Subject: COMPUTER SCIENCE   **Date: 05.12.2019**

Time Allowed: 3 Hours   Maximum Marks: 70

General instructions:

(1) **All** questions are **compulsory**.
(2) Marks are indicated against each question.
(3) Please check that this question paper contains 16 printed pages only.
(4) Please check that this question paper contains 7 questions. In Question 2(b, d) ,3 and 4 has internal choices.

Section : A

1. a) Write the type of C++ tokens (keywords and user defined identifiers) from the following: (i) else (ii) Queue (iii) _Count (iv) new   2

    b) Which C++ header file(s) will be essentially required to be included to run /execute the following C++ code: 1

```cpp
void main(){
 char Msg[]="Sunset Gardens";
 for (int I=5;I<strlen(Msg);I++)
    puts(Msg);
}
```

    c) Rewrite the following program after removing the syntactical error(s) if any. Underline each correction.   2

```cpp
#include<iostream.h>
void main()
{
    First=10, Second=20;
    Jumpto(First;Second);
    Jumpto(Second);
}
void Jumpto(int N1, int N2=20)
{
    N1=N1+N2;
    cout<<N1>>N2;
}
```

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

```cpp
#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[C]=Modify(LIST[C]);
    for(C=0;C<=3;C++)
    {
        cout<<*P<<":";
        P++;
    }
}
```

e) Give the output of the following program segment: Note: Assume all required header files are already included in the program. 2

```cpp
void main()
{
    char *NAME="IntRAneT";
    for(int x=0;x<strlen(NAME);x++)
        if(islower(NAME[x]))
            NAME[x]=toupper(NAME[x]);
        else if(isupper(NAME[x]))
            if(x%2==0)
                NAME[x]=tolower(NAME[x]);
        else
            NAME[x]=NAME[x-1];
            puts(NAME);
}
```

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. 2

```cpp
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. a) Explain Data Encapsulation and Data Hiding with example in c++. 2

b) Answer the question (i)and (ii)after going through the following class: 2
```
class Maths
{
    char Chapter[20];
    int Marks;
    public:
        Maths() //Member Function 1
        {
            strcpy (Chapter, "Geometry");
            Marks=10;
            cout <<"Chapter Initialised ";
        }
        ~Maths() //Member Functions 2
        {
            cout<<"Chapter Over";
        }
};
```
(i)Name the specific feature shown by Member Function 1 and Member Function 2 in the above example.

(ii)How would Member Function 1 and Member Function 2 get executed?

OR

b) What is copy constructor? Explain with a suitable example.

c) Define a class Travel in C++ with the following descriptions: 4

Private Members:

Travelcode   of type long
Place   of type character array(string)
Number_of_travellers   of type integer
Number_of_buses   of type integer

Public Members:

* A constructer to assign initial values of Travelcode as 201, Place as "Nainital", Number_of_travellers as 10, Number_of_buses as 1
* A function NewTravel() which allows user to enter Travelcode, Place and Number_of travelers. Also, assign the value of Number_of_buses as per the following conditions:

Number_of_travellers	Number_of_buses
less than 20	1
Equal to or more than 20 and less than 40	2
Equal to 40 or more than 40	3

* A function ShowTravel() to display the content of all the data members on the screen.

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

```
class Interior
{
    int OrderId;
    char Address[20];
    protected:
        float Advance;
    public:
        Interior();
        void Book();
        void View();
};

class Painting:public Interior
{
```

```
        int WallArea,ColorCode;
        protected:
            char Type;
        public:
            Painting();
            void PBook();
            void PView();
};
class Billing:public Painting
{
        float Charges;
        void Calculate();
        public:
            Billing();
            void Bill();
            void BillPrint();
};
```
(i) Which type of Inheritance is illustrated in the above example?

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

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

(iv) What will be the order of execution of the constructors, when an object of class Billing is declared?

OR

d)   Consider the following class State:

