Lab Manual

C++ Programming

Computer Science & Engineering | Information Technology

(II- B. Tech. – I– Semester)

Regulation R18

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1. Syllabus

CS309PC: C++ Programming LAB

B.Tech. II Year I Sem.   **L T P C**
                                                                                                                    0 0 3 1.5

1. Write a C++ Program to display Names, Roll No., and grades of 3 students who have appeared in the examination. Declare the class of name, Roll No. and grade. Create an array of class objects. Read and display the contents of the array.

2. Write a C++ program to declare Struct. Initialize and display contents of member variables.

3. Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.

4. Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data members.

5. Write a C++ program to read the data of N employee and compute Net salary of each employee (DA=52% of Basic and Income Tax (IT) =30% of the gross salary).

6. Write a C++ to illustrate the concepts of console I/O operations.

7. Write a C++ program to use scope resolution operator. Display the various values of the same variables declared at different scope levels.

8. Write a C++ program to allocate memory using new operator.

9. Write a C++ program to create multilevel inheritance. (Hint: Classes A1, A2, A3)

10. Write a C++ program to create an array of pointers. Invoke functions using array objects.

11. Write a C++ program to use pointer for both base and derived classes and call the member function. Use Virtual keyword..

PROGRAM OUTCOMES (PO's)

PO No.	Program Outcomes (PO's)
PO1	An ability to apply knowledge of computing, mathematics, science and engineering fundamentals appropriate to the discipline.
PO2	An ability to analyze a problem, and identify and formulate the computing requirements appropriate to its solution.
PO3	An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
PO4	An ability to design and conduct experiments, as well as to analyze and interpret data.
PO5	An ability to use current techniques, skills, and modern tools necessary for computing practice.
PO6	An ability to analyze the local and global impact of computing on individuals, organizations, and society.
PO7	Knowledge of contemporary issues.
PO8	An understanding of professional, ethical, legal, security and social issues and responsibilities.
PO9	An ability to function effectively individually and on teams, including diverse and multidisciplinary, to accomplish a common goal.
PO10	An ability to communicate effectively with a range of audiences.
PO11	An understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects.
PO12	Recognition of the need for and an ability to engage in continuing professional development.

3.Lesson/Course Plan

Week No.	Name of the Program	No. of Hours required	Text Books	Mode of Assessment
1	Basic Programs	2	1	Viva&Execution
2	Write a C++ Program to display Names, Roll No., and grades of 3 students who have appeared in the examination. Declare the class of name, Roll No. and grade. Create an array of class objects. Read and display the contents of the array.	1	T1	Viva&Execution
3	Write a C++ program to declare Struct. Initialize and display contents of member variables	1	T1	Viva&Execution
4	Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.	1	T1	Viva&Execution
5	Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data members..	1	T1	Viva&Execution
6	Write a C++ program to read the data of N employee and compute Net salary of each employee (DA=52% of Basic and Income Tax (IT) =30% of the gross salary).	1	T1	Viva&Execution
7	Write a C++ to illustrate the concepts of console I/O operations.,	1	T1	Viva&Execution
8	Write a C++ program to use scope resolution operator. Display the various values of the same variables declared at different scope levels.	1	T1	Viva&Execution
9	Write a C++ program to allocate memory using new operator.	1	T1	Viva&Execution
10	Write a C++ program to create multilevel inheritance. (Hint: Classes A1, A2, A3)	1	T1	Viva&Execution
11	Write a C++ program to create an array of pointers. Invoke functions using array objects	1	T1	Viva&Execution
12	Write a C++ program to use pointer for both base and derived classes and call the member function. Use Virtual keyword.	1	T1	Viva&Execution
13	LEAD Experments	1	T1	Viva&Execution
	Total no of HOURS required to complete syllabus	**14**		

PROGRAMS

Week 1.

Aim: Write a C++ Program to display Names, Roll No., and grades of 3 students who have appeared in the examination. Declare the class of name, Roll No. and grade. Create an array of class objects. Read and display the contents of the array.

Source Code:

```cpp
#include <iostream>

using namespace std;

class student {
    public:
    char name[50];
    int roll;
    char grade;
} s[3];

int main() {
    cout << "Enter information of students: " << endl;

    // storing information
    for(int i = 0; i < 3; ++i) {
        s[i].roll = i+1;
        cout << "For roll number" << s[i].roll << "," << endl;

        cout << "Enter name: ";
        cin >> s[i].name;

        cout << "Enter Grade: ";
        cin >> s[i].grade;

        cout << endl;
    }

    cout << "Displaying Information: " << endl;

    // Displaying information
    for(int i = 0; i < 3; ++i) {
        cout << "\nRoll number: " << i+1 << endl;
        cout << "Name: " << s[i].name << endl;
        cout << "Grade: " << s[i].grade << endl;
    }

    return 0;
}
```
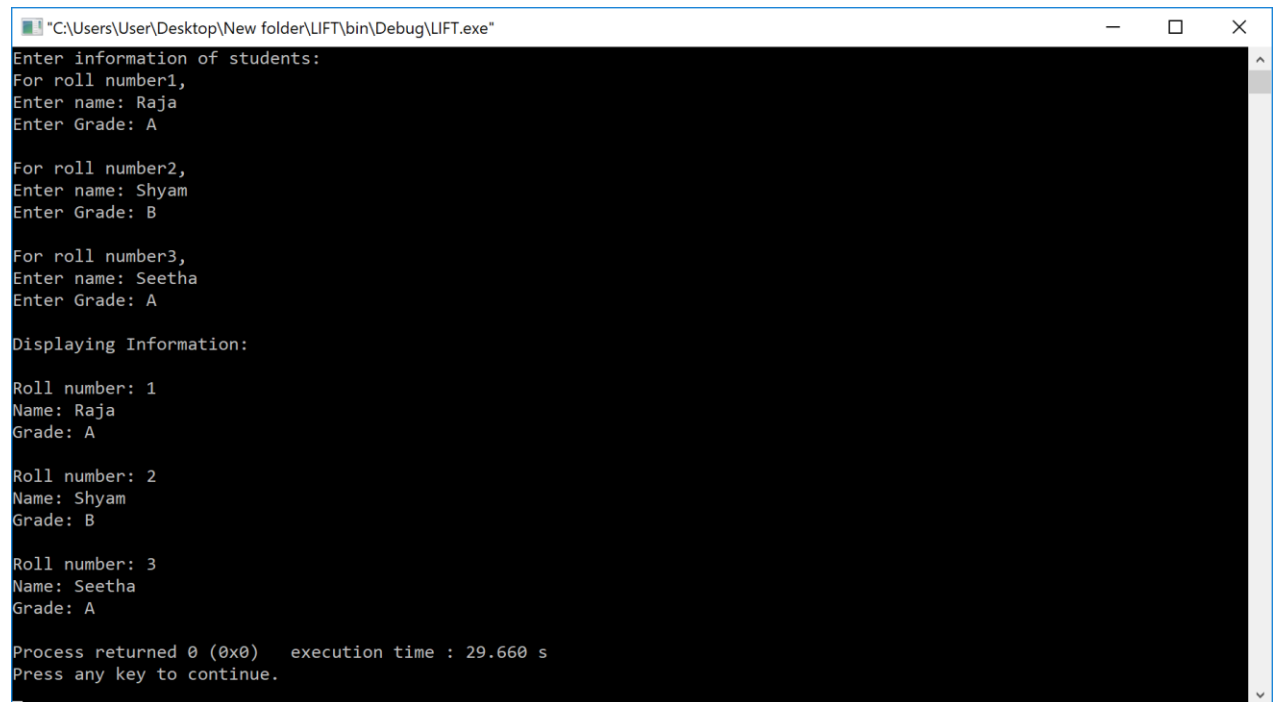
Output:

```
"C:\Users\User\Desktop\New folder\LIFT\bin\Debug\LIFT.exe"                    —    □    ✕
Enter information of students:
For roll number1,
Enter name: Raja
Enter Grade: A

For roll number2,
Enter name: Shyam
Enter Grade: B

For roll number3,
Enter name: Seetha
Enter Grade: A

Displaying Information:

Roll number: 1
Name: Raja
Grade: A

Roll number: 2
Name: Shyam
Grade: B

Roll number: 3
Name: Seetha
Grade: A

Process returned 0 (0x0)    execution time : 29.660 s
Press any key to continue.
```

