vehicle("BMW")                       #Line 7
V1.Show()                               #Line 8
Vehicle.Type="Bus"                      #Line 9
V2=Vehicle("VOLVO")                     #Line 10
V2.Show()                               #Line 11
```

(i) What is the difference between the variable in Line 2 and Line 4 in the above Python code ?

(ii) Write the output of the above Python code.

(c) Define a class CONTAINER in Python with the following specifications : *4*

Instance Attributes

```
- Radius,Height   # Radius and Height of Container
- Type            # Type of Container
- Volume          # Volume of Container
```

Methods

```
- CalVolume()     # To calculate volume
                  # as per the Type of container
                  # With the formula as given below :
```

Type	Formula to calculate Volume
1	3.14 * Radius * Height
3	3.14 * Radius * Height/3

```
- GetValue()      # To allow user to enter values of
                  # Radius, Height and Type.
                  # Also, this method should call
                  # CalVolume() to calculate Volume
- ShowContainer() # To display Radius, Height, Type
                  # Volume of the Container
```

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

```
Class Top1(object):
    def __init__(self,tx):                    #Line 1
        self.X=tx                             #Line 2
    def ChangeX(self,tx):
        self.X=self.X+tx
    def ShowX(self):
        print self.X

Class Top2(object):
    def __init__(self,ty):                    #Line 3
        self.Y=ty                             #Line 4
    def ChangeY(self,ty):
        self.Y=self.Y+ty
    def ShowY(self):
        print self.Y,

class Bottom(Top1,Top2):
    def __init__(self,tz):                    #Line 5
        self.Z=tz                             #Line 6
    Top2.__init__(self,2*tz):                 #Line 7
    Top1.__init__(self,3*tz):                 #Line 8
    def ChangeZ(self,tz):
        self.Z=self.Z+tz
        self.ChangeY(2*tz)
        self.ChangeX(3*tz)
    def ShowZ(self):
        print self.Z,
        self.ShowY()
        self.ShowX()
    B=Bottom(1)
    B.ChangeZ(2)
    B.ShowZ()
```

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

(ii) Find and write the output of the above code.

(iii) What are the methods shown in Line 1, Line 3 and Line 5 known as ?

(iv) What is the difference between the statements shown in Line 6 and Line 7 ?

3. (a) Consider the following randomly ordered numbers stored in a list : *3*

786, 234, 526, 132, 345, 467

Show the content of the list after the First, Second and Third pass of the bubble sort method used for arranging in **ascending order** ?

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

(b) Write the definition of a method **ZeroEnding(SCORES)** to add all those values in the list of SCORES, which are ending with zero (0) and display the sum. *3*

For example :

If the SCORES contain [200, 456, 300, 100, 234, 678]

The sum should be displayed as 600

(c) Write AddClient(Client) and DeleteClient(Client) methods in Python to add a new Client and delete a Client from a List of Client Names, considering them to act as insert and delete operations of the queue data structure. *4*

(d) Write a definition of a method COUNTNOW(PLACES) to find and display those place names, in which there are more than 5 characters. *2*

For example :

If the list PLACES contains

```
["DELHI","LONDON","PARIS","NEW YORK","DUBAI"]
```

The following should get displayed :

```
LONDON

NEW YORK
```

(e) Evaluate the following Postfix notation of expression : *2*

```
22,11,/,5,10,*,+,12,-
```

4. (a) Write a statement in Python to open a text file STORY.TXT so that new contents can be added at the end of it. *1*

(b) Write a method in Python to read lines from a text file INDIA.TXT, to find and display the occurrence of the word "India". *2*

For example :
If the content of the file is

"India is the fastest growing economy.
India is looking for more investments around the globe.
The whole world is looking at India as a great market.
Most of the Indians can foresee the heights that India is capable of reaching."

The output should be 4.

(c) Considering the following definition of class MULTIPLEX, write a method in Python to search and display all the contents in a pickled file CINEMA.DAT, where MTYPE is matching with the value 'Comedy'. *3*

