1. (a) What is the difference between automatic type conversion and typecasting? Give suitable examples. (2)

(b) What is the difference between actual parameters and formal parameters in C++? (2)

(c) Write the names of the header files to which the following functions belong: (2)
   (i) isalpha() (ii) setw() (iii) gets() (iv) pow()

(d) Rewrite the following program after correcting syntactical errors, if any. (2)
   Underline each correction.
   
   ```
   #include <iostream.h>
   void main()
   {
       n1=40, n2=30;
       change(n1;n2);
       change(n2);
   }
   void change(int num1,int num2=20)
   {
       num2=num1*num2;
       cout<<num1,num2;
   }
   ```

(e) Find the output of the following program. (Assume that all necessary header files are included). (2)
   ```
   void trans(char txt[],int len)
   {
       for(int i=1; i<len; i++)
       {
           if(isupper(txt[i])) txt[i]=tolower(txt[i]);
           else if(islower(txt[i])) txt[i]=toupper(txt[i]);
           else if(isdigit(txt[i])) txt[i]=txt[i-1];
           else txt[i]='$';
       }
   }
   void main()
   {
       char name[]="World Cup 2012";
       int size=strlen(name);
       trans(name,size);
       cout<<name<"\n";
   }
   ```
(f) For the following C++ program, choose the possible output(s) from options (i) to (iv) given below: (Assume that all necessary header files are included).

```cpp
void main()
{
    randomize();
    char Area[="NORTH", "SOUTH", "EAST", "WEST"];
    int ToGo;
    for(int i=0; i<3; i++)
    {
        ToGo=Random(2)+i;
        cout<<Area[ToGo]<<":";
    }
}
```

Outputs:
(i) SOUTH:East:SOUTH
(ii) NORTH:SOUTH:East
(iii) SOUTH:East:WEST
(iv) SOUTH:WEST:East

(g) Find the output of the following program:
```
#include <iostream.h>
int var=12;
void func(int &x, int y)
{
    x=x-y;
    y=x*10;
    cout<<x<<'#'<<y<<'
';
}
void main()
{
    int var=8;
    func(8,var);
    cout<<var<<'#'<<var<<'
';
    func(var,8);
    cout<<var<<'#'<<var<<'
';
}
```

(h) Rewrite the following program after correcting syntactical errors, if any.

```cpp
#include iostream.h
Struct emp
{
    int eno; float sal;
} emp[101,1600];
```
void main()
{
    emp e;
    cout<<eno<<sal;
}

(i) Find the output of the following program:
#include <iostream.h>
struct Pixel
{
    int C,R;
};
void Display(Pixel P)
{
    cout<<"Col"<<P.C<<"Row"<<P.R<<endl;
}
void main()
{
    Pixel X={40,50}, Y, Z;
    Z=X;
    X.C+=10;
    Y=Z;
    Y.C+=10;
    Y.R+=20;
    Z.C-=15;
    Display(X);
    Display(Y);
    Display(Z);
}

2. (a) Define the term function overloading. Illustrate with an example

2. (b) Compare Object Oriented Programming with Procedural Programming
(Any two points).

2. (c) Answer the questions (i) to (iv) after going through the following code:
class exam
{
    char name[20];
    int year;

    public:

    exam(int y) // function 1
    {
        year=y;
    }


```cpp
}

exam(exam &e); // function 2

~exam();       // function 3

void show()    // function 4
{
    cout<<"Name: "<<name<<"\n"<<"Year: "<<year;
}

};
```

(i) Name the phenomenon displayed by function 1 and 2 together.

(ii) Write a statement to create invoke function 1.

(iii) Write the definition for function 2.

(iv) When will function 3 be invoked?

(d) Define a class Applicant in C++ with the following descriptions:

Private members:
- A data member ANo (Admission Number) of type long.
- A data member Name of type string.
- A data member Agg (Aggregate marks) of type float.
- A data member Grade of type char.
- A member function GradeMe() to find the grade as per the aggregate marks as follows:

<table>
<thead>
<tr>
<th>Aggregate Marks</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;=80</td>
<td>A</td>
</tr>
<tr>
<td>less than 80 and &gt;=65</td>
<td>B</td>
</tr>
<tr>
<td>less than 65 and &gt;=50</td>
<td>C</td>
</tr>
<tr>
<td>less than 50</td>
<td>D</td>
</tr>
</tbody>
</table>

Public members:
- A function ENTER() to input the values of ANo, Name, and Agg and invoke the GradeMe() function to calculate grade.
- A function RESULT() which displays the content of all the data members.

(e) Define a class RESTRA in C++ with the following descriptions:

Private members:
- FoodCode of type int
- Food of type string
• FType of type string
• Sticker of type string
• A function GetSticker() which assigns the value of Sticker as follows:

<table>
<thead>
<tr>
<th>FType</th>
<th>Sticker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetarian</td>
<td>GREEN</td>
</tr>
<tr>
<td>Contains Egg</td>
<td>YELLOW</td>
</tr>
<tr>
<td>Non-Vegetarian</td>
<td>RED</td>
</tr>
</tbody>
</table>

Public members:
• A function GetFood() to input the values of FoodCode, Food, and FType and invoke the GetSticker() function to assign sticker.
• A function ShowFood() which displays the content of all the data members.