Viva Questions:

1. How do you declare a class in C++.
2. What is the Difference between class and structure.

Week 2:

Write a C++ program to declare Struct. Initialize and display contents of member variables.

Source Code:
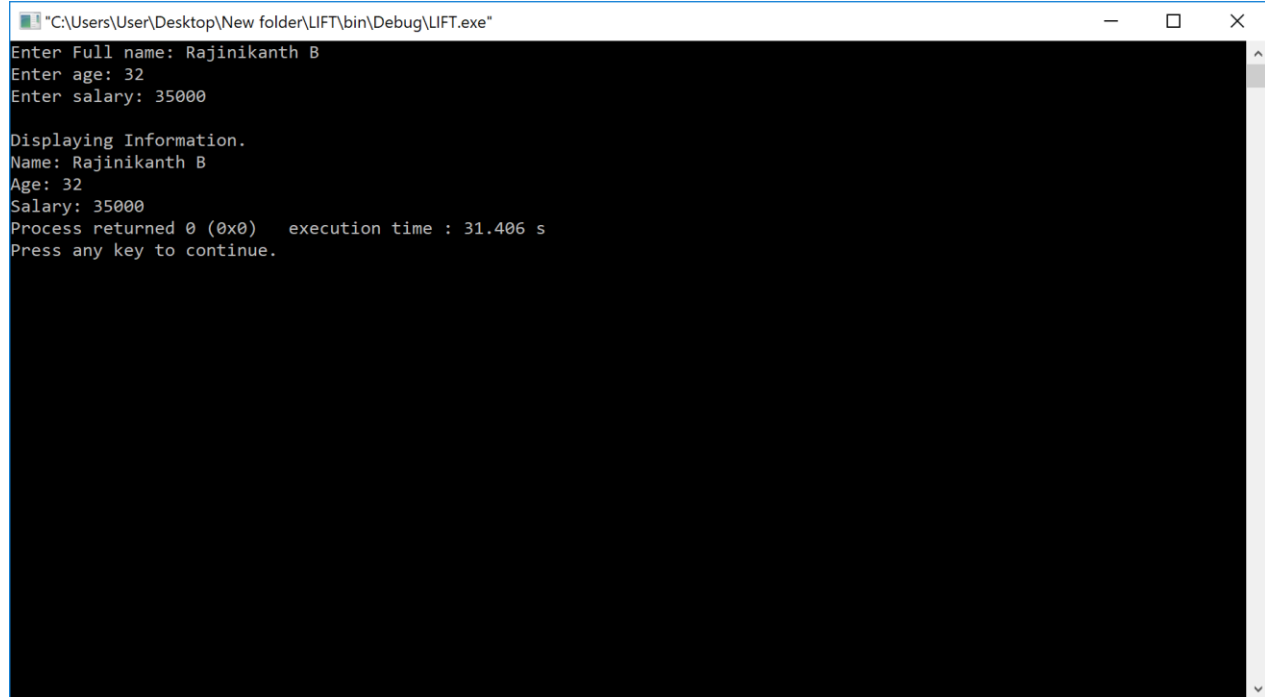
```cpp
#include <iostream>
using namespace std;

struct Person
{
    char name[50];
    int age;
    float salary;
};

int main()
{
    Person p1;

    cout << "Enter Full name: ";
    cin.get(p1.name, 50);
    cout << "Enter age: ";
    cin >> p1.age;
    cout << "Enter salary: ";
    cin >> p1.salary;

    cout << "\nDisplaying Information." << endl;
    cout << "Name: " << p1.name << endl;
    cout <<"Age: " << p1.age << endl;
    cout << "Salary: " << p1.salary;

    return 0;
}
```

Output:

```
"C:\Users\User\Desktop\New folder\LIFT\bin\Debug\LIFT.exe"                    —    □    ×
Enter Full name: Rajinikanth B
Enter age: 32
Enter salary: 35000

Displaying Information.
Name: Rajinikanth B
Age: 32
Salary: 35000
Process returned 0 (0x0)    execution time : 31.406 s
Press any key to continue.
```

Viva Questions:

1. What is a structure?
2. What are structure Variables?
3. What is the difference between structure variable and member variable?

Week 3:

Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.