```
class MULTIPLEX :
    def __init__(self,mno,mname,mtype):
        self.MNO        = mno
        self.MNAME      = mname
        self.MTYPE      = mtype
    def Show(self):
        print self.MNO:"*",self.MNAME,"$",self.MTYPE
```

SECTION C

[For all the candidates]

5. (a) Observe the following tables VIDEO and MEMBER carefully and write the name of the RDBMS operation out of (i) SELECTION (ii) PROJECTION (iii) UNION (iv) CARTESIAN PRODUCT, which has been used to produce the output as shown below. Also, find the Degree and Cardinality of the final result. *2*

TABLE : VIDEO

VNO	VNAME	TYPE
F101	The Last Battle	Fiction
C101	Angels and Devils	Comedy
A102	Daredevils	Adventure

TABLE : MEMBER

MNO	MNAME
M101	Namish Gupta
M102	Sana Sheikh
M103	Lara James

TABLE : FINAL RESULT

VNO	VNAME	TYPE	MNO	MNAME
F101	The Last Battle	Fiction	M101	Namish Gupta
F101	The Last Battle	Fiction	M102	Sana Sheikh
F101	The Last Battle	Fiction	M103	Lara James
C101	Angels and Devils	Comedy	M101	Namish Gupta
C101	Angels and Devils	Comedy	M102	Sana Sheikh
C101	Angels and Devils	Comedy	M103	Lara James
A102	Daredevils	Adventure	M101	Namish Gupta
A102	Daredevils	Adventure	M102	Sana Sheikh
A102	Daredevils	Adventure	M103	Lara James

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

TABLE : ACCOUNT

ANO	ANAME	ADDRESS
101	Nirja Singh	Bangalore
102	Rohan Gupta	Chennai
103	Ali Reza	Hyderabad
104	Rishabh Jain	Chennai
105	Simran Kaur	Chandigarh

TABLE : TRANSACT

TRNO	ANO	AMOUNT	TYPE	DOT
T001	101	2500	Withdraw	2017-12-21
T002	103	3000	Deposit	2017-06-01
T003	102	2000	Withdraw	2017-05-12
T004	103	1000	Deposit	2017-10-22
T005	101	12000	Deposit	2017-11-06

(i) To display details of all transactions of TYPE Deposit from Table TRANSACT.

(ii) To display the ANO and AMOUNT of all Deposits and Withdrawals done in the month of October 2017 from table TRANSACT.

(iii) To display the last date of transaction (DOT) from the table TRANSACT for the Accounts having ANO as 103.

(iv) To display all ANO, ANAME and DOT of those persons from tables ACCOUNT and TRANSACT who have done transactions less than or equal to 3000.

(v)
```
SELECT ANO, ANAME FROM ACCOUNT
WHERE ADDRESS NOT IN ('CHENNAI', 'BANGALORE');
```

(vi)
```
SELECT DISTINCT ANO FROM TRANSACT;
```

(vii)
```
SELECT ANO, COUNT(*), MIN(AMOUNT) FROM TRANSACT
GROUP BY ANO HAVING COUNT(*)> 1;
```

(viii)
```
SELECT COUNT(*), SUM(AMOUNT) FROM TRANSACT
WHERE DOT <= '2017-06-01';
```

6. (a) State any one Absorption Law of Boolean Algebra and verify it using truth table. *2*

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

$(U' + V).(V' + W')$

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

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

(d) Reduce the following Boolean Expression to its simplest form using K-Map : *3*

$G(U,V,W,Z) = \sum(3,5,6,7,11,12,13,15)$

7. (a) Differentiate between Bus Topology and Star Topology of Networks. What are the advantages and disadvantages of Star Topology over Bus Topology ? *2*

(b) Classify each of the following Web Scripting as Client Side Scripting and Server Side Scripting : *2*

(i) Java Scripting

(ii) ASP

(iii) VB Scripting

(iv) JSP

(c) Write the expanded names for the following abbreviated terms used in Networking and Communications : *2*

(i) SMTP

(ii) VoIP

(iii) GSM

(iv) WLL

(d) CASE STUDY BASED QUESTION :

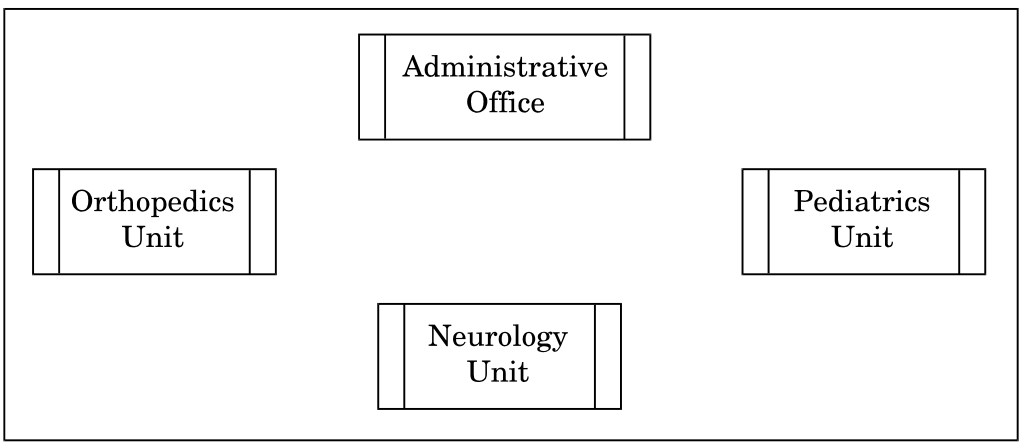
Ayurveda Training Educational Institute is setting up its centre in Hyderabad with four specialised departments for Orthopedics, Neurology and Pediatrics along with an administrative office in separate buildings. The physical distances between these department buildings and the number of computers to be installed in these departments and administrative office are given as follows. You, as a network expert, have to answer the queries as raised by them in (i) to (iv).

Shortest distances between various locations in metres :

Administrative Office to Orthopedics Unit	55
Neurology Unit to Administrative Office	30
Orthopedics Unit to Neurology Unit	70
Pediatrics Unit to Neurology Unit	50
Pediatrics Unit to Administrative Office	40
Pediatrics Unit to Orthopedics Unit	110

Number of Computers installed at various locations are as follows :

Pediatrics Unit	40
Administrative Office	140
Neurology	50
Orthopedics Unit	80



(i) Suggest the most suitable location to install the main server of this institution to get efficient connectivity. *1*

(ii) Suggest the best cable layout for effective network connectivity of the building having server with all the other buildings. *1*

(iii) Suggest the devices to be installed in each of these buildings for connecting computers installed within the building out of the following : *1*

- Gateway
- Modem
- Switch

(iv) Suggest the topology of the network and network cable for efficiently connecting each computer installed in each of the buildings out of the following : *1*

Topologies : Bus Topology, Star Topology

Network Cable : Single Pair Telephone Cable, Coaxial Cable, Ethernet Cable

General Instructions:

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

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

1	**(a)**	Write the type of C++ tokens (keywords and user defined identifiers) from the following: (i) **`else`** (ii) **`Long`** (iii) **`4Queue`** (iv) **`_count`**	2
	Ans	**(i) keyword (ii) Identifier (iii) None (iv) Identifier** **NOTE: Ignore (iii)**	
		(Full 2 Marks for ALL correct answers - (i), (ii) and (iv)) ***(1½ Mark for any TWO correct answers out of (i), (ii) and (iv))*** ***(1 Mark for any ONE correct answer out of (i), (ii) and (iv))***	

	(b)	The following C++ code during compilation reports errors as follows:
		Error: 'ofstream' not declared
		Error: 'strupr' not declared
		Error: 'strcat' not declared
		Error: 'FIN' not declared
		Write the names of the correct header files, which must be included to compile the code successfully:
		`void main()`
		`{`
		`  ofstream FIN("WISH.TXT");`
		`  char TEXT2[]="good day";`
		`  char TEXT1[]="John!";`
		
		`  strupr(TEXT2);`
		`  strcat(TEXT1, TEXT2);`
		`  FIN<<TEXT1<<endl;`
		`}`
			1

	Ans	**(i) fstream (ii) string**	
		(½ Mark for writing each correct answer) ***NOTE: Any other header file to be ignored***	

	(c)	Rewrite the following C++ code after removing any/all syntactical errors with each correction underlined.
		Note: Assume all required header files are already included in the program.
		`Typedef Count int;`
		`void main()`
		`{`
		`  Count C;`
		`  cout<<"Enter the count:";`
		`  cin>>C;`
		`  for (K = 1; K<=C; K++)`
		`  cout<< C "*" K <<endl;`
		`}`
			2

	Ans	`typedef int Count;` `//Error 1, Error 2`
		`void main()`
		`{`
		`  Count C;`
		`  int K;  //OR Count K;` `//Error 3`
		`  cout<<"Enter the count:";`
		`  cin>>C;`
		`  for (K = 1; K<=C; K++)`
		`  //OR for (int K = 1; K<=C; K++)` `//Error 3`
		`  //OR for (Count K = 1; K<=C; K++)` `//Error 3`
		`  cout<< C << "*" << K <<endl;` `//Error 4`
		`  //OR cout<<C * K<<endl;` `//Error 4`
		`}`	

		(½ Mark for correcting each correct Error) ***NOTE:*** ***(1 Mark for only identifying all the 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 Revert(int &Num, int Last=2)`
		`{`
		`  Last=(Last%2==0)?Last+1:Last-1;`
		`  for(int C=1; C<=Last; C++)`
		`  Num+=C;`
		`}`
			3

		`void main()` **`{`** **`int A=20,B=4;`** **`Revert(A,B);`** **`cout<<A<<"&"<<B<<endl;`** **`B--;`** **`Revert(A,B);`** **`cout<<A<<"#"<<B<<endl;`** **`Revert(B);`** **`cout<<A<<"#"<<B<<endl;`** **`}`**	
	Ans	**`35&4`** **`38#3`** **`38#9`**	
		(½ Mark for writing each correct value) ***OR*** ***(Only ½ Mark for writing all '&' 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. **`#define Modify(N) N*3+10`** **`void main()`** **`{`** **`int LIST[]={10,15,12,17};`** **`int *P=LIST, C;`** **`for(C=3; C>=0; C--)`** **`LIST[I]=Modify(LIST[I]);`** **`for (C=0; C<=3; C++)`** **`{`** **`cout<<*P<<":";`** **`P++;`** **`}`** **`}`**	2
	Ans	**Considering `LIST[I]` being replaced with `LIST[C]`** **`40:55:46:61:`**	
		(½ Mark for writing each correct value) ***Note:*** ● ***Deduct ½ Marks if the values are written in reverse order*** ● ***Full 2 marks for writing "undeclared variable `I`"/"Error" / "No Output". Ignore output if the error is mentioned.***	

	(f)	Look at the following C++ code and find the possible output(s) from the options (i) to (iv) following it. Also, write the highest and lowest values that can be assigned in the array A.
		Note:
		● Assume all the required header files are already being included in the code.
		● The function random(n) generates an integer between 0 and n-1.
		`void main()`
		`{`
		`  randomize();`
		`  int A[4], C;`
		`  for(C=0; C<4; C++)`
		`  A[C]=random(C+1)+10;`
		`  for(C=3; C>=0; C--)`
		`  cout<<A[C]<<"@";`
		`}`
		(i) `13@10@11@10@`
		(ii) `15$14$12$10$`
		(iii) `12@11@13@10@`
		(iv) `12@11@10@10@`
			2

	Ans	**(i) and (iv)** **A_{Min} = 10 A_{Max} = 13**	
		(1 Mark for writing the correct options) ***OR*** ***(½ Mark for writing only option (i) OR only option (iv))*** ***NOTE: No marks to be awarded for writing any other option or any other combination*** ***(½ Mark for writing each correct Maximum and Maximum value in array A)***	

2.	**(a)**	Which function(s) out of the following can be considered as overloaded function(s) in the same program? Also, write the reason for not considering the other(s) as overloaded function(s).
		`void Execute(char A,int B);  //Function 1`
		`void Execute(int A,char B);  //Function 2`
		`void Execute(int P=10);  //Function 3`
		`void Execute();  //Function 4`
		`int  Execute(int A);  //Function 5`
		`void Execute(int &K);  //Function 6`
			2

	Ans	**Option [i]** **Functions 1,2,3 are overloaded** **Reason: Function 4,5,6 would give ambiguity for Function 3** **OR Any equivalent valid reason** **OR**	

Option [ii]
Functions 1,2,4,5 are overloaded

Reason: Function 3 and 6 not considered in this case because it would give redeclaration error for Function 5
OR Any equivalent valid reason

OR
Option [iii]
Functions 1,2,4,6 are overloaded

Reason: Function 3 and 5 not considered in this case because it would give redeclaration error for Function 6
OR Any equivalent valid reason

(Full 2 Marks for any of the Options [i] / [ii] / [iii])

NOTE:
- ***Deduct ½ Mark for not stating the reason***
- ***1 Mark for partially correct answer***

OR
(1 Mark for writing only any 2 Functions from Options [i] / [ii] / [iii])
(1½ Mark for writing only any 3 Functions from Options [ii] / [iii])

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

