Q.1 Implement a class Complex which represents the Complex Number data type. Implement the following
1. Constructor (including a default constructor which creates the complex number 0+0i).
2. Overload operator+ to add two complex numbers.
3. Overload operator* to multiply two complex numbers.
4. Overload operators << and >> to print and read Complex Numbers.

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

class Complex                        //decaring Class Complex
{
    double real;
    double img;
    public:
    Complex();            // Default Constructor
    friend istream & operator >> (istream &, Complex &); // Input
    friend ostream & operator << (ostream &, const Complex &); // Output
    Complex operator + (Complex); // Addition
    Complex operator * (Complex); // Multiplication
};


Complex::Complex()                // Default Constructor
{
    real = 0;
    img = 0;
}


istream & operator >> (istream &, Complex & i)
{
    cin >> i.real >> i.img;
    return cin;
}

ostream & operator << (ostream &, const Complex & d)
{
    cout << d.real << " + " << d.img << "i" << endl;
    return cout;
}



Complex Complex::operator + (Complex c1)   // Overloading + operator
{
    Complex temp;
    temp.real = real + c1.real;
    temp.img = img + c1.img;
    return temp;
}
```

```
Complex Complex::operator * (Complex c2)   // Overloading * Operator
{
    Complex tmp;
    tmp.real = real * c2.real - img * c2.img;
    tmp.img = real * c2.img + img * c2.real;
    return tmp;
}


int main()
{
    Complex C1, C2, C3, C4;
    int flag = 1;
    char b;
    while (flag == 1)
    {
        cout << "Enter Real and Imaginary part of the Complex Number 1 : \n";
        cin >> C1;
        cout << "Enter Real and Imaginary part of the Complex Number 2 : \n";
        cin >> C2;
        int f = 1;
        while (f == 1)
        {
            cout << "Complex Number 1 : " << C1 << endl;
            cout << "Complex Number 2 : " << C2 << endl;
            cout << "***MENU***" << endl;
            cout << "1. Addition of Complex Numbers" << endl;
            cout << "2. Multiplication of Complex Numbers" << endl;
            cout << "3. Exit\n";
            int a;
            cout << "Enter your choice from above MENU (1 to 3) : ";
            cin >> a;
            if (a == 1)
            {
                C3 = C1+C2;
                cout << "Addition : " << C3 << endl;
                cout << "Do you wan to perform another operation (y/n) : \n";
                cin >> b;
                if (b == 'y' || b == 'Y')
                {
                    f=1;
                }
                else
                {
                    cout << "Thanks for using this program!!\n";
                    flag=0;
                    f=0;
                }
            }
```

```
            else if (a == 2)
            {
                C4 = C1 * C2;
                cout << "Multiplication : " << C4 << endl;
                cout << "Do you wan to perform another operation (y/n) : \n";
                cin >> b;
                if (b == 'y' || b == 'Y')
                {
                    f=1;
                }
                else
                {
                    cout << "Thanks for using this program!!\n";
                    flag=0;
                    f=0;
                }
            }
            else
            {
                cout << "Thanks for using this program!!\n";
                flag=0;
                f=0;
            }
        }
    }
    return 0;
}
```

```
onkar@ubuntu: ~
onkar@ubuntu:~$ g++ oop1.cpp
onkar@ubuntu:~$ ./a.out
Enter Real and Imaginary part of the Complex Number 1 :
5
4
Enter Real and Imaginary part of the Complex Number 2 :
7
8
Complex Number 1 : 5 + 4i

Complex Number 2 : 7 + 8i

***MENU***
1. Addition of Complex Numbers
2. Multiplication of Complex Numbers
3. Exit
Enter your choice from above MENU (1 to 3) : 1
Addition : 12 + 12i

Do you wan to perform another operation (y/n) :
y
Complex Number 1 : 5 + 4i

Complex Number 2 : 7 + 8i

***MENU***
1. Addition of Complex Numbers
2. Multiplication of Complex Numbers
3. Exit
Enter your choice from above MENU (1 to 3) : 2
Multiplication : 3 + 68i

Do you wan to perform another operation (y/n) :
y
Complex Number 1 : 5 + 4i

Complex Number 2 : 7 + 8i

***MENU***
1. Addition of Complex Numbers
```

Q.2. Develop a program in C++ to create a database of student's information system containing the following information: Name, Roll number, Class, Division, Date of Birth, Blood group, Contact address, Telephone number, Driving license no. and other. Construct the database with suitable member functions. Make use of constructor, default constructor, copy constructor, destructor, static member functions, friend class, this pointer, inline code and dynamic memory allocation operators-new and delete as well as exception handling.

```
#include<iostream>
#include<string.h>
using namespace std;

class StudData;

class Student{
    string name;
    int roll_no;
    string cls;
    char* division;
    string dob;
    char* bloodgroup;
    static int count;

    public:

    Student()          // Default Constructor
    {
        name="";
        roll_no=0;
        cls="";
        division=new char;
        dob="dd/mm/yyyy";
        bloodgroup=new char[4];
    }

    ~Student()
    {
        delete division;
        delete[] bloodgroup;
    }

    static int getCount()
    {
        return count;
    }

    void getData(StudData*);
    void dispData(StudData*);
};

class StudData{
    string caddress;
    long int* telno;
```

```
    long int* dlno;
    friend class Student;

    public:

    StudData()
    {
        caddress="";
        telno=new long;
        dlno=new long;
    }

