1
a) What is the difference between Global Variable and Local Variable? Also give a suitable C++ code to illustrate both.

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

```cpp
#include <iostream>
#include <cmath>

void main()
{
    int Last = 25;
    for (int C = 0; C <= Last; C++)
        cout << C << "\n" << sqrt(C) << endl;
}
```

c) Find the output of the following program:
d) Rewrite the following program after removing the syntactical errors (if any). Underline each correction.

```c
#include <iostream.h>
class MEMBER
{
  int Mno; float Fees;
PUBLIC:
  void Register(){cin>>Mno>>Fees;}
  void Display{cout<<Mno<<" : "<<Fees<<endl;} 
};
void main()
{
  MEMBER M;
  Register();
  M.Display();
}
```

```c
#include <iostream.h>
class MEMBER
{
  int Mno; float Fees;
PUBLIC:
  void Register(){cin>>Mno>>Fees;}
  void Display{cout<<Mno<<" : "<<Fees<<endl;} 
};
void main()
{
  MEMBER M;
  Register();
  M.Display();
}
```

e) Find the output of the following program:

```c
#include <iostream.h>
class MEMBER
{
  int Mno; float Fees;
PUBLIC:
  void Register(){cin>>Mno>>Fees;}
  void Display{cout<<Mno<<" : "<<Fees<<endl;} 
};
void main()
{
  MEMBER M;
  Register();
  M.Display();
}
```
f) In the following program, if the value of Guess entered by the user is 65, what will be the expected output(s) from the following options (i), (ii), (iii) and (iv)? Give explanation for your answer.  

```cpp
#include <iostream.h>
#include <cstdlib.h>

void main()
{
    int Guess;
    randomize();
    cin>>Guess;
    for (int I=1;I<=4;I++)
    {
        New=Guess+random(I);
        cout<<(char)New;
    }
}
```

(i) ABBC  
(ii) ACBA  
(iii) BCDA  
(iv) CABD
a) What do you understand by Data Encapsulation and Data Hiding? Also, give a suitable C++ code to illustrate both.

b) Answer the questions (i) and (ii) after going through the following class:

```cpp
class Seminar {
    int Time;
    public:
    Seminar()  //Function 1
    {
        Time=30;cout<<"Seminar starts now"<<endl;
    }
    void Lecture()  //Function 2
    {
        cout<<"Lectures in the seminar on"<<endl;
    }
    Seminar(int Duration)  //Function 3
    {
        Time=Duration;cout<<"Seminar starts now"<<endl;
    }
    ~Seminar()  //Function 4
    {
        cout<<"Vote of thanks"<<endl;
    }
    Seminar(Seminar &obj){ _____ }  //Function 5
};
```

i) In Object Oriented Programming, which feature is demonstrated by function 1, function 3 and function 5.

ii) What is Function 4 referred as?

iii) How is Function 4 invoked/called?

iv) Complete the definition of Function 5.

v) Write an example illustrating the calls for:
   - Function 2
   - Function 3
   - Function 5

c) Define a class in C++ with following description:

```cpp
Private Members
```
• data member Flight number of type integer
• data member Destination of type string
• data member Distance of type float
• data member Fuel of type float
• member function CALFUEL() to calculate the value of Fuel as per the following criteria:
  Distance Fuel <=1000 500 more than 1000 and <=2000 1100 more than 2000 2200

Public Members
• function FEEDINFO() to allow user to enter values for Flight Number, Destination, Distance & call function CALFUEL() to calculate the quantity of Fuel
• function SHOWINFO() to allow user to view the content of all the data members

d) Answer the questions (i) to (iv) based on the following:
class CUSTOMER
{ int Cust_no; char Cust_Name[20];
    protected:
    void Register();
    public:
    CUSTOMER();
    void Status();
};
class SALESMAN
{ int Salesman_no; char Salesman_Name[20];
    protected:
    float Salary;
    public:
    SALESMAN();
    void Enter();
    void Show();
};
class SHOP : private CUSTOMER, public SALESMAN
{ char Voucher_No[10];
    char Sales_Date[8];
    public: SHOP();
    void Sales_Entry();
    void Sales_Detail();
};
i. Which type of inheritance is demonstrated in the above example?
ii. Write the names of data members which are accessible from objects belonging to class CUSTOMER.

iii. Write the names of all the member functions which are accessible from objects belonging to class SALESMAN.

iv. Write the names of all the members which are accessible from member functions of class SHOP.

v. Name the sequence in which the constructors and destructors are executed when an object of class SHOP is created.

vi. Name the data members and member functions that would be accessible from object of the class SHOP if SALESMAN is inherited privately.

vii. How many bytes will be required by an object belonging to class SHOP?