```
class FIRST
{
  int Num1;
public:
  void Display()                    //Member Function 1
  {
     cout<<Num1<<endl;
  }
};
class SECOND: public FIRST
{
  int Num2;
public:
  void Display()                   //Member Function 2
  {
    cout<<Num2<<endl;
  }
};
void main()
{
```

```
  SECOND S;
  _____________________          //Statement 1
  _____________________          //Statement 2
}
```

(i) Which Object Oriented Programming feature is illustrated by the definitions of classes FIRST and SECOND? 1

Ans
Inheritance
OR
Encapsulation
OR
Data Abstraction
OR
Data Hiding

(1 Mark for writing any correct OOP feature from the given answers)

(ii) Write Statement 1 and Statement 2 to execute Member Function 1 and Member Function 2 respectively using the object S. 1

Ans
```
S.FIRST::Display()     //Statement 1
S.Display()            //Statement 2
```
OR
```
S.SECOND::Display()    //Statement 2
```

(½ Mark for writing correct Statement 1)
(½ Mark for writing correct Statement 2)

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

Private Members

```
- Radius,Height // float
- Type          // int  (1 for Cone,2 for Cylinder)
- Volume        // float
- CalVolume()   // Member function to calculate
                // volume as per the Type
```

Type	Formula to calculate Volume
1	3.14*Radius*Height
2	3.14*Radius*Height/3

Public Members

```
- GetValues() // A function to allow user to enter value
              // of Radius, Height and Type. Also, call
              // function CalVolume() from it.
- ShowAll()   // A function to display Radius, Height,
              // Type and Volume of Container
```

Ans
```
class CONTAINER
```

```
{
   float Radius, Height;
   int Type;
   float Volume;
   void CalVolume();
public:
    void GetValues();
    void ShowAll();
};

void CONTAINER::GetValues()
{
    cin>>Radius>>Height>>Type ;
    CalVolume();
}

void CONTAINER::ShowAll()
{
  cout<<Radius<<Height<<Type<<Volume<<endl;
}
```

```
void CONTAINER::CalVolume()
{
if (Type == 1)
Volume=3.14*Radius*Height;
  else if (Type == 2)
Volume=3.14*Radius*Height/3;
}
```

OR

```
void CONTAINER::CalVolume()
{
 switch (Type)
 {
  case 1:
Volume =3.14*Radius*Height;
break;
  case 2:
Volume=3.14*Radius*Height/3;
  }
}
```

(½ Mark for declaring class header correctly)
(½ Mark for declaring data members correctly)
(1 Mark for defining CalVolume() correctly)
(½ Mark for taking inputs of Radius, Type and Height in GetValues())
(½ Mark for invoking CalVolume() inside GetValues())
(½ Mark for defining ShowAll() 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*
- *Marks not to be deducted for replacing the Formulae for calculating*

		the Volumes with correct Formulae	

	(d)	Answer the questions (i) to (iv) based on the following:
		`class Teacher`
		`{`
		`  int  TCode;`
		`protected:`
		`  char  Name[20];`
		`public:`
		`  Teacher();`
		`  void  Enter(); void Show();`
		`};`
		`class Course`
		`{`
		`  int ID;`
		`protected:`
		`  Char  Title[30];`
		`public:`
		`  Course();`
		`  void  Initiate();`
		`  void  Display();`
		`};`
		`class Schedule: public Course, private Teacher`
		`{`
		`  int DD,MM,YYYY;`
		`public:`
		`  Schedule();`
		`  void Start();`
		`  void View();`
		`};`
		`void main()`
		`{`
		`  Schedule S;`
		`}`
			4

	(i)	Which type of Inheritance out of the following is illustrated in the above example? Single Level Inheritance, Multilevel Inheritance, Multiple Inheritance	
	Ans	**Multiple Inheritance**	
		(1 Mark for writing correct option)	
	(ii)	Write the names of all the members, which are directly accessible by the member function View() of class Schedule.	

	Ans	`Start(), DD, MM, YYYY`
		`Display(), Initiate(), Title`
		`Enter(), Show(), Name`
		`View()  // Optional`	

		(1 Mark for writing all correct member names)	

		NOTE: ● ***Marks not to be awarded for partially correct answer*** ● ***Ignore the mention of Constructors***	
	(iii)	Write the names of all the members, which are directly accessible by the object S of class Schedule declared in the main() function.	
	Ans	`View(), Start()` `Display(), Initiate()`	
		(1 Mark for writing all correct member names) ***NOTE:*** ● ***Marks not to be awarded for partially correct answer*** ● ***Ignore the mention of Constructors***	
	(iv)	What will be the order of execution of the constructors, when the object S of class Schedule is declared inside main() function?	
	Ans	**Course(), Teacher(), Schedule()**	
		(1 Mark for writing correct order) ***NOTE:*** ● ***No Marks to be awarded for any other combination/order.*** ● ***Names of the constructor/class without parentheses is acceptable***	
3	**(a)**	Write the definition of a function **SumEO(int VALUES[], int N)** in C++, which should display the sum of even values and sum of odd values of the array separately. Example: if the array VALUES contains 25 | 20 | 22 | 21 | 53 Then the functions should display the output as: Sum of even values = 42 (i.e 20+22) Sum of odd values = 99 (i.e 25+21+53)	2

	Ans	`void SumEO(int VALUES[], int N)`
		`{`
		`  int SE = 0, SO = 0;`
		`  for (int I=0;I<N;I++)`
		`  {`
		`  if(VALUES[I] %2 == 0)`
		`  SE += VALUES[I];`
		`  else`
		`  SO += VALUES[I];`
		`  }`
		`  cout<< "Sum of even values = " << SE<<endl;`
		`  cout<< "Sum of odd values = "  << SO<<endl;`
		`}`
		OR
		Any other correct alternative code in C++	

		(½ Mark for correctly writing the loop) ***(½ Mark for adding even elements)***	

		(½ Mark for adding odd elements) ***(½ Mark for displaying the sum of even and odd elements)***	
	(b)	Write definition for a function **UpperHalf(int Mat[4][4])** in C++, which displays the elements in the same way as per the example shown below. For example, if the content of the array Mat is as follows: 25 24 23 22 20 19 18 17 15 14 13 12 10 9 8 7 The function should display the content in the following format: 25 24 23 22 20 19 18 15 14 10	3

	Ans	`void UpperHalf(int Mat[4][4])`
		`{`
		`  for (int I=0;I<4;I++)`
		`  {`
		`  for (int J=0;J<4-I;J++)`
		`  cout<<MAT[I][J]<< "  " ;`
		`  cout<<endl;`
		`  }`
		`}`
		OR
		`void UpperHalf(int Mat[4][4])`
		`{`
		`  for (int I=0;I<4;I++)`
		`  {`
		`  for (int J=0;J<4;J++)`
		`  if ((I+J)<=3)`
		`  cout<<MAT[I][J]<< "  " ;`
		`  cout<<endl;`
		`  }`
		`}`
		OR
		Any other correct alternative code in C++	

		(½ Mark for correctly writing loop for traversing rows) ***(½ Mark for correctly writing loop for traversing columns in each row)*** ***(1 Mark for correctly checking elements for display)*** ***(½ Mark for correctly displaying the selected elements)*** ***(½ Mark for correctly displaying line break after each row)***	
	(c)	Let us assume Data[20][15] is a two dimensional array, which is stored in the memory along the row with each of its element occupying 2 bytes, find the	3

		address of the element Data[10][5], if the element Data[15][10] is stored at the memory location 15000.	

	Ans	`LOC(Data[10][5]) = LOC(Data[15][10])+2(15*(10-15)+(5-10))`
		`= 15000 + 2((-75) + (-5))`
		`= 15000 + 2(-80)`
		`= 15000 - 160`
		`= 14840`
		OR
		`LOC(Data[I][J]) = Base(Data)+W*(NC*(I-LBR)+(J-LBC))`
		`Taking LBR=0, LBC=0`
		`LOC(Data[15][10]) = Base(Data)+2*(15*15+10)`
		`15000 = Base(Data)+2*(15*15+10)`
		`Base(Data) = 15000 - 2*(235)`
		`Base(Data) = 15000 - 470`
		`Base(Data) = 14530`
		`LOC(Data[10][5])= 14530 + 2*(10*15+5)`
		`= 14530 + 2*(155)`
		`= 14530 + 310`
		`= 14840`
		OR
		`LOC(Data[I][J]) = Base(Data)+W*(NC*(I-LBR)+(J-LBC))`
		`Taking LBR=1, LBC=1`
		`LOC(Data[15][10]) = Base(Data)+2*(15*14+9)`
		`15000 = Base(Data)+2*(15*14+9)`
		`Base(Data) = 15000 - 2*(219)`
		`Base(Data) = 15000 - 438`
		`Base(Data) = 14562`
		`LOC(Data[10][5])= 14562 + 2*(15*9+4)`
		`= 14562 + 2*(139)`
		`= 14562 + 278`
		`= 14840`	

		(1 Mark for writing correct formula (for Row major) ***OR substituting formula with correct values)*** ***(1 Mark for correct step calculations)*** ***(1 Mark for final correct address)*** ***NOTE:*** ● ***Marks to be awarded for calculating the address taking LBR and LBC = 1***	

	(d)	Write the definition of a member function AddPacket() for a class QUEUE in C++, to remove/delete a Packet from a dynamically allocated QUEUE of Packets considering the following code is already written as a part of the program.
		`struct Packet`
		`{`
		`int PID;`
			4

