1. (a) Find the correct identifiers out of the following:
   switch, For, float, _pow, 2ndNum, mid-val, CHAR, If
   (2)

(b) What is the difference between ordinary function and member function in C++? Explain with example.
   (2)

(c) Write the related library function name based upon the given information:
   i. To copy one string into another.
   ii. To check whether given character is a digit.
   iii. To terminate the program
   iv. To take a string from standard input
   (2)

(d) Name the header files required to compile execute the following program:

```c
typedef char Txt[30];
void main()
{
    Txt n1="Good Morning";
    for(int c=0;n1[c]!='\0';c++)
        if(isalpha(n1[c]))
            n1[c]=n[c]+1;
        else
            n1[c]=' ';
    puts(n1);
}
```
   (1)

(e) Rewrite the following C++ program after removing all the syntactical errors (if any), underlining each correction.

```c
#include<iostream.h>
define PI=3.14
void main()
{
    float r; a;
    cout<"enter any radius";
    cin>>r;
    a=PI*power(r, 2);
    cout<"Area=\n"
a
}
```
   (2)

(f) Find the output of the following program [Assume that all required header files are included]:
   void Encode(char Msg[])
   {
       int size=strlen(Msg);char temp;
       for(int k=0; k<size/3; k++)
   (2)
```cpp
if(Msg[k] >= 'A' && Msg[k] <= 'Z')
    Msg[k] = 'S';
else
    {
        temp = Msg[k];
        Msg[k] = Msg[size-k-1];
        Msg[size-k-1] = temp;
    }
void main()
{
    char Line[] = "April$May";
    Encode(Line);
    cout << Line << endl;
}

(g) Find the output of the following program [Assume that all required header files are included]:
int var=12;
void func(int &p, int &q)
{
    p = p - q;
    q = p * 10;
    cout << p << '@' << q << '
';
}
void main()
{
    int var=8;
    func(var, var);
    cout << var << '@' << ::var << '
';
    func(var, ::var);
    cout << var << '@' << ::var << '
';
}

(h) Find the output of the following C++ program [Assume that all required header files are included]:
class Class
{
    int Cno, total;
    char section;
    public:
    Class(int no=1)
    {
        Cno = no;
        section = 'A';
        total = 30;
    }
    void admission(int c=20)
    {
        section++;
    }
```
total+=c;
}
void ClassShow()
{
    cout<<Chol:<<section:<<total<<endl;
    }

void main()
{
    Class C1(5),C2;
    C1.addmission(25);
    C1.ClassShow();
    C2.addmission();
    C1.addmission(30);
    C2.ClassShow();
    C1.ClassShow();
}

(i) Study the following program and select the possible output(s) from (i) to (iv): Also write the maximum and minimum values that can be assigned to the variable Num.

Assume that all required header files are included:

void main()
{
    randomize();
    intNum,i,j;
    Num=random(3)+2;
    char Chance[]="ABCDEFGHIJKLMNOPQRSTUVWXYZ";
    for(i=1;i<=Num;i++)
    {
        for(j=Num;j<=7;j++)
            cout<<Chance[j];
        cout<<endl;
    }
}

(i) BCDEFGH (ii) CDEFGH (iii) BFGH (iv) FGHI

2. (a) Define the term Data hiding. Illustrate with an example

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

(c) Answer the questions (i) to (iv) after going through the following code:

class eval
{
char title[20];
int year;

public:
eval(int x) // function 1
{
    year=x;
}
eval(evalue); // function 2
~eval(); // function 3
void show() // function 4
{
    cout<<"Title: "<<title<<"\n"<<"Year: "<year;
}
void main()
{
    //line 1
    //line 2
} //Ends Here

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

(ii) Fill in the blank statements in line 1 and line 2 to execute function 1 and function 4 respectively.

(iii) Write the definition for function 2.

(iv) Which function will be invoked at //Ends here? What is this function referred as?

(v) What is the difference between the following statements?
eval S(2010);
eval S=eval(2010);

(d) Define a class Stock with the following specification:

Private members:
  icode : integer (item code)
  iname : String (item name)
  price : float (price of each item)
  qty : integer (quantity)
  discount : float (discount %)

A function calc_disc() that calculates and assigns the discount as
follows:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Discount</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;=50</td>
<td>0</td>
</tr>
<tr>
<td>51 - 100</td>
<td>5</td>
</tr>
<tr>
<td>&gt;100</td>
<td>10</td>
</tr>
</tbody>
</table>

Public members:
A constructor to assign initial values as follows:

i. icode and qty as 0.
ii. iname as "Noname".
iii. price and discount as 0.0

A function get_input() to allow the user to enter the values of icode, iname, price and qty and invoke the calc_disc() function.