Source code:

```cpp
#include <iostream>

using namespace std;

class Data
{
    public:
    int a;
    void print()
    {
        cout << "\n" << "Value of 'a' is "<< a << "\n";
    }
};

int main()
{
    Data d, *dp;
    dp = &d;        // pointer to object

    int Data::*ptr=&Data::a;    // pointer to data member 'a'

    d.*ptr=10;
    d.print();

    dp->*ptr=20;
    dp->print();

    return 0;
}
```
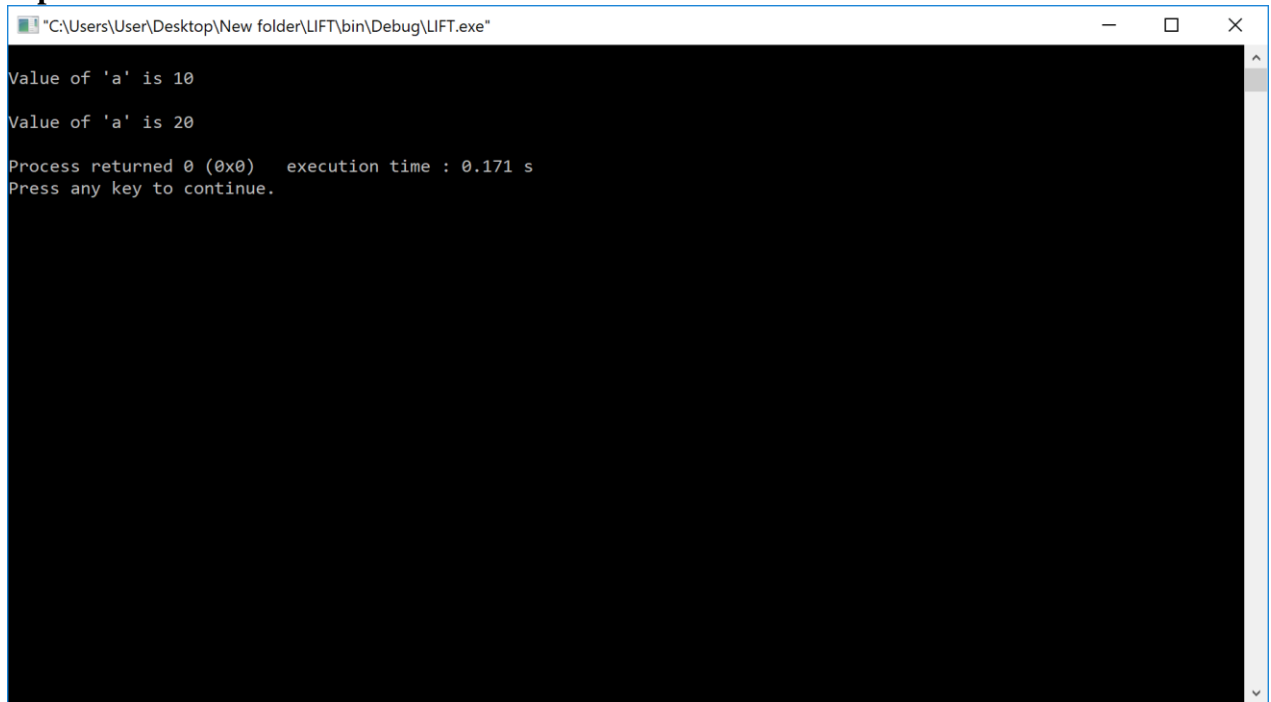
Output:


```
 "C:\Users\User\Desktop\New folder\LIFT\bin\Debug\LIFT.exe"

Value of 'a' is 10

Value of 'a' is 20

Process returned 0 (0x0)   execution time : 0.171 s
Press any key to continue.
```

Viva Questions:

1. What are pointers?
2. How do you declare a pointer in c++?
3. What is the use of pointers in c++?

Week 4:

Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data members.

Source code:

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

using namespace std;

class employee
{
    int    emp_number;
    char   emp_name[20];
    float  emp_basic;
    float  sal;
    float  emp_da;
    float  emp_net_sal;
    float  emp_it;

    public:
        void get_details(int i);
        void find_net_sal();
        void show_emp_details();
};

void employee :: get_details(int i) {
    cout<<"\nEnter employee " << i+1 << " number: ";
    cin>>emp_number;
    cout<<"\nEnter employee " << i+1 << " name: ";
    cin>>emp_name;
    cout<<"\nEnter employee " << i+1 << " basic: ";
    cin>>emp_basic;
}

void employee :: show_emp_details() {
    cout<<"\n\n\nDetails of    :   "<<emp_name;
    cout<<"\n\nEmployee number:  "<<emp_number;
    cout<<"\nBasic salary     :   "<<emp_basic;
    cout<<"\nEmployee DA      :   "<<emp_da;
    cout<<"\nIncome Tax       :   "<<emp_it;
    cout<<"\nNet Salary       :   "<<emp_net_sal;
}

int main() {
    employee emp[10];
    int i,num;

    cout<<"\nEnter number of employee details: ";
```
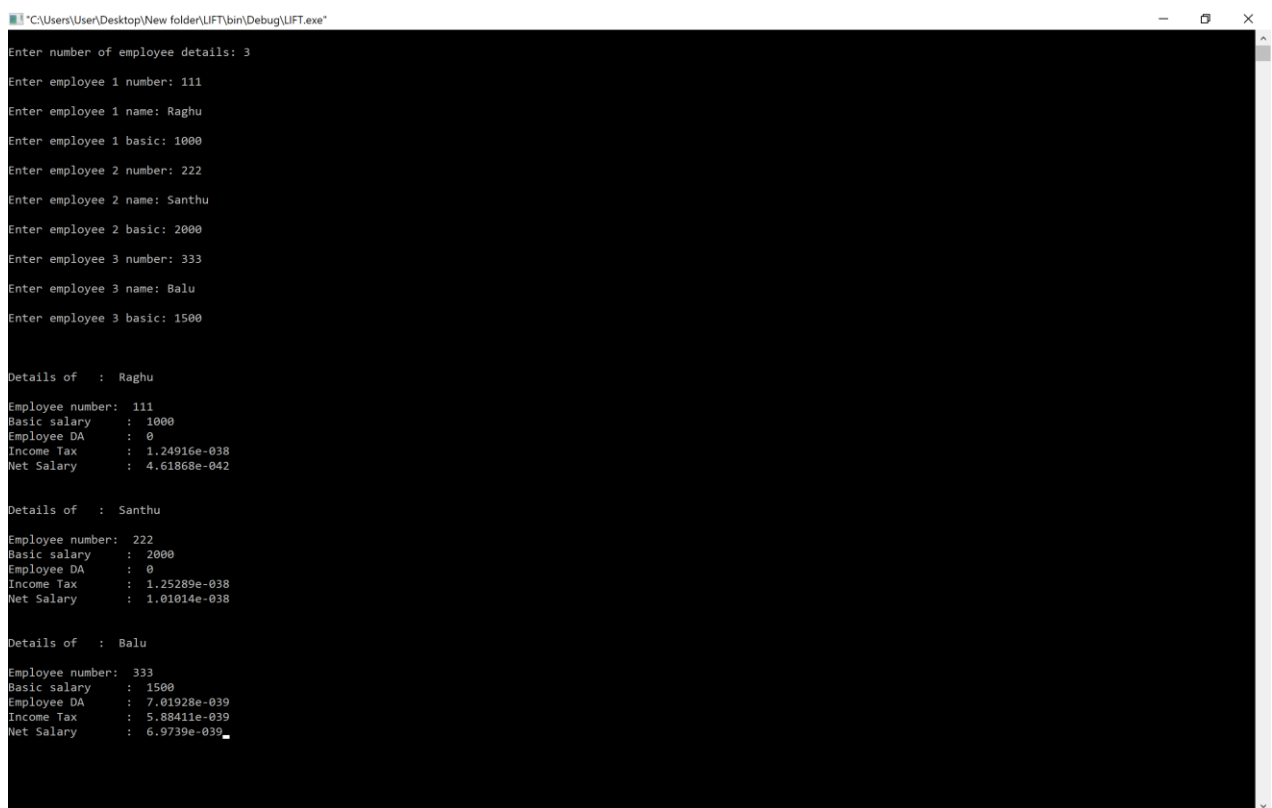
```
    cin>>num;