```
  char    Address[20];
  Packet  *LINK;
};
class QUEUE
{
  Packet *Front, *Rear;
public:
  QUEUE(){Front=NULL;Rear=NULL;}
  void AddPacket();
  void DeletePacket();
  ~QUEUE();
};
```

Ans

```
void QUEUE::AddPacket()
{
  if(Front != NULL)
  {
    Packet *T;
    T=Front;
    cout<<Front->PID<<Front->Address<<" removed"<<endl;
    //OR cout<<T->PID<<T->Address<<" removed"<<endl;
    Front = Front->LINK;
    delete T;
    if (Front==NULL)
      Rear=NULL;
  }
  else
     cout<< "Queue Empty"<<endl;
}
```

OR

Any other equivalent code in C++

(1 Mark for checking EMPTY condition)

(½ Mark for declaring Packet T)

(½ Mark for assigning Front to T)

(½ Mark for deleting the previous Front Packet)

(½ Mark for changing LINK of Front)

(1 Mark for reassigning Rear with NULL if Queue becomes empty on deletion)

NOTE:

- *Marks should not be deducted if function header is written as*

  `void QUEUE::DeletePacket()` *instead of*

  `void QUEUE::AddPacket()`

- *4 Marks to be awarded if Addition of Packet is done in place of Deletion according to the following distribution*
  - *(1 Mark for creating a new Packet)*
  - *(½ Mark for entering data for the new Packet)*
  - *(½ Mark for assigning NULL to link of the new Packet)*
  - *(½ Mark for assigning Front to the first Packet as Front = T)*

- ***(½ Mark for linking the last Packet to the new Packet as Rear->LINK =T)***
- ***(1 Mark for assigning Rear to the new Packet as Rear = T)***

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

U * V + (W - Z) / X

Ans **((U * V) + ((W - Z) / X))**

INFIX	STACK	POSTFIX
U		U
*	*	U
V	*	UV
)		UV*
+	+	UV*
W		UV*W
-	+ -	UV*W
Z	+ -	UV*WZ
)	+	UV*WZ-
/	+ /	UV*WZ-
X	+ /	UV*WZ-X
)	+	UV*WZ-X/
)		UV*WZ-X/+

OR

U * V + (W - Z) / X

INFIX	STACK	POSTFIX
U		U
*	*	U
V	*	UV
+	+	UV*
(	+(	UV*
W	+(	UV*W
-	+(-	UV*W
Z	+(-	UV*WZ
)	+	UV*WZ-
/	+/	UV*WZ-
X	+/	UV*WZ-X
		UV*WZ-X/+

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

		(1 Mark for only the final answer as **UV*WZ-X/+** ***)***	
4.	**(a)**	A text file named **MATTER.TXT** contains some text, which needs to be displayed such that every next character is separated by a symbol '#'. Write a function definition for **HashDisplay**() in C++ that would display the entire content of the file **MATTER.TXT** in the desired format. Example: If the file MATTER.TXT has the following content stored in it: **THE WORLD IS ROUND** The function **HashDisplay**() should display the following content: **T#H#E# #W#O#R#L#D# #I#S# #R#O#U#N#D#**	3

	Ans	**void HashDisplay()**
		{
		char ch;
		ifstream F("MATTER.TXT");
		while(F.get(ch))
		cout<<ch<<'#';
		F.close(); //IGNORE
		}
		OR
		Any other correct function definition
		
		`ifstream F;`
		`F.open("MATTER.TXT");`
		`OR`
		`fstream F;`
		`F.open("MATTER.TXT", ios::in);`
		`OR`
		`fstream F("MATTER.TXT", ios::in);`	

		(1 Mark for opening **MATTER.TXT** ***correctly)*** ***(1 Mark for reading each character (using any method) from the file)*** ***(½ Mark for displaying the character)*** ***(½ Mark for displaying a # following the character)***	

	(b)	Write a definition for function TotalTeachers( ) in C++ to read each object of a binary file SCHOOLS.DAT, find the total number of teachers, whose data is stored in the file and display the same. Assume that the file SCHOOLS.DAT is created with the help of objects of class SCHOOLS, which is defined below:
		class SCHOOLS
		{
		int SCode; // School Code
		char SName[20]; // School Name
		int NOT; // Number of Teachers in the school
		public:
		void Display()
		{cout<<SCode<<"#"<<SName<<"#"<<NOT<<endl;}
		int RNOT(){return NOT;}
		};
			2

	Ans	**void TotalTeachers()**
		{
		ifstream F;
		F.open("SCHOOLS.DAT",ios::binary);
		
		`OR`
		`fstream F;`	

```
 int Count=0;
 SCHOOLS S;

 while(F.read((char*)&S,sizeof(S)))
   Count += S.RNOT();

 cout<<"Total number of teachers :"<<Count<<endl;
 F.close();  //IGNORE
}
```

OR

```
void TotalTeachers()
{
 ifstream F;
 F.open("SCHOOLS.DAT",ios::binary);
 SCHOOLS S;
 while(F.read((char*)&S,sizeof(S)))
   cout<<S.RNOT()<<endl;//OR S.Display();
 F.close();  //IGNORE
}
```