```
class State
{
  protected:
    int tp;
  public :
    State() {tp=0;}
    void inctp() { tp++;};
    int gettp() { return tp;}
};
```

Write a code in C++ to publically derive another class 'District' with the following additional members derived in the public visibility mode.

Data Members :

Dname string

Distance float

Population long int

Member functions :

DINPUT( ) : To enter Dname, Distance and Population

DOUTPUT( ) : To display the data members on the screen.

3. a) Write a function in C++ to print the product of each column of a two   2
dimensional array passed as the arguments of the function.

Example : If the two dimensional array contains

1	2	4
3	5	6
4	3	2
2	1	5

Then the output should appear as:

Product of Column 1 = 24

Product of Column 2 = 30

Product of Column 3 =240

OR

a) Write a Get2From1() function in C++ to transfer the content from one array ALL[] to two different arrays Odd[] and Even[]. The Odd[] array should contain the values from odd positions (1,3,5,...) of ALL[] and Even [] array should contain the values from even positions (0, 2, 4,.....) of ALL [ ].

Example:

If the ALL[] array contains

12, 34, 56, 67, 89, 90

The Odd[] array should contain

34, 67, 90

And the Even [] array should contain

12,56,89

b) Write a function SORTSCORE() in C++ to sort an array of structure   3
Examinee in descending order of Score using Bubble Sort.

Note: Assume the following definition of structure Examinee

struct Examinee

```
{
    long RollNo;
    char Name[20] ;
    float Score;
};
```

Sample content of the array(before sorting)

Rollno	Name	Score
1001	Ravyank Kapur	300
1005	Farida Khan	289
1002	Anika Jain	345
1003	George Peter	297

Sample content of the array(after sorting)

Rollno	Name	Score
1002	Anika Jain	345
1001	Ravyank Kapur	300
1003	George Peter	297
1005	Farida Khan	289

OR

b) Considering the following key set: 42,29,74,11,65,58, use insertion sort to sort the data in ascending order and indicate the sequences of steps required.

c) An array S[40][30] is stored in the memory along the column with each of the element occupying 4 bytes, find out the base address and address of element S[20][15], if an element S[15][10] is stored at the memory location 7200.   3

OR

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.

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.
(Note: In the given problem, we should write a function to remove/delete a packet with function name AddPacket())   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( );
};
```

OR

d) Write the definition of a member function Ins_Player() for a class CQUEUE in C++, to add a Player in a statically allocated circular queue of PLAYERs considering the following code is already written as a part of the program:

```
struct Player
{
  long Pid;
  char Pname[20];
};
const int size=10;
class CQUEUE
{
 Player Ar[size];
 int Front, Rear;
 public:
  CQUEUE()
  {
    Front =-1;
    Rear =-1;
  }
  void Ins_Player(); // To add player in a static circular queue
  void Del_Player(); // To remove player from a static circular queue
```

void Show_Player(); // To display static circular queue
　　};

e)　Convert the following Infix expression to its equivalent Postfix expression, showing the stack contents for each step of conversion. $(P-Q)/(R*(S-T)+U)$　　2

OR

e)　Evaluate the following postfix notation of expression:
10 20 + 25 15 - * 30 /

4.　a)　Write a function in C++ to count the words "to" and "the" present in a text file "POEM.TXT".　　2
[Note that the words "to" and "the" are complete words]

OR

a)　Write a function in C++ to count the number of lowercase alphabets present in a text file "BOOK.TXT"

b)　Write a function in C++ to search and display details, whose destination is "Cochin" from binary file "Bus.Dat". Assuming the binary file is containing the objects of the following class:　　3

```cpp
class BUS
{
  int Bno; // Bus Number
  char From[20]; // Bus Starting Point
  char To[20]; // Bus Destination
  public:
      char * StartFrom()
      {
          return From;
      }
      char * EndTo()
      {
          return To;
      }
      void input()
      {
          cin>>Bno;
          gets(From);
          gets(To);
      }

      void show()
```

```
        {
            cout<<Bno<< ":"<<From << ":"<<To<<endl;
        }
    };
```

<div align="center">OR</div>

b) Write a function in C++ to add more new objects at the bottom of a
    binary file "STUDENT.dat", assuming the binary file is containing the
    objects of the following class:
    class STU

```
    {
      int Rno;
      char Sname[20];
      public:
      void Enter()
      {
        cin>>Rno;
        gets(Sname);
      }
      void show()
      {
        cout << Rno<<Sname<<endl;
      }
    };
```

c) Consider the following code: 1

```
    void main()
    {
      char ch='A';
      fstream fileout("data.dat", ios::app);
      fileout<<ch;
      int p=fileout.tellg();
      cout<<p;
    }
```

What is the output if the file content before the execution of the
program is the string "ABC"?
(Note that " " are not part of the file)

<div align="center">OR</div>

c) Distinguish between ios::out and ios::app.