(f) Consider the following and answer the questions given below: (4)

class University
{
    int NOC;

    protected:
        char Uname[25];

    public:
        University();
        char State[25];
        void EnterData();
        void DisplayData();
};

class College : public University
{
    int NOD;
    int Cname[25];

    protected:
        void Affiliation();

    public:
        College();
        void Enrol(int, int);
        void show();
};

class Department : public College

{
    char Dname[25];
    int NOF;

public:
    Department();
    void Display();
    void Input();

};

i. Which class' constructor will be called first at the time of declaration of an object of class Department?
ii. How many bytes does an object belonging to class Department require?
iii. Name the member function(s) which are accessed from the objects of class Department.
iv. Name the data member(s) which are accessible from the objects of class College.

(g) Consider the following and answer the questions given below:

    class Chairperson
    {
        long Cid;
        char Cname[20];
        protected:
            char description[40];
            void allocate();
        public:
            Chairperson();
            void assign();
            void show();
    };
    class Director
    {
        int Did;
        char Dname[20];
        protected:
            char profile[30];
        public:
            Director();
            void input();
            void output();
    };
    class Company: private Chairperson, public Director
    {
        int Cid;
        char city[20], country[20];
    };

public:
    Company();
    void enter();
    void display();
}

(i) Which type of inheritance is illustrated in this code?
(ii) Name the data members which can be accessed by an object of class Company.
(iii) Name the member functions which can be accessed by an object of class Company.
(iv) Name the members which cannot be accessed by objects of class Director.

3. (a) Explain the terms in the context of RDBMS:
    (i) Primary key  (ii) Foreign key (iii) Selection (iv) Cardinality

(b) Consider the following tables:
    Write the SQL commands for the statements (i) to (vi) \[6 \times 1 = 6 \text{ marks}\]
    and outputs for SQL queries (vii) to (xii) \[6 \times \frac{1}{2} = 3 \text{ marks}\]

<table>
<thead>
<tr>
<th>Item</th>
<th>I_Id</th>
<th>Itemname</th>
<th>Manufacturer</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC01</td>
<td>ABC</td>
<td>Laptop</td>
<td>ABC</td>
<td>35000</td>
</tr>
<tr>
<td>PC03</td>
<td>XYZ</td>
<td>Personal Computer</td>
<td>COMP</td>
<td>37000</td>
</tr>
<tr>
<td>PC06</td>
<td>PQR</td>
<td>Personal Computer</td>
<td>COMP</td>
<td>55000</td>
</tr>
<tr>
<td>LC03</td>
<td>ABC</td>
<td>Laptop</td>
<td>ABC</td>
<td>57000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Customer</th>
<th>C_Id</th>
<th>Customername</th>
<th>City</th>
<th>I_Id</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>N Roy</td>
<td>Delhi</td>
<td>LC03</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>H Singh</td>
<td>Mumbai</td>
<td>PC03</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>R Pandey</td>
<td>Delhi</td>
<td>PC06</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>C Sharma</td>
<td>Delhi</td>
<td>LC03</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>A Agarwal</td>
<td>Bangalore</td>
<td>PC01</td>
<td></td>
</tr>
</tbody>
</table>

(i) To display the details of those customers whose address is Delhi.

(ii) To display the details of items whose price is in the range of 35000 to 55000 (both values included).

(iii) To display the number of customers from each city.
(iv) To display the Customername, City from table Customer and Itemname and price from table Item, with their corresponding matching I_Id.

(v) To increase the price of all items by 1000 in the table Item.

(vi) To delete the row of C Sharma from the Customer table.

(vii) SELECT DISTINCT City FROM Customer;

(viii) SELECT Itemname, MAX(Price) FROM Item GROUP BY Itemname;

(ix) SELECT PRICE FROM Item WHERE Manufacturer='PQR' || Itemname='Laptop';

(x) SELECT Customername, Manufacturer FROM Item, Customer WHERE Item.I_Id=Customer.I_Id;

(xi) SELECT Itemname, Price*100 FROM Item WHERE Manufacturer = 'ABC';

(xii) SELECT C_Id FROM Customer WHERE City LIKE "%b%";

4. (a) State Absorption Laws. Verify one of them algebraically. (2)

(b) Draw the Logical circuit diagram for the following Boolean expression using NOR gates only:
   \( X \cdot (Y+Z) \) (2)

(c) Write the equivalent Boolean expression for the following logic circuit: (2)

(d) Prove algebraically:
   \( x'y'z' + x'y'z + xy'z + xy'z' + xy'z + x'yz = x' + y' \) (2)
(e) Write the equivalent Canonical Sum of Product (SOP) form:
\[ F(X,Y,Z) = \Pi(1,3,6,7) \] 

(f) Reduce the following Boolean expression using K-map:
\[ F(u,v,w,x) = \Sigma(0,3,4,5,7,11,13,15) \]