```
OR
fstream F;
F.open("SCHOOLS.DAT",ios::binary|ios::in);
```

OR

Any other correct function definition

(½ Mark for opening* SCHOOLS.DAT *correctly)
(½ Mark for reading each record from the file)

(½ Mark for finding Total number of teachers)
(½ Mark for displaying Total number of teachers)
OR
(1 mark for displaying number of teachers in Each Record)

(c) Find the output of the following C++ code considering that the binary file SCHOOLS.DAT exists on the hard disk with the following records of 10 schools of the class SCHOOLS as declared in the previous question (4 b). **1**

SCode	SName	NOT
1001	Brains School	100
1003	Child Life School	115
1002	Care Share School	300
1006	Educate for Life School	50
1005	Guru Shishya Sadan	195
1004	Holy Education School	140
1010	Rahmat E Talim School	95
1008	Innovate Excel School	300
1011	Premier Education School	200
1012	Uplifted Minds School	100

```
void main()
{
```

```
  fstream SFIN;
  SFIN.open("SCHOOLS.DAT",ios::binary|ios::in);
  SCHOOLS S;
  SFIN.seekg(5*sizeof(S));
  SFIN.read((char*)&S, sizeof(S));
  S.Display();
  cout<<"Record :"<<SFIN.tellg()/sizeof(S) + 1<<endl;
  SFIN.close();
}
```

Ans

```
1004#Holy Education School#140
Record :7
```

(½ Mark for displaying correct values of Record 6)
(½ Mark for displaying correct value of SFIN.tellg()/sizeof(B) + 1)

SECTION B - [Only for candidates, who opted for Python]

1 (a) Differentiate between Syntax Error and Run-Time Error? Also, write a suitable example in Python to illustrate both. **2**

Ans

Syntax error: An error of language resulting from code that does not conform to the syntax of the programming language.
Example

```
a = 0
while a < 10   # : is missing as per syntax
      a = a + 1
      print a
```

Runtime error: A runtime error is an error that causes abnormal termination of program during running time..
Example

```
A=10
B=int(raw_input("Value:"))
print A/B
# If B entered by user is 0, it will be run-time error
```

(½ mark each for defining syntax error and run-time error)
(½ mark for each correct example)
OR
(Full 2 Marks for illustrating both through examples)

(b) Name the Python Library modules which need to be imported to invoke the following functions: **1**

(i) `sin()` **(ii)** `search()`

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
		Val = int(rawinput("Value:")) **Adder = 0** **for C in range(1,Val,3)** **Adder+=C** **if C%2=0:** **Print C*10** **Else:** **print C*** **print Adder**	
	Ans	**Val = int(raw_input("Value:")) # Error 1** **Adder = 0** **for C in range(1,Val,3) : # Error 2** **Adder+=C** **if C%2==0: # Error 3** **print C*10 # Error 4** **else: # Error 5** **print C # Error 6** **print Adder** **OR** **Corrections mentioned as follows:** **raw_input in place of rawinput** **: to be placed in for** **== in place of =** **print in place of Print** **else in place of Else** **C* is invalid, replaced by a suitable integer or C**	
		(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
		Data = ["P",20,"R",10,"S",30] **Times = 0** **Alpha = ""** **Add = 0** **for C in range(1,6,2):** **Times= Times + C**	

		`Alpha= Alpha + Data[C-1]+"$"`
		`Add = Add + Data[C]`
		`print Times,Add,Alpha`	

	Ans	`1 20 P$`
		`4 30 P$R$`
		`9 60 P$R$S$`	

		(1 Mark for each correct line of output) *Note:* ● *½ Mark deduction for not considering all line changes*	
	(e)	Find and write the output of the following python code:	3

		`class GRAPH:`
		`  def __init__(self,A=50,B=100):`
		`  self.P1=A`
		`  self.P2=B`
		`  def Up(self,B):`
		`  self.P2 = self.P2 - B`
		`  def Down(self,B):`
		`  self.P2 = self.P2 + 2*B`
		`  def Left(self,A):`
		`  self.P1 = self.P1 - A`
		`  def Right(self,A):`
		`  self.P1 = self.P1 + 2*A`
		`  def Target(self):`
		`  print "(",self.P1.":",self.P2,")"`
		`G1=GRAPH(200,150)`
		`G2=GRAPH()`
		`G3=GRAPH(100)`
		`G1.Left(10)`
		`G2.Up(25)`
		`G3.Down(75)`
		`G1.Up(30)`
		`G3.Right(15)`
		`G1.Target()`
		`G2.Target()`
		`G3.Target()`	

	Ans	`( 190 : 120 )`
		`( 50 : 75 )`
		`( 130 : 250 )`	

		(1 mark for each correct line of output) *OR* *(Full 3 marks to be awarded if "Error" / "No Output" in print "(",self.P1.":",self.P2,")" is mentioned)* *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 maximum values that can be assigned to each of the variables BEGIN and LAST.	2
		`import random` **`POINTS=[20,40,10,30,15];`** **`POINTS=[30,50,20,40,45];`** **`BEGIN=random.randint(1,3)`** **`LAST=random.randint(2,4)`** **`for C in range(BEGIN,LAST+1):`** **`  print POINTS[C],"#",`**	
		(i) **`20#50#30#`** (ii) **`20#40#45#`** (iii) **`50#20#40#`** (iv) **`30#50#20#`**	
	Ans	**`(ii)  20#40#45# and (iii) 50#20#40#`**	
		Max value for BEGIN 3 **Max value for LAST 4**	
		(1 Mark for writing the correct options) ***OR*** ***(½ Mark for writing only option (ii))*** ***OR*** ***(½ Mark for writing only option (iii))*** ***OR*** ***(Full 2 Marks to be awarded if "ERROR"/ "NO OUTPUT" mentioned)*** ***NOTE: No marks to be awarded for writing any other option or any other combination*** ***(½ Mark for writing correct Maximum value of BEGIN)*** ***(½ Mark for writing correct Maximum value of LAST)***	
2	**(a)**	What is the advantage of super() function in inheritance? Illustrate the same with the help of an example in Python.	2
	Ans	In Python, super() function is used to call the methods of base class which have been extended in derived class. **`class person(object):`** **`  def __init__(self,name,age):`** **`  self.name=name`** **`  self.age=age`** **`  def display(self):`**	

```
          print self,name, self.Age
class student(person):
     def __init__(self,name,age,rollno,marks):
          super(student,self)._init_(self, name, age)
          self.rollno=rollno
          self.marks=marks
     def getRoll(self):
          print self.rollno, self.marks
```

(1 mark for mentioning the advantage, 1 mark for writing any suitable example)

(b)

```
class Vehicle:                          #Line 1
    Type = 'Car'                        #Line 2
    def __init__(self, name):           #Line 3
        self.Name = name                #Line 4
    def Show(self):                     #Line 5
        print self.Name,Vehicle.Type    #Line 6

V1=Vehicle("BMW")                       #Line 7
V1.Show()                               #Line 8
Vehicle.Type="Bus"                      #Line 9
V2=Vehicle("VOLVO")                     #Line 10
V2.Show()                               #Line 11
```

2

(i) What is the difference between the variable in Line 2 and Line 4 in the above Python code?

Ans The variable in Line 2 is a class attribute. This belongs to the class itself. These attributes will be shared by all the instances.
The variable in Line 4 is an instance attribute. Each instance creates a separate copy of these variables.

(1 mark for correct difference)

(ii) Write the output of the above Python code.

Ans BMW Car
VOLVO Bus

(½ for writing each correct line of output)

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

Instance Attributes

```
- Radius,Height   # Radius and Height of Container
- Type            # Type of Container
- Volume          # Volume of Container
```

Methods

```
- CalVolume()      # To calculate volume
                   # as per the Type of container
                   # With the formula as given below:
```

Type	Formula to calculate Volume
1	3.14 * Radius * Height
3	3.14 * Radius * Height/3

```
- GetValue()       # To allow user to enter values of
                   # Radius, Height and Type.
                   # Also, this method should call
                   # CalVolume() to calculate Volume
- ShowContainer()# To display Radius, Height, Type
                   # Volume of the Container
```

Ans