A function display() to display the contents of all data members.

(c) Define a class Computer with the following specifications:

Private members:

processortype : String
processorspeed : Integer
cost : Float

Public members:

A constructor to assign initial values as follows:

(i) processortype as "NULL"
(ii) processorspeed as 0
(iii) cost as 0.0

A function calc_cost() that takes speed as parameter and calculates and returns the cost as follows

<table>
<thead>
<tr>
<th>Speed</th>
<th>cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>4000MHz</td>
<td>Rs. 30000</td>
</tr>
<tr>
<td>&lt;4000 and &gt;=2000</td>
<td>Rs. 25000</td>
</tr>
<tr>
<td>&lt;2000</td>
<td>Rs. 20000</td>
</tr>
</tbody>
</table>

A function enter_data() to take the values of processortype and processorspeed as user input and calls the function calc_cost().

3. (a) What is Cartesian product? Explain with an example.
   (2)
   (b) Answer the questions based on the table given below:
   (4)
Table: Students

<table>
<thead>
<tr>
<th>StuNo</th>
<th>StuName</th>
<th>Mob</th>
<th>Subject</th>
<th>TutorID</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Leena</td>
<td>9856012321</td>
<td>Math</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>Surya</td>
<td>9995565402</td>
<td>Chemistry</td>
<td>200</td>
</tr>
<tr>
<td>3</td>
<td>Neha</td>
<td>9539645125</td>
<td>Physics</td>
<td>300</td>
</tr>
<tr>
<td>4</td>
<td>Deepak</td>
<td>9444764213</td>
<td>Chemistry</td>
<td>200</td>
</tr>
</tbody>
</table>

(i) Name the columns which can be considered as (a) Candidate keys and (b) Primary key

(ii) Define Degree and cardinality. Write down the degree and cardinality of the table Students.

(c) Consider the following tables: Write the SQL commands for the statements (i) to (vii) [7 X 1 = 7 marks]

and outputs for SQL queries (vii) to(xii) [6 X ½ = 3 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></td>
<td>Personal Computer</td>
<td>ABC</td>
<td>35000</td>
</tr>
<tr>
<td>LC05</td>
<td></td>
<td>Laptop</td>
<td>ABC</td>
<td>55000</td>
</tr>
<tr>
<td>PC03</td>
<td></td>
<td>Personal Computer</td>
<td>XYZ</td>
<td>32000</td>
</tr>
<tr>
<td>PC06</td>
<td></td>
<td>Personal Computer</td>
<td>COMP</td>
<td>37000</td>
</tr>
<tr>
<td>LC03</td>
<td></td>
<td>Laptop</td>
<td>PQR</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 display the Item names total price for all items where total price is price+price*5/100
(vi) To increase the price of all items by 1000 in the table Item.

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

(viii) SELECT DISTINCT City FROM Customer;

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

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

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

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

(xiii) 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 NAND gates only:
    \[ A \cdot (B+C') \] (2)

(c) Write the dual of the Boolean expression:
    \[ pq + p'q' \] (1)

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

![Logic Circuit Diagram]
(c) Write Product Of Sum expression of the function \( F(p,q,r,s) \) from the given truth table:

<table>
<thead>
<tr>
<th>p</th>
<th>q</th>
<th>r</th>
<th>s</th>
<th>F</th>
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</thead>
<tbody>
<tr>
<td>0</td>
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<td>1</td>
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</tbody>
</table>

(f) Prove algebraically:
\( (X' + Y') \cdot (X + Y) = X' \cdot Y + X \cdot Y' \)  

(g) Write the equivalent Canonical Sum of Product (SOP) form:
\( F(A,B,C) = \Pi \{1,3,6,7\} \)  

(h) Reduce the following Boolean expression using K-map:
\( F(u,v,w,x) = \Sigma \{0,1,4,5,6,7,8,9,11,15\} \)  

(i) Reduce the following Boolean expression using K Map:
\( F(A,B,C,D) = \Pi \{5,6,7,8,9,12,13,14,15\} \)