    for(i=0;i<num;i++)
        emp[i].get_details(i);

    for(i=0;i<num;i++)
        emp[i].show_emp_details();

    getch();
    return 0;
}
```

Output:

Viva Questions:

1. What is a class?
2. What are data members?

Week 5:
Write a C++ program to read the data of N employee and compute Net salary of each employee
(DA=52% of Basic and Income Tax (IT) =30% of the gross salary).

Source code:

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

using namespace std;

class employee {
      int   emp_num;
      char  emp_name[20];
      float emp_basic;
      float sal;
      float emp_da;
      float net_sal;
      float emp_it;

      public:
          void get_details(int i);
          void find_net_sal();
          void show_emp_details();
};

void employee :: get_details(int i) {
      cout<<"\nEnter employee "<< i+1 <<" number: ";
      cin>>emp_num;
      cout<<"\nEnter employee "<< i+1 <<" name: ";
      cin>>emp_name;
      cout<<"\nEnter employee "<< i+1 <<" basic: ";
      cin>>emp_basic;
}

void employee :: find_net_sal() {
      emp_da=0.52*emp_basic;
      emp_it=0.30*(emp_basic+emp_da);
      net_sal=(emp_basic+emp_da)-emp_it;
}

void employee :: show_emp_details() {
    cout<<"\n\n\n********* Employee Details *********\n";
     cout<<"\nDetails of   :  "<<emp_name;
     cout<<"\n\nEmployee number:      "<<emp_num;
     cout<<"\nBasic salary      :   "<<emp_basic;
     cout<<"\nEmployee DA       :   "<<emp_da;
     cout<<"\nIncome Tax        :   "<<emp_it;
     cout<<"\nNet Salary        :   "<<net_sal;
}
```

```
int main() {
      employee emp[10];
      int i,num;

      cout<<"\nEnter number of employee details: ";
      cin>>num;

      for(i=0;i<num;i++)
            emp[i].get_details(i);

      for(i=0;i<num;i++)
            emp[i].find_net_sal();

      for(i=0;i<num;i++)
            emp[i].show_emp_details();

      getch();
      return 0;
}
```
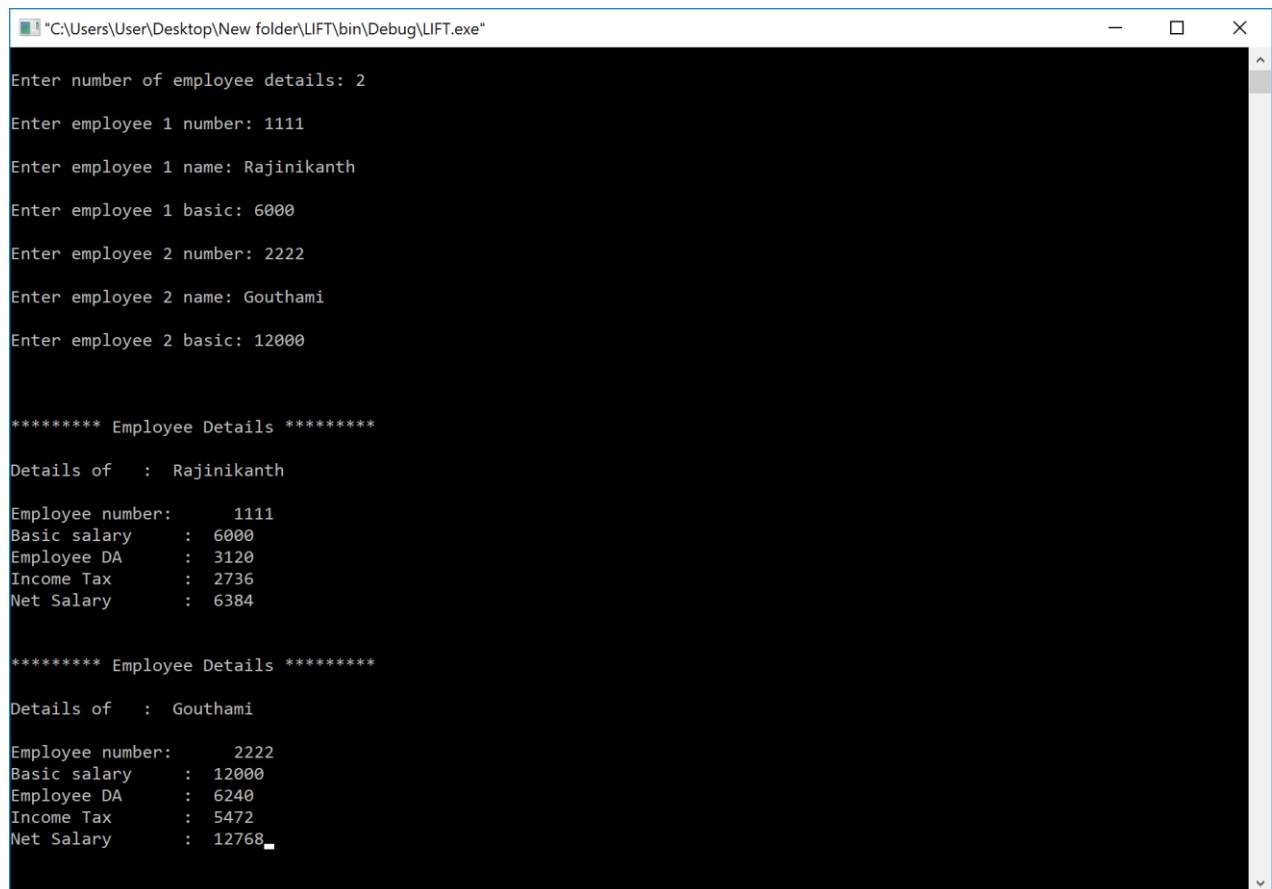
Output:

```
"C:\Users\User\Desktop\New folder\LIFT\bin\Debug\LIFT.exe"                    —    □    ×

Enter number of employee details: 2

Enter employee 1 number: 1111

Enter employee 1 name: Rajinikanth

Enter employee 1 basic: 6000

Enter employee 2 number: 2222

Enter employee 2 name: Gouthami

Enter employee 2 basic: 12000


********* Employee Details *********

Details of    :  Rajinikanth

Employee number:      1111
Basic salary     :  6000
Employee DA      :  3120
Income Tax       :  2736
Net Salary       :  6384


********* Employee Details *********

Details of    :  Gouthami

Employee number:      2222
Basic salary     :  12000
Employee DA      :  6240
Income Tax       :  5472
Net Salary       :  12768
```

Viva Questions:

1. What is a class?
2. What are data members?
3. How you will calculate net salary?

Week6:

Write a C++ to illustrate the concepts of console I/O operations.