```
class CONTAINER: # class CONTAINER():/class CONTAINER(Object):
    def __init__(self):         # def __init__(self,R,H,T,V):
        self.Radius=0           #       self.Radius=R
        self.Height=0           #       self.Height=H
        self.Type  =0           #       self.Type=T
        self.Volume=0           #       self.Volume=V

    def CalVolume(self):
        if self.Type == 1:
            self.Volume = 3.14 * self.Radius * self.Height
        elif self.Type ==3:
            self.Volume = 3.14 * self.Radius * self.Height /3
    def GetValue(self):
        self.Radius = input("Enter Radius")
        self.Height = input("Enter Height")
        self.Type = input("Enter type")
        self.CalVolume()        # OR     CalVolume(self)
    def ShowContainer(self):
        print self.Radius
        print self.Height
        print self.Type
        print self.Volume
```

(½ Mark for correct syntax for class header)
(½ Mark for correct declaration of instance attributes)
(1 Mark for correct definition of CalVolume() function)
(1 Mark for correct definition of GetValue() with proper invocation of CalVolume( ))
(1 Mark for correct definition of ShowContainer())

		NOTE: • ***Deduct ½ Mark if CalVolume() is not invoked properly inside NewBox() function*** • ***Marks not to be deducted for replacing the Formulae for calculating the Volumes with correct Formulae***	

	(d)	Answer the questions (i) to (iv) based on the following:
		`Class Top1(object):`
		`  def __init__(self,tx):  #Line 1`
		`  self.X=tx  #Line 2`
		`  def ChangeX(self,tx):`
		`  self.X=self.X+tx`
		`  def ShowX(self):`
		`  print self.X`
		
		`Class Top2(object):`
		`  def __init__(self,ty):  #Line 3`
		`  self.Y=ty  #Line 4`
		`  def ChangeY(self,ty):`
		`  self.Y=self.Y+ty`
		`  def ShowY(self):`
		`  print self.Y,`
		
		`class Bottom(Top1,Top2):`
		`  def __init__(self,tz):  #Line 5`
		`  self.Z = tz  #Line 6`
		`  Top2.__init__(self,2*tz)  #Line 7`
		`  Top1.__init__(self,3*tz)  #Line 8`
		`  def ChangeZ(self,tz):`
		`  self.Z=self.Z+tz`
		`  self.ChangeY(2*tz)`
		`  self.ChangeX(3*tz)`
		`  def ShowZ(self):`
		`  print self.Z,`
		`  self.ShowY()`
		`  self.ShowX()`
		`  B=Bottom(1)`
		`  B.ChangeZ(2)`
		`  B.ShowZ()`
			4

	(i)	Write the type of the inheritance illustrated in the above.	
	Ans	Multiple Inheritance	

		(1 Mark for writing correct Inheritance type)	
	(ii)	Find and write the output of the above code.	
	Ans	**3 6 9** **OR** "Error" / "No Output"	
		(1 Mark for writing correct answer)	
	(iii)	What are the methods shown in Line 1, Line 3 and Line 5 are known as?	
	Ans	Constructors	
		(1 Mark for writing correct answer)	
	(iv)	What is the difference between the statements shown in Line 6 and Line 7?	
	Ans	Initializing the member of child class in Line 6 and calling the parent class constructor in Line 7	
		(1 Mark for writing correct answer)	
3	**(a)**	Consider the following randomly ordered numbers stored in a list 786, 234, 526, 132, 345, 467, Show the content of list after the First, Second and Third pass of the bubble sort method used for arranging in **ascending order**? Note: Show the status of all the elements after each pass very clearly underlining the changes.	3
	Ans	I Pass **234, 526, 132, 345, 467, 786** II Pass **234, 132, 345, 467, 526, 786** III Pass **132, 234, 345, 467, 526, 786**	
		(1 mark for each correct pass)	
	(b)	Write definition of a method **ZeroEnding(SCORES)** to add all those values in the list of SCORES, which are ending with zero (0) and display the sum. For example, If the SCORES contain [200,456,300,100,234,678] The sum should be displayed as 600	3

	Ans	`def ZeroEnding(SCORES):`
		`  s=0`
		`  for i in SCORES:`
		`  if i%10==0:`
		`  s=s+i`
		`  print s`	

		(½ mark for function header) ***(½ mark for initializing s (sum) with 0)***	

		(½ mark for reading each element of the list using a loop) ***(½ mark for checking whether the value is ending with 0)*** ***(½ mark for adding it to the sum)*** ***(½ mark for printing or returning the value)***	
	(c)	Write AddClient(Client) and DeleteCleint(Client) methods in python to add a new Client and delete a Client from a List of Client Names, considering them to act as insert and delete operations of the queue data structure.	4
	Ans	**def AddClient(Client):** **C=raw_input("Client name: ")** **Client.append(C)** **def DeleteClient(Client):** **if (Client==[]):** **print "Queue empty"** **else:** **print Client[0],"Deleted"** **del Client[0] # OR Client.pop(0)** **OR** **class queue:** **Client=[]** **def AddClient(self):** **a=raw_input("Client name: ")** **queue.Client.append(a)** **def DeleteClient(self):** **if (queue.Client==[]):** **print "Queue empty"** **else:** **print queue.Client[0],"Deleted"** **del queue.Client[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)***	
	(d)	Write definition of a Method COUNTNOW(PLACES) to find and display those place names, in which there are more than 5 characters. For example:	2
		If the list PLACES contains **["DELHI","LONDON","PARIS","NEW YORK","DUBAI"]** The following should get displayed **LONDON** **NEW YORK**	
	Ans	**def COUNTNOW(PLACES):**	

```
for P in PLACES:
    if len(P)>5:
        print P
```

(1 Mark for correct loop)
(½ Mark for checking length of place name)
(½ Mark for display desired place names)

(e) Evaluate the following Postfix notation of expression: 2

22,11,/,5,10,*,+,12,-

Ans

Element	Stack Contents
22	22
11	22, 11
/	2
5	2, 5
10	2, 5, 10
*	2, 50
+	52
12	52, 12
-	40

OR
Any other way of stepwise evaluation

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

4 **(a)** Write a statement in Python to open a text file STORY.TXT so that new contents can be added at the end of it. 1

Ans `file= open("STORY.TXT","a")` **OR** `file.open("STORY.TXT","a")`

(1 mark for correct statement)

(b) Write a method in python to read lines from a text file INDIA.TXT, to find and display the occurrence of the word "India". 2
For example:
If the content of the file is

"India is the fastest growing economy.
India is looking for more investments around the globe.
The whole world is looking at India as a great market.
Most of the Indians can foresee the heights that India is capable of reaching."

The output should be 4

	Ans	**def display1():** **c=0** **file=open('INDIA.TXT','r')** **c=0** **for LINE in file:** **Words = LINE.split()** **for W in Words:** **if W=="India":** **c=c+1** **print c** **file.close()** **OR** **def display():** **c=0** **file=open('INDIA.TXT','r')** **lines = file.read() # lines = file.readline()** **while lines:** **words = lines.split()** **for w in words:** **if w=="India":** **c=c+1** **lines = file.read() # lines = file.readline()** **print 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)* *Note: Ignore if try: except:*	
	(c)	Considering the following definition of class MULTIPLEX, write a method in python to search and display all the content in a pickled file CINEMA.DAT, where MTYPE is matching with the value 'Comedy'. **class MULTIPLEX:** **def __init__(self,mno,mname,mtype):** **self.MNO = mno** **self.MNAME = mname** **self.MTYPE = mtype** **def Show(self):** **print self.MNO:"*",self.MNAME,"$",self.MTYPE**	3
	Ans	**def Search():** **file=open('CINEMA.DAT','rb')** **try:** **while True:** **M=pickle.load(file)** **if M.MTYPE=="Comedy":** **M.Show()** **except EOFError:** **pass**	