d) Observe the program segment given below carefully and fill the blanks marked as Statement 1 and Statement 2 using tellg() and seekp() functions for performing the required task.   1

```cpp
class Customer
{
    long Cno;
    char Name[20],Mobile[12];
    public:
    void Enter(); //Function to allow user to enter the Cno,Name,Mobile
    void Modify();//Function to allow user to enter modify mobile number
    long GetCno() //Function to return value of Cno
    {
        return Cno;
    }
};
void ChangeMobile()
{
    Customer C;
    fstream F;
    F.open("CONTACT.DAT",ios::binary|ios::in|ios::out);
    long Cnoc; //Customer no. whose mobile number needs to be changed
    cin>>Cnoc;
    while (F.read((char*)&C,sizeof(C)))
    {
        if (Cnoc==C.GetCno( ))
        {
            C.Modify();
            int Pos= ---------//Statement 1
            //To find the current position of file pointer
            ----------------//Statement 2
            //To move the file pointer to write the modified
//record back onto the file for the desired Cnoc
            F.write((char*)&C, sizeof(C));
        }
    }
}
```

OR

d) Which file stream is required for seekp() ?

Section : B

5. a) Observe the following tables VIDEO and MEMBER carefully and write the name of the RDBMS operation 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) Consider the following tables ACCOUNT and TRANSACT. Write SQL commands for the statements (i) to (iv) and give outputs for SQL queries (vi) to (viii) **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 and verify Associative law in Boolean Algebra.   2

    b)   Draw the Logic Circuit of the following Boolean Expression: 2
         ((U + V').(U + W)). (V + W')

    c)   Derive a canonical POS expression for a Boolean function FN,   1
         represented by the following truth table.

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 using K – Map : 3
$F(P, Q, R, S,) = \Pi (0,3,5,6,7,11,12,15)$

7. a) Assume that 50 employees are working in an organization. Each 1 employee has been allotted a separate workstation to work. In this way, all computers are connected through the server and all these workstations are distributed over two floors. In each floor, all the computers are connected to a switch. Identify the type of network?

b) Differentiate between packet switching and message switching? 1

c) Which protocol helps us to transfer files to and from a remote 1 computer?

d) What is the difference between XML and HTML? Write two 1 differences.

e) Write two advantages of using open source software over proprietary 1 software.

f) Expand the following terminologies: 1
(i) CDMA (ii) GSM

g) Ayurveda Training Educational Institute is setting up its centre in 4 Hyderabad with four specialized 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 location in metres:

Administrative Office to Orthopedics Unit	55
Radiology Unit to Administrative Office	30
Orthopedics Unit to Neurology Unit	70
Pediatrics Unit to Radiology 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
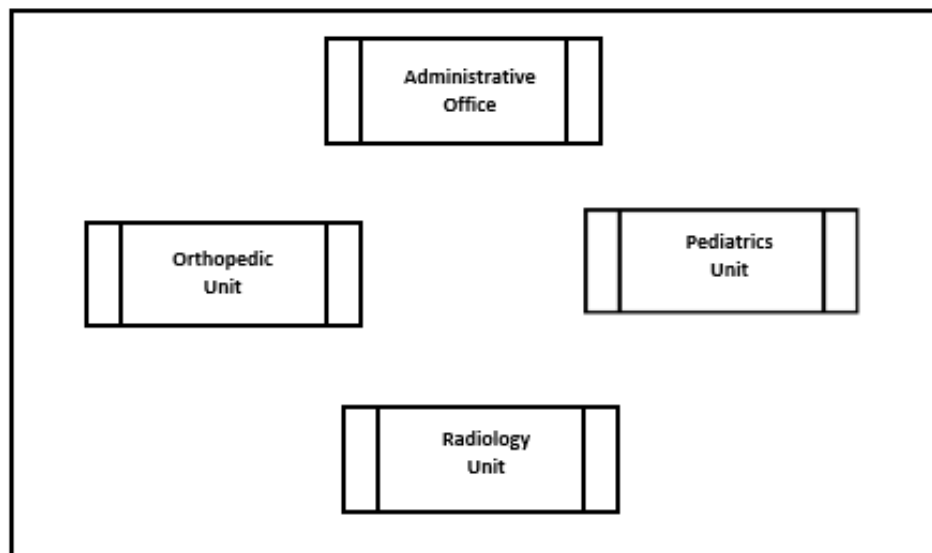
(i) Suggest the most suitable location to install the main server of this institution to get efficient connectivity.

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

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

a) Gateway b) Modem c) 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:

Topologies: Bus Topology, Star Topology

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