Source code:

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

using namespace std;

int main() {
    char c;

    cout<<"\nEnter any character value: ";
    c=cin.get();

    cout.put(c); //Here it prints the value of variable c;

    cout.put('c'); //Here it prints the character 'c';

    return 0;
}
```
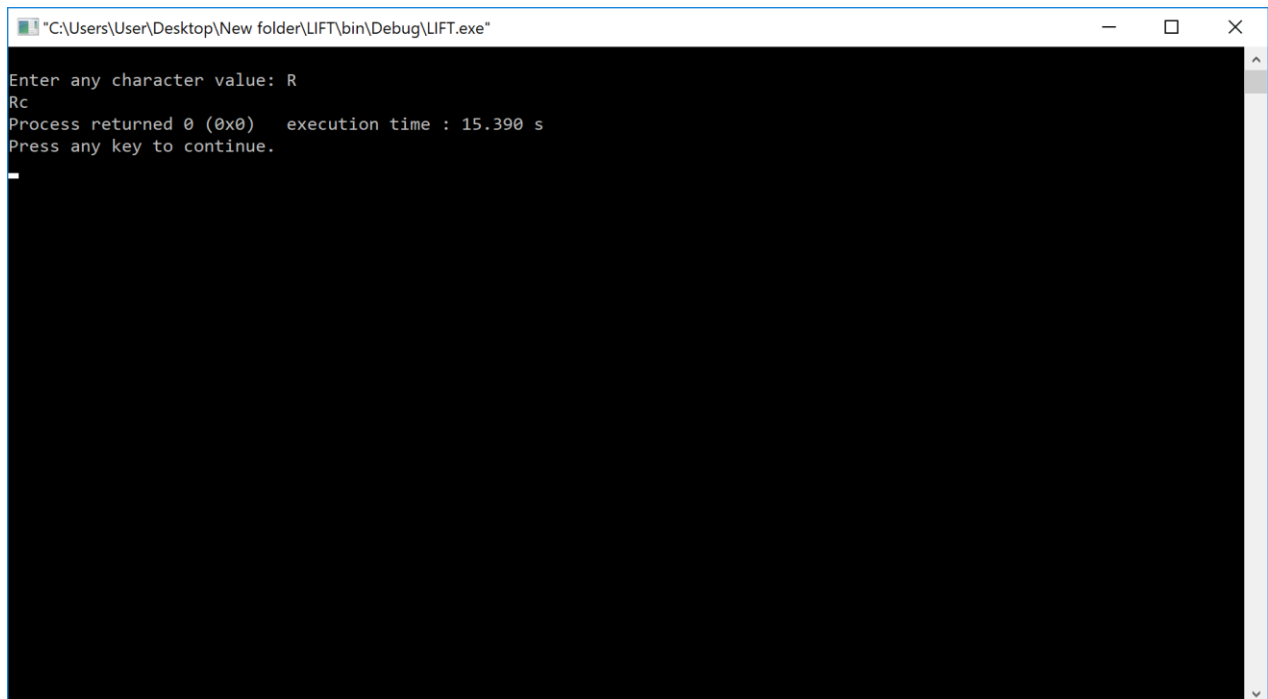
Output:

```
"C:\Users\User\Desktop\New folder\LIFT\bin\Debug\LIFT.exe"                    —    □    ✕

Enter any character value: R
Rc
Process returned 0 (0x0)   execution time : 15.390 s
Press any key to continue.
```
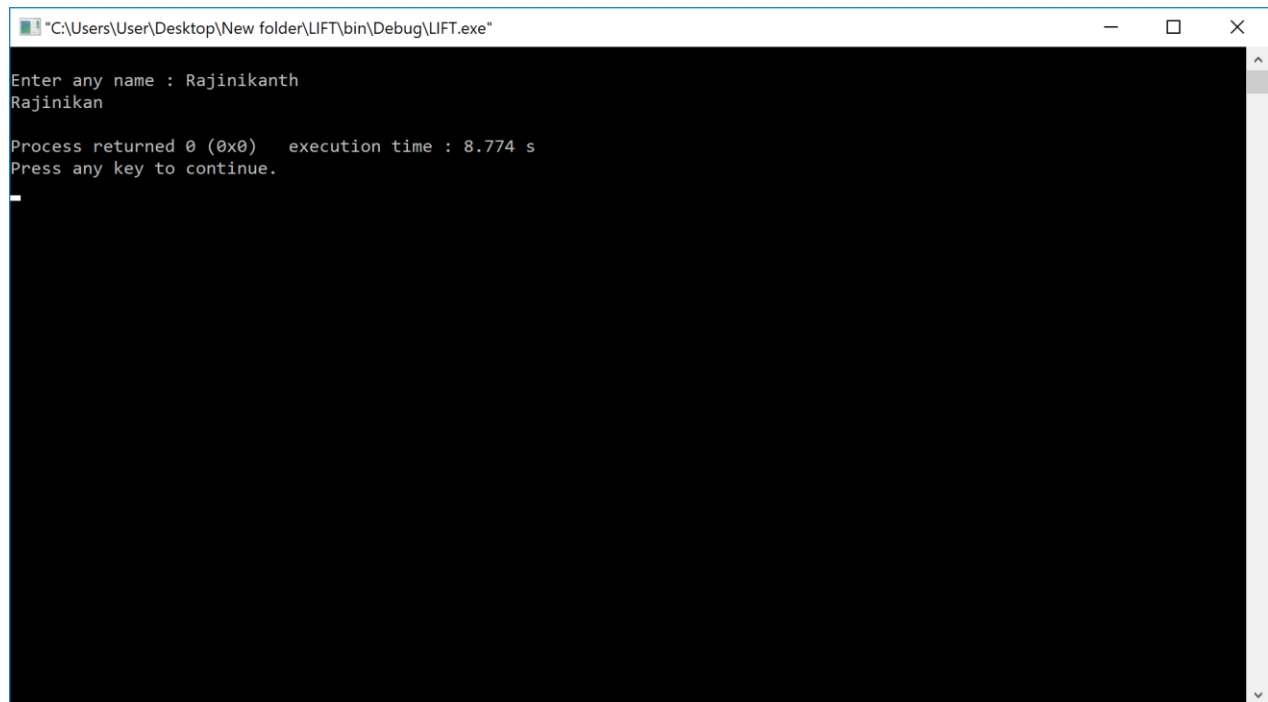
```
#include <iostream>
#include<conio.h>

using namespace std;

int main() {
    cout<<"\nEnter any name : ";
    char c[10];
    cin.getline(c,10); //It takes 10 charcters as input;
    cout.write(c,9); //It reads only 9 character from buffer c;
    cout<<"\n";

    return 0;
}
```

Output:

```
"C:\Users\User\Desktop\New folder\LIFT\bin\Debug\LIFT.exe"                    —    □    ✕

Enter any name : Rajinikanth
Rajinikan

Process returned 0 (0x0)   execution time : 8.774 s
Press any key to continue.
■
```
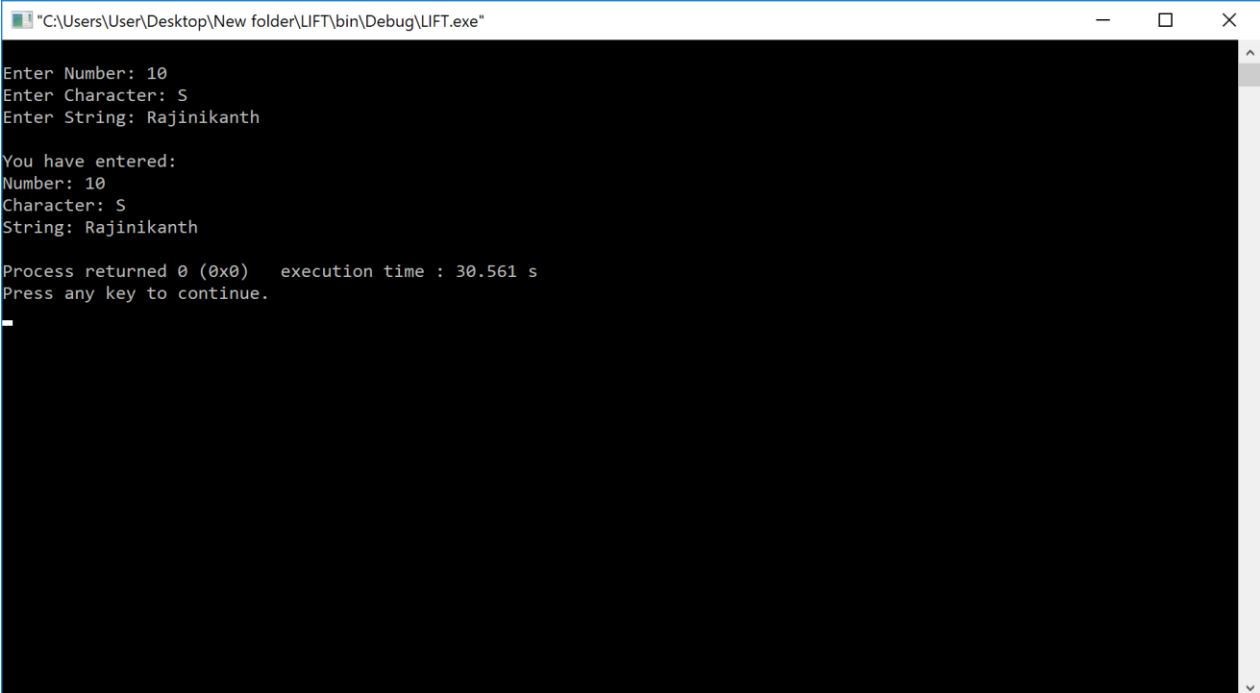
```cpp
#include <iostream>
#include<conio.h>

using namespace std;

int main() {
    int num;
    char ch;
    string str;
    cout<<"\nEnter Number: ";
    cin>>num; //Inputs a variable;
    cout<<"Enter Character: ";
    cin>>ch; //Inputs a character;
    cout<<"Enter String: ";
    cin>>str; //Inputs a string;
    cout<<endl <<"You have entered:\nNumber: "<<num<<"\nCharacter: "
        <<ch<<"\nString: "<<str<<endl;
    return 0;

}
```

Output:

Viva Questions:

1. Various types of console I/O operations form.
2. Explain Insertion and Extraction operator

Week 7:

Write a C++ program to use scope resolution operator. Display the various values of the same variables declared at different scope levels.
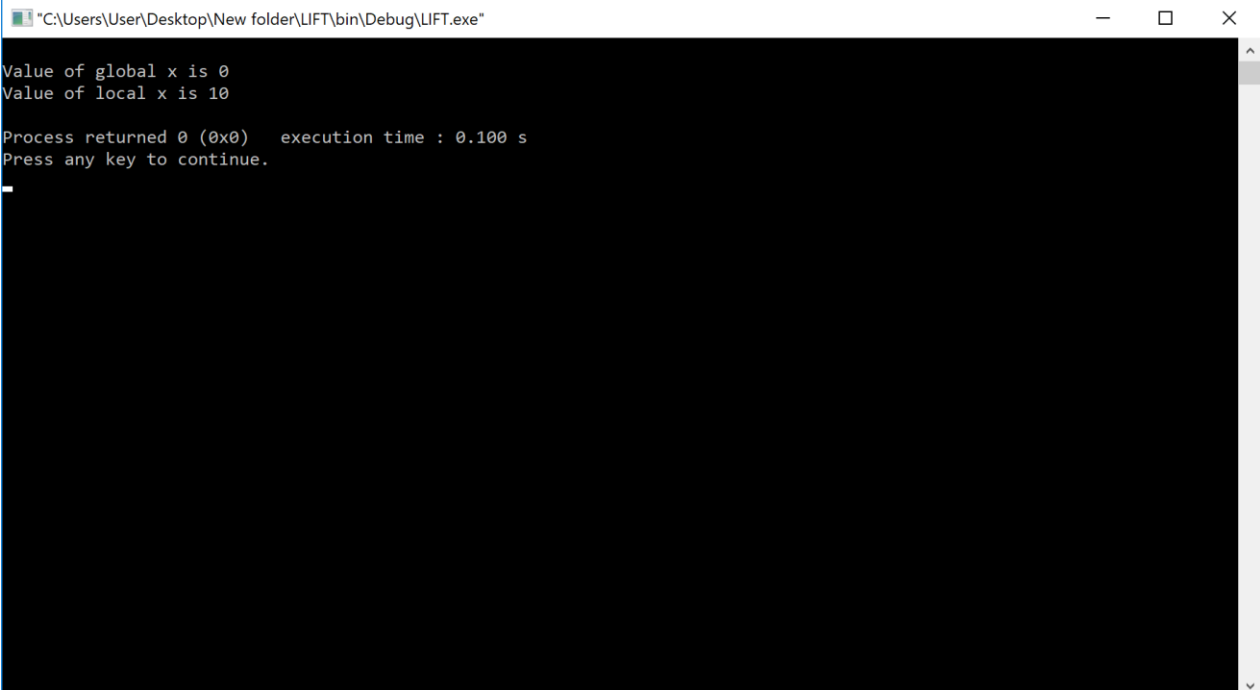
Source code:

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

using namespace std;

int x;

int main() {
    int x = 10; // Local x
    cout << "\nValue of global x is " << ::x;
    cout << "\nValue of local x is " << x <<endl;

    return 0;

}
```

Output:

Viva Questions:
1.What is importance of scope resolution operator?
2.Define scope of the variables?