```
    file.close()
```

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

SECTION C - (For all the candidates)

5 (a) Observe the following tables VIDEO and MEMBER carefully and write the name of the RDBMS operation out of (i) SELECTION (ii) PROJECTION (iii) UNION (iv) CARTESIAN PRODUCT, which has been used to produce the output as shown below, Also, find the Degree and Cardinality of the final result. 2

TABLE: VIDEO

VNO	VNAME	TYPE
F101	The Last Battle	Fiction
C101	Angels and Devils	Comedy
A102	Daredevils	Adventure

TABLE: MEMBER

MNO	MNAME
M101	Namish Gupta
M102	Sana Sheikh
M103	Lara James

FINAL RESULT

VNO	VNAME	TYPE	MNO	MNAME
F101	The Last Battle	Fiction	M101	Namish Gupta
F101	The Last Battle	Fiction	M102	Sana Sheikh
F101	The Last Battle	Fiction	M103	Lara James
C101	Angels and Devils	Comedy	M101	Namish Gupta
C101	Angels and Devils	Comedy	M102	Sana Sheikh
C101	Angels and Devils	Comedy	M103	Lara James
A102	Daredevils	Adventure	M101	Namish Gupta
A102	Daredevils	Adventure	M102	Sana Sheikh
A102	Daredevils	Adventure	M103	Lara James

Ans **CARTESIAN PRODUCT**

OR Option (iv)

DEGREE = 5
CARDINALITY = 9

(1 Mark for writing CARTESIAN PRODUCT OR Option (iv))
(½ Mark for writing correct Degree)
(½ Mark for writing correct Cardinality)

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

Table: ACCOUNT

ANO	ANAME	ADDRESS
101	Nirja Singh	Bangalore
102	Rohan Gupta	Chennai
103	Ali Reza	Hyderabad
104	Rishabh Jain	Chennai
105	Simran Kaur	Chandigarh

Table: TRANSACT

TRNO	ANO	AMOUNT	TYPE	DOT
T001	101	2500	Withdraw	2017-12-21
T002	103	3000	Deposit	2017-06-01
T003	102	2000	Withdraw	2017-05-12
T004	103	1000	Deposit	2017-10-22
T005	101	12000	Deposit	2017-11-06

(i) To display details of all transactions of TYPE Deposit from Table TRANSACT.

Ans

```
SELECT * FROM TRANSACT WHERE TYPE = 'Deposit';
```

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

(ii) To display the ANO and AMOUNT of all Deposits and Withdrawals done in the month of October 2017 from table TRANSACT.

Ans

```
SELECT ANO,AMOUNT FROM TRANSACT
WHERE DOT >= '2017-10-01' AND DOT <= '2017-10-31';
OR
SELECT ANO,AMOUNT FROM TRANSACT
WHERE DOT BETWEEN '2017-10-01' AND '2017-10-31';
```

(½ Mark for correct SELECT statement)

		(½ Mark for correct WHERE clause) *Note:* • *No marks to be deducted if MONTH() is used.* • *No marks to be deducted if LIKE clause is used correctly.*	
	(iii)	To display the last date of transaction (DOT) from the table TRANSACT for the Accounts having ANO as 103.	
	Ans	**SELECT MAX(DOT) FROM TRANSACT WHERE ANO = 103;**	
		(½ Mark for correct SELECT statement) *(½ Mark for correct WHERE clause)*	
	(iv)	To display all ANO, ANAME and DOT of those persons from tables ACCOUNT and TRANSACT who have done transactions less than or equal to 3000.	
	Ans	**SELECT ACCOUNT.ANO,ANAME,DOT FROM ACCOUNT,TRANSACT WHERE ACCOUNT.ANO=TRANSACT.ANO AND AMOUNT <=3000;** **OR** **SELECT A.ANO,ANAME,DOT FROM ACCOUNT A,TRANSACT T WHERE A.ANO=T.ANO AND AMOUNT <=3000;**	
		(½ Mark for correct SELECT statement) *(½ Mark for correct WHERE clause)* *NOTE:* • *Marks not to be deducted for writing* **SELECT ANO** *instead of* **SELECT ACCOUNT.ANO / SELECT A.ANO**	
	(v)	**SELECT ANO, ANAME FROM ACCOUNT** **WHERE ADDRESS NOT IN ('CHENNAI', 'BANGALORE');**	
	Ans	**ANO ANAME** **103 Ali Reza** **105 Simran Kaur** **OR** **ANO ANAME** **101 Nirja Singh** **102 Rohan Gupta** **103 Ali Reza** **104 Rishabh Jain** **105 Simran Kaur**	
		(½ Mark for correct output)	
	(vi)	**SELECT DISTINCT ANO FROM TRANSACT;**	
	Ans	**DISTINCT ANO** **101** **102** **103**	

(½ Mark for correct output)
NOTE: Values may be written in any order

(vii)

```
SELECT ANO, COUNT(*), MIN(AMOUNT) FROM TRANSACT
GROUP BY ANO HAVING COUNT(*)> 1;
```

Ans

ANO	COUNT(*)	MIN(AMOUNT)
101	2	2500
103	2	1000

(½ Mark for correct output)
NOTE: Values may be written in any order

(viii)