3.

a) Write a function in C++ to combine the contents of two equi-sized arrays A and B by computing their corresponding elements with the formula $2*A[i]+3*B[i]$; where value $i$ varies from 0 to N-1 and transfer the resultant content in the third same sized array.

b) An array $P[20][30]$ is stored in the memory along the column with each of the element occupying 4 bytes, find out the memory location for the element $P[5][15]$, if an element $P[2][20]$ is stored at the memory location 5000.

c) Write a function in C++ to find the sum of both left and right diagonal elements from a two dimensional array (matrix).

d) Write a function in C++ to perform Insert operation in dynamically allocated Queue containing of names of students.

e) Write UDF in C++ which accepts an integer array and its size as arguments/parameters and assigns the elements into a 2 D array of integers in the following format:

If the array is 1,2,3,4,5.

The resultant 2D array is given below

1 2 3 4 5
1 2 3 4 0
1 2 3 0 0
1 2 0 0 0
f) Find the postfix expression from the given infix expression:

\[(A+B-(C*D)+F*G*H+M)\]

g) Evaluate the following postfix notation of expression:

True, False, AND, True, True, NOT, OR, AND

4.

a) Name two member functions common to the classes `ifstream` and `ofstream`.

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

```cpp
#include <fstream.h>
class Item
{
    int Ino; char Item[20];
    public:
        // Function to search and display the content from a particular record number
        void Search(int);
        // Function to modify the content of a particular record number
        void Modify(int);
    }
    void Item::Search(int RecNo)
    {
        fstream File;
        File.open("STOCK.DAT", ios::binary|ios::in);
        __________________________ //Statement 1
        File.read((char*)this,sizeof(Item));
        cout<<Ino<<"==>>"<<Item<<endl;
        File.close();
    }
    void Item::Modify(int RecNo)
    {
        fstream File;
        File.open("STOCK.DAT", ios::binary|ios::in|ios::out);
        cout>>Ino;cin.getline(Item,20); //Statement 2
        File.write((char*)this,sizeof(Item));
        File.close();
    }
}
```
c) Assume that a text file named “MATHS.TXT” contains text and some mathematical operators written into it. “MATHS.TXT” contains only five types of operator ‘+’, ‘−’, ‘∗’, ‘/’, ‘=’. Write a function named `copyoperator()` that reads the file “MATHS.TXT” and creates a new file named “OPERATOR.TXT”, to contain only operators from the file “MATHS.TXT”. In “OPERATOR.TXT” operators are separated by commas. 

For example: If “MATHS.TXT” contains

Result of 2 + 4 * 3 = 14
Result of 16 / 2 + 1 = 9

Then the file “OPERATOR.TXT” shall contain +, *, /, +.

d) Write a function in C++ to search for a Toy having a particular ToyCode from a binary file “TOY.DAT” and display its details (Tdetails), assuming the binary file is containing the objects of the following class:

```c++

class TOYSHOP
{
  int Tcode;        //Toy Code
  char Tdetails[20];
  public:
  int RTcode(){return Tcode;}
  void AddToy(){cin>>Tcode;gets(Tdetails);}
  void DisToy(){cout<<Tcode<<Tdetails<<endl;}
};
```

5.

a) What do you understand by degree and cardinality of a table?

b) Given the following tables:

```
Table: ACTIVITY

<table>
<thead>
<tr>
<th>ACode</th>
<th>ActivityName</th>
<th>Stadium</th>
<th>ParticipantsNum</th>
<th>PrizeMoney</th>
<th>ScheduleDate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1001</td>
<td>Relay 100x4</td>
<td>Star Annex</td>
<td>16</td>
<td>10000</td>
<td>23-Jan-04</td>
</tr>
<tr>
<td>1002</td>
<td>High Jump</td>
<td>Star Annex</td>
<td>10</td>
<td>12000</td>
<td>12-Dec-03</td>
</tr>
<tr>
<td>1003</td>
<td>Shot Put</td>
<td>Super Power</td>
<td>12</td>
<td>8000</td>
<td>14-Feb-04</td>
</tr>
<tr>
<td>1005</td>
<td>Long Jump</td>
<td>Star Annex</td>
<td>12</td>
<td>9000</td>
<td>01-Jan-04</td>
</tr>
<tr>
<td>1008</td>
<td>Discuss Throw</td>
<td>Super Power</td>
<td>10</td>
<td>15000</td>
<td>19-Mar-04</td>
</tr>
</tbody>
</table>
```

Write SQL commands for the following statements:

(i) To display the names of all activities with Acodes in descending order.

(ii) To display sum of PrizeMoney for the Activities played in each of the Stadium separately.

(iii) To display the coach’s name and Acodes in ascending order of Acodes from the table COACH.

(iv) To display the highest PrizeMoney for any activity.

(v) To display the content of all activities for which ScheduleDate is earlier than 01-01-2004 in ascending order of ParticipantsNum.

Give the output of the following SQL queries:

(i) SELECT COUNT(DISTINCT ParticipantsNum) FROM ACTIVITY;

(ii) SELECT MAX(ScheduleDate),MIN(ScheduleDate) FROM ACTIVITY;

(iii) SELECT Name,ActivityName FROM ACTIVITY A,COACH C
     WHERE A.Acode=C.Acode AND A.ParticipantsNum=10;

(iv) SELECT DISTINCT ParticipantsNum FROM ACTIVITY;