Week 8:

Write a C++ program to allocate memory using new operator.

Source code:

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

using namespace std;

int main() {

    double* pvalue  = NULL; // Pointer initialized with null
    pvalue  = new double;   // Request memory for the variable

    *pvalue = 29494.99;     // Store value at allocated address
    cout << "\nValue of pvalue : " << *pvalue << endl;

    delete pvalue;          // free up the memory.

    return 0;
}
```
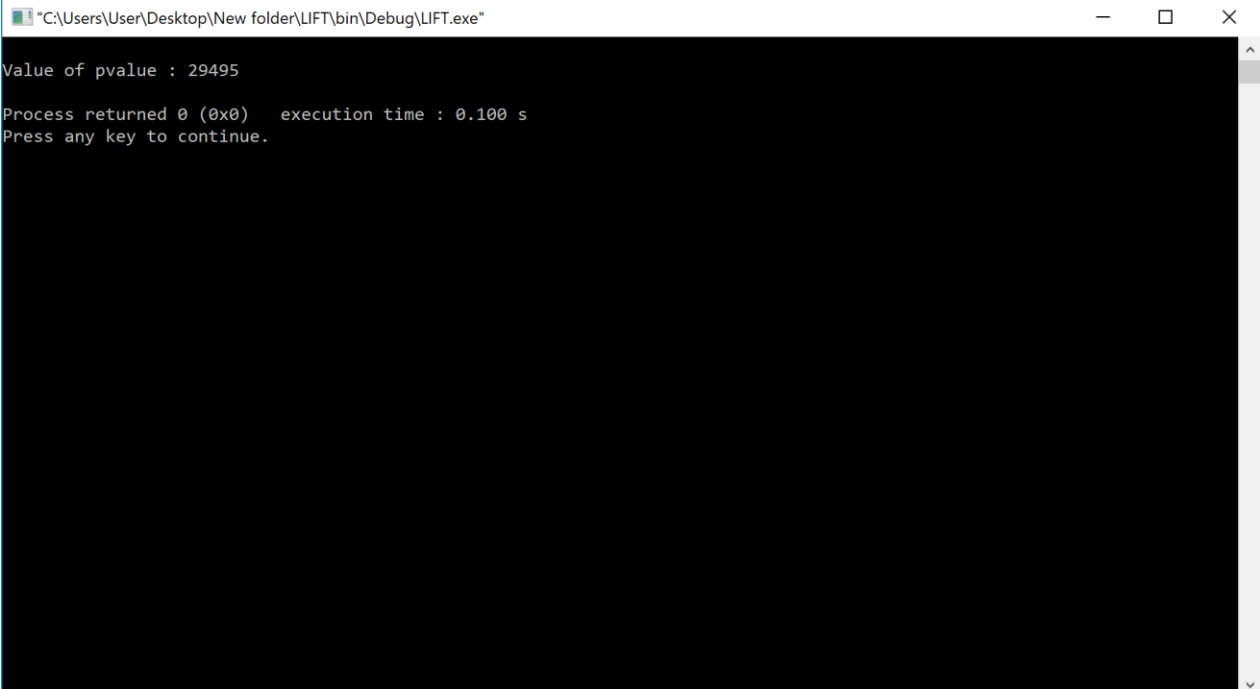
Output:


```
"C:\Users\User\Desktop\New folder\LIFT\bin\Debug\LIFT.exe"                    —    □    ✕

Value of pvalue : 29495

Process returned 0 (0x0)   execution time : 0.100 s
Press any key to continue.
```

Viva Questions:
1.What is dynamic memory allocation?
2.Explain new and delete operators.

Week 9:

Write a C++ program to create multilevel inheritance. (Hint: Classes A1, A2, A3)

Source code:

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

using namespace std;

class base //single base class
{
 public:
 int x;
 void getdata() {
    cout << "Enter value of x= "; cin >> x;
 }
};
class derive1 : public base // derived class from base class
{
 public:
 int y;
 void readdata()
 {
        cout << "\nEnter value of y= "; cin >> y;
 }
};
class derive2 : public derive1   // derived from class derive1
{
    private:
    int z;
    public:
    void indata() {
    cout << "\nEnter value of z= "; cin >> z;
    }
    void product() {
        cout << "\nProduct= " << x * y * z <<endl;
    }
};

int main() {
    derive2 a;        //object of derived class
    a.getdata();
    a.readdata();
    a.indata();
    a.product();

    return 0;

}
```
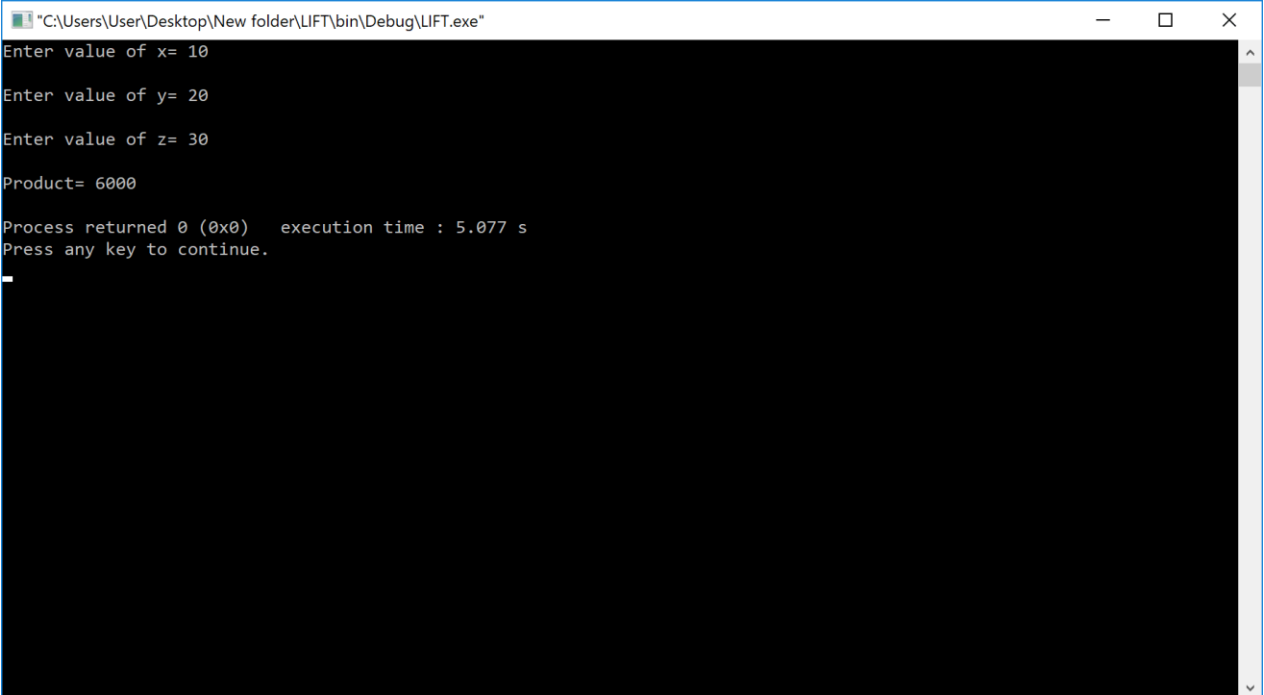
Output:

```
"C:\Users\User\Desktop\New folder\LIFT\bin\Debug\LIFT.exe"                    —    □    ✕

Enter value of x= 10

Enter value of y= 20

Enter value of z= 30

Product= 6000

Process returned 0 (0x0)   execution time : 5.077 s
Press any key to continue.
_
```