```
SELECT COUNT(*), SUM(AMOUNT) FROM TRANSACT
WHERE DOT <= '2017-06-01';
```

Ans

COUNT(*)	SUM(AMOUNT)
2	5000

(½ Mark for correct output)

6 (a) State any one Absorption Law of Boolean Algebra and verify it using truth table. 2

Ans

X + X . Y = X

Verification:

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

OR

X . (X + Y)= X

Verification:

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

OR

X + X′ . Y = X + Y

Verification:

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

OR

X . (X′+ Y)= X . Y
Verification:

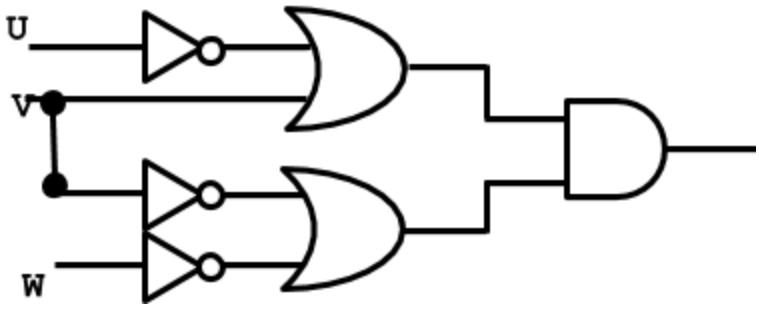
X	Y	X′	X′+ Y	X.(X′+Y)	X.Y
0	0	1	1	0	0
0	1	1	1	0	0
1	0	0	0	0	0
1	1	0	1	1	1

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

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

(U′+V) . (V′+W′)

Ans



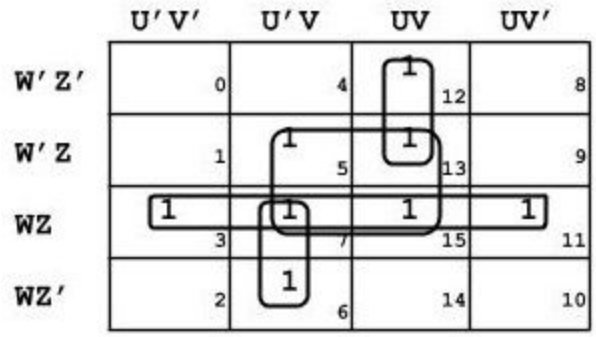
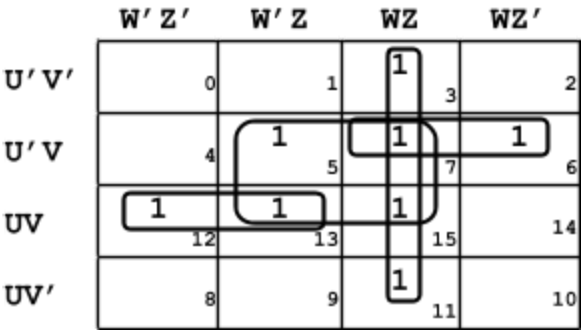
(Full 2 Marks for drawing the Logic Circuit for the expression correctly)
OR
(½ Mark for drawing Logic circuit for (U' + V) correctly)
(½ Mark for drawing Logic circuit for (V' + W') correctly)

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

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

Ans **FN(X,Y,Z)= (X+Y′+Z) . (X+Y′+Z′) . (X′+Y+Z′) . (X′+Y′+Z)**
OR
FN(X,Y,Z)= ∏(2,3,5,6)

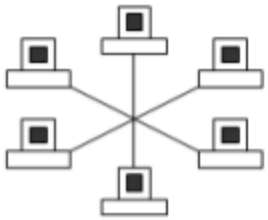
(1 Mark for correctly writing the POS form)
OR
(½ Mark for any two correct terms)
Note: Deduct ½ mark if wrong variable names are written in the expression

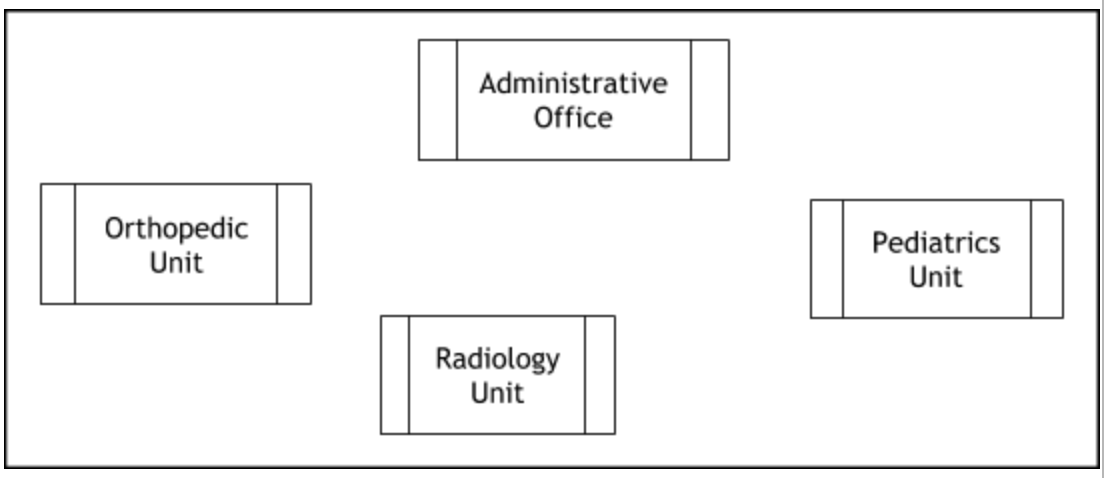
	(d)	Reduce the following Boolean Expression to its simplest form using K-Map:	3
		G(U,V,W,Z) = ∑(3,5,6,7,11,12,13,15)	
		 **OR**  **F(U,V,W,Z)= VZ + WZ + UVW'+ U'VW**	
		(½ Mark for drawing K-Map and correctly plotting 1s in the given cells) ***(½ Mark each for 4 groupings)*** ***(½ Mark for writing final expression in reduced/minimal form)*** ***Note:*** ● ***Deduct ½ mark if wrong variable names are used***	
7	**(a)**	Differentiate between Bus Topology and Star Topology of Networks. What are the advantages and disadvantages of Star Topology over Bus Topology?	2
	Ans		

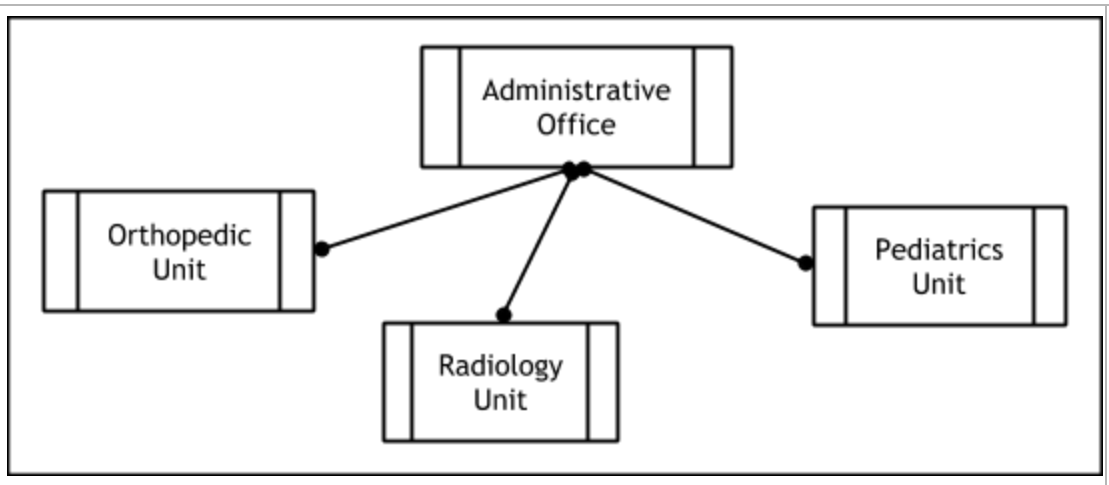
Bus Topology	**Star Topology**
It is characterised by common transmission medium shared by all the connected nodes.	It is characterised by central switching node connected directly to each of multiple nodes in the network.

OR

Bus Topology	**Star Topology**

		  **Advantages of Star Topology over Bus Topology** ● Faster communication as compared to Bus topology ● Independent line of connection allows freedom of removing or adding nodes from the network **Disadvantages of Star Topology over Bus Topology** ● Expensive as compared to Bus topology ● Long cable length	
		(1 Mark for writing any correct difference between Bus and Star Topology) ***(½ Mark for writing any correct advantage of Star Topology over Bus)*** ***(½ Mark for writing any correct disadvantage of Star Topology over Bus)***	
	(b)	Classify each of the following Web Scripting as Client Side Scripting and Server Side Scripting: (i) JavaScripting (ii) ASP (iii) VB Scripting (iv) JSP	2
	Ans	**(i) Client Side Scripting / Server Side Scripting (ii) Server Side Scripting** **(iii) Client Side Scripting (iv) Server Side Scripting**	
		(½ Mark for writing each correct classification)	
	(c)	Write the expanded names for the following abbreviated terms used in Networking and Communications: (i) SMTP (ii) VoIP (iii) GSM (iv) WLL	2
	Ans	**(i) Simple Mail Transfer Protocol** **(ii) Voice over Internet Protocol (Voice over IP)** **(iii) Global System for Mobile Communication** **(iv) Wireless Local Loop**	
		(½ Mark for writing each correct expansion)	
	(d)	CASE STUDY BASED QUESTION:	
		Ayurveda Training Educational Institute is setting up its centre in Hyderabad with four specialised departments for Orthopedics, Neurology and Pediatrics along with an administrative office in separate buildings. The physical distances between these department buildings and the number of computers to be installed in these departments and administrative office as given as follows. You as a network	

		expert have to answer the queries as raised by them in (i) to (iv).	
		Shortest distances between various locations in metres: Administrative Office to Orthopedics Unit: 55 Neurology Unit to Administrative Office: 30 Orthopedics Unit to Neurology Unit: 70 Pediatrics Unit to Neurology Unit: 50 Pediatrics Unit to Administrative Office: 40 Pediatrics Unit to Orthopedics Unit: 110	
		Number of Computers installed at the various locations are as follows: Pediatrics Unit: 40 Administrative Office: 140 Neurology: 50 Orthopedics Unit: 80 	
	(i)	Suggest the most suitable location to install the main server of this institution to get efficient connectivity.	1
	Ans	**Administrative Office**	
		(1 Mark for writing correct location)	
	(ii)	Suggest the best cable layout for effective network connectivity of the building having server with all the other buildings.	1

	Ans	 **OR** **Administrative Office is connected to Orthopedic, Radiology, Pediatrics units directly in a Star Topology**	
		(1 Mark for drawing/writing the layout correctly)	
	(iii)	Suggest the devices to be installed in each of these buildings for connecting computers installed within the building out of the following: ● Gateway ● Modem ● Switch	1
	Ans	Switch	
		(1 Mark for writing the correct device)	
	(iv)	Suggest the topology of the network and network cable for efficiently connecting each computer installed in each of the buildings out of the following: Topologies : Bus topology, Star Topology Network Cable: Single Pair Telephone Cable, Coaxial Cable, Ethernet Cable	1
	Ans	**Topology : Star Topology** **Network Cable: Ethernet Cable / Coaxial Cable**	
		(½ Mark for writing the correct topology) ***(½ Mark for writing the correct network cable)***	