Viva Questions:

1.What is Inheritance?
2.Types of inheritance?

Week 10:

Write a C++ program to create an array of pointers. Invoke functions using array objects.

Source code:

```cpp
#include <iostream>
#include <string>

using namespace std;

class Student
{
        string name;
        int marks;
        public:
            void getName()
            {
                    getline( cin, name );
            }
            void getMarks()
            {
                    cin >> marks;
            }
            void displayInfo()
            {
                    cout << "Name : " << name << endl;
                    cout << "Marks : " << marks << endl;
            }
};

int main()
{
        Student st[5].*ptr;
        ptr=&st;
        for( int i=0; i<5; i++ )
        {
                cout << "Student " << i + 1 << endl;
                cout << "Enter name" << endl;
                st[i]->getName();
                cout << "Enter marks" << endl;
                st[i]->getMarks();
        }

        for( int i=0; i<5; i++ )
        {
                cout << "Student " << i + 1 << endl;
                st[i]->displayInfo();
        }
        return 0;
}
```

Output:

Output
Student 1
Enter name
Jack
Enter marks
54
Student 2
Enter name
Marx
Enter marks
45
Student 3
Enter name
Julie
Enter marks
47
Student 4
Enter name
Peter
Enter marks
23
Student 5
Enter name
Donald
Enter marks
87
Student 1
Name : Jack
Marks : 54
Student 2
Name : Marx
Marks : 45
Student 3
Name : Julie
Marks : 47
Student 4
Name : Peter
Marks : 23
Student 5
Name : Donald
Marks : 87

Viva Questions:

1. What is a Pointer to an Array?

Week 11:

Write a C++ program to use pointer for both base and derived classes and call the member function. Use Virtual keyword.

Source code:

```cpp
#include <iostream>
using namespace std;

class Weapon {
    public:
      virtual void features() { cout << "Loading weapon features.\n"; }
};

class Bomb : public Weapon {
    public:
    void features() {
        this->Weapon::features();
        cout << "Loading bomb features.\n";
     }
};

class Gun : public Weapon {
    public:
    void features() {
      this->Weapon::features();
      cout << "Loading gun features.\n";
    }
};

class Loader {
   public:
     void loadFeatures(Weapon *weapon) {
        weapon->features();
     }
};

int main() {
    Loader *l = new Loader;
    Weapon *w;
    Bomb b;
    Gun g;
    w = &b;
    l->loadFeatures(w);
    w = &g;
    l->loadFeatures(w);

    return 0;
}
```
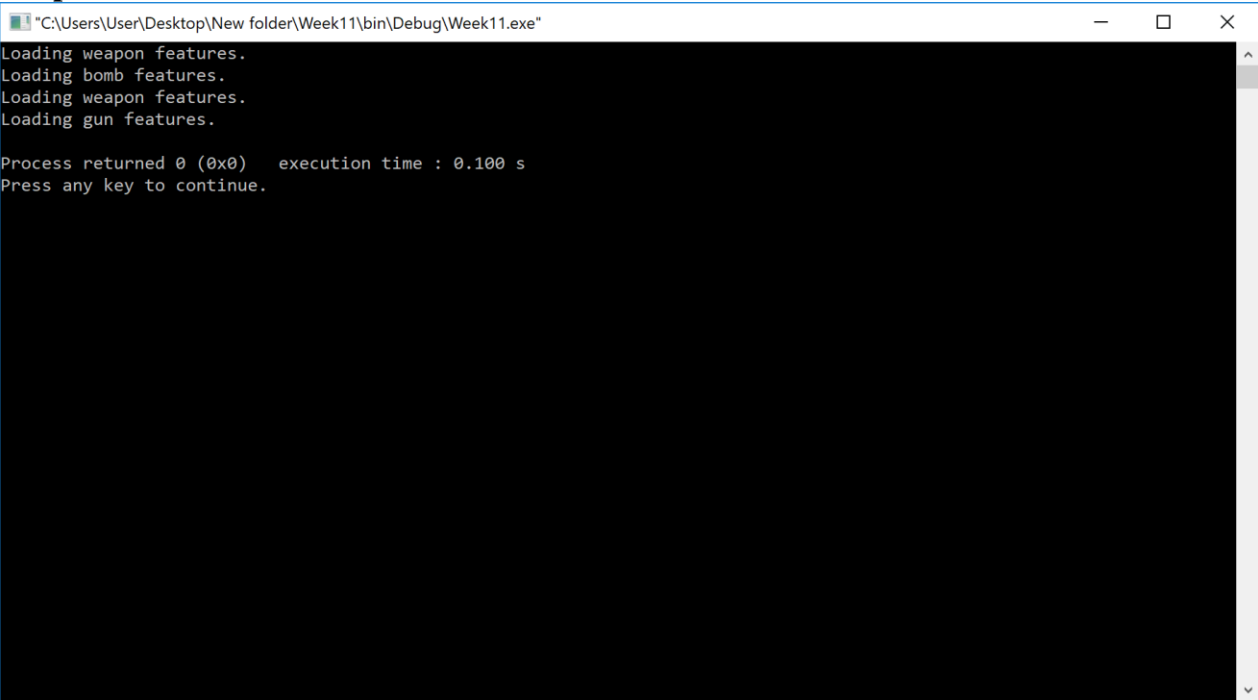
Output:

```
"C:\Users\User\Desktop\New folder\Week11\bin\Debug\Week11.exe"                    —  □  ×
Loading weapon features.
Loading bomb features.
Loading weapon features.
Loading gun features.

Process returned 0 (0x0)   execution time : 0.100 s
Press any key to continue.
```

Viva Questions:

1. What is virtual function?
2. Why virtual function is used?