    ~StudData()
    {
        delete telno;
        delete dlno;
    }

    void getStudData()
    {
        cout<<"Enter Contact Address : ";
        cin.get();
        getline(cin,caddress);
        cout<<"Enter Telephone Number : ";
        cin>>*telno;
        cout<<"Enter Driving License Number : ";
        cin>>*dlno;
    }

    void dispStudData()
    {
        cout<<"Contact Address : "<<caddress<<endl;
        cout<<"Telephone Number : "<<*telno<<endl;
        cout<<"Driving License Number : "<<*dlno<<endl;
    }
};

inline void Student::getData(StudData* st)
{
    cout<<"Enter Student Name : ";
    getline(cin,name);
    cout<<"Enter Roll Number : ";
    cin>>roll_no;
    cout<<"Enter Class : ";
    cin.get();
    getline(cin,cls);
    cout<<"Enter Division : ";
    cin>>division;
    cout<<"Enter Date of Birth : ";
    cin.get();
```

```
    getline(cin,dob);
    cout<<"Enter Blood Group : ";
    cin>>bloodgroup;
    st->getStudData();
    count++;
}

inline void Student::dispData(StudData* st1)
{
    cout<<"Student Name : "<<name<<endl;
    cout<<"Roll Number : "<<roll_no<<endl;
    cout<<"Class : "<<cls<<endl;
    cout<<"Division : "<<division<<endl;
    cout<<"Date of Birth : "<<dob<<endl;
    cout<<"Blood Group : "<<bloodgroup<<endl;
    st1->dispStudData();
}

int Student::count;

int main()
{
    Student* stud1[100];
    StudData* stud2[100];
    int n=0;
    char ch;

    do
    {
        stud1[n]=new Student;
        stud2[n]=new StudData;
        stud1[n]->getData(stud2[n]);
        n++;
        cout<<"Do you want to add another student (y/n) : ";
        cin>>ch;
        cin.get();
    } while (ch=='y' || ch=='Y');

    for(int i=0;i<n;i++)
    {
        cout<<"-----------------------------------------------------------------"<<endl;
        stud1[i]->dispData(stud2[i]);
    }

    cout<<"-----------------------------------------------------------------"<<endl;
    cout<<"Total Students : "<<Student::getCount();
    cout<<endl<<"-----------------------------------------------------------------"<<endl;

    for(int i=0;i<n;i++)
    {
```

```
        delete stud1[i];
        delete stud2[i];
    }


    return 0;
}
```

Q.3. Imagine a publishing company which does marketing for book and audio cassette versions. Create a class publication that stores the title (a string) and price (type float) of publications. From this class derive two classes: book which adds a page count (type int) and tape which adds a playing time in minutes (type float).
Write a program that instantiates the book and tape class, allows user to enter data and displays the data members. If an exception is caught, replace all the data member values with zero values.

```
 # include<iostream>

# include<stdio.h>
using namespace std;
class publication                 // declaring class Publication
 {
 private:
 string title;
 float price;
 public:
 void add()
 {
 cout << "\nEnter the Publication information : " << endl;
 cout << "Enter Title of the Publication : ";
cin.ignore();
getline(cin, title);
cout << "Enter Price of Publication : ";
 cin >> price;
 }
 void display()
 {
 cout << "\n-------------------------------------------------";
 cout << "\nTitle of Publication : " << title;
 cout << "\nPublication Price : " << price;
 }
 };
 class book : public publication  // declaring class book which inherits class publication in
public mode.
 {
 private:
 int page_count;
 public:
 void add_book()
 {
 try
 {
 add();
cout << "Enter Page Count of Book : ";
 cin >> page_count;
 if (page_count <= 0)
 {
 throw page_count;
```

```
 }
 }
 catch(...)
 {
 cout << "\nInvalid Page Count!!!";
 page_count = 0;
 }
 }
 void display_book()
 {
 display();
cout << "\nPage Count : " <<
page_count;
 cout << "\n-------------------------------------------------\n";
 }
 };
 class tape : public publication     // declaring class tape which inherits class publication
in public mode
 {
 private:
 float play_time;
 public:
 void add_tape()
 {
 try
 {
 add();
cout << "Enter Play Duration of the Tape : ";
 cin >> play_time;
 if (play_time <= 0)
 throw play_time;
 }
 catch(...)
 {
 cout << "\nInvalid Play Time!!!";
 play_time = 0;
 }
 }
 void display_tape()
 {
 display();
 cout << "\nPlay Time : " <<
play_time << " min";
 cout << "\n-------------------------------------------------\n";
 }
 };
 int main()
 {
 book b1[10];            // object of class book
 tape t1[10];            // object of class tape
```

```
 int ch, b_count = 0, t_count = 0;
 do
 {
 cout << "\n* * * * * PUBLICATION DATABASE SYSTEM * * * * *";
 cout << "\n--------------------MENU----------------------";
 cout << "\n1. Add Information to Books";
 cout << "\n2. Add Information to Tapes";
 cout << "\n3. Display Books Information";
 cout << "\n4. Display Tapes Information";
 cout << "\n5. Exit";
 cout << "\n\nEnter your choice : ";
 cin >> ch;
 switch(ch)
 {
 case 1:
 b1[b_count].add_book();
b_count ++ ;
break;
 case 2:
 t1[t_count].add_tape();
 t_count ++ ;
 break;
 case 3:
 cout << "\n* * * * BOOK PUBLICATION DATABASE SYSTEM * * * *";
 for (int j=0;j < b_count;j++)
 {
 b1[j].display_book();
 }
 break;
 case 4:
 cout << "\n* * * * TAPE PUBLICATION DATABASE SYSTEM * * * *";
 for (int j=0;j < t_count;j++)
 {
 t1[j].display_tape();
 }
 break;
 case 5:
 cout<< "Thank for using program\n";
 exit(0);
 }
 }while (ch != 5);
 return 0;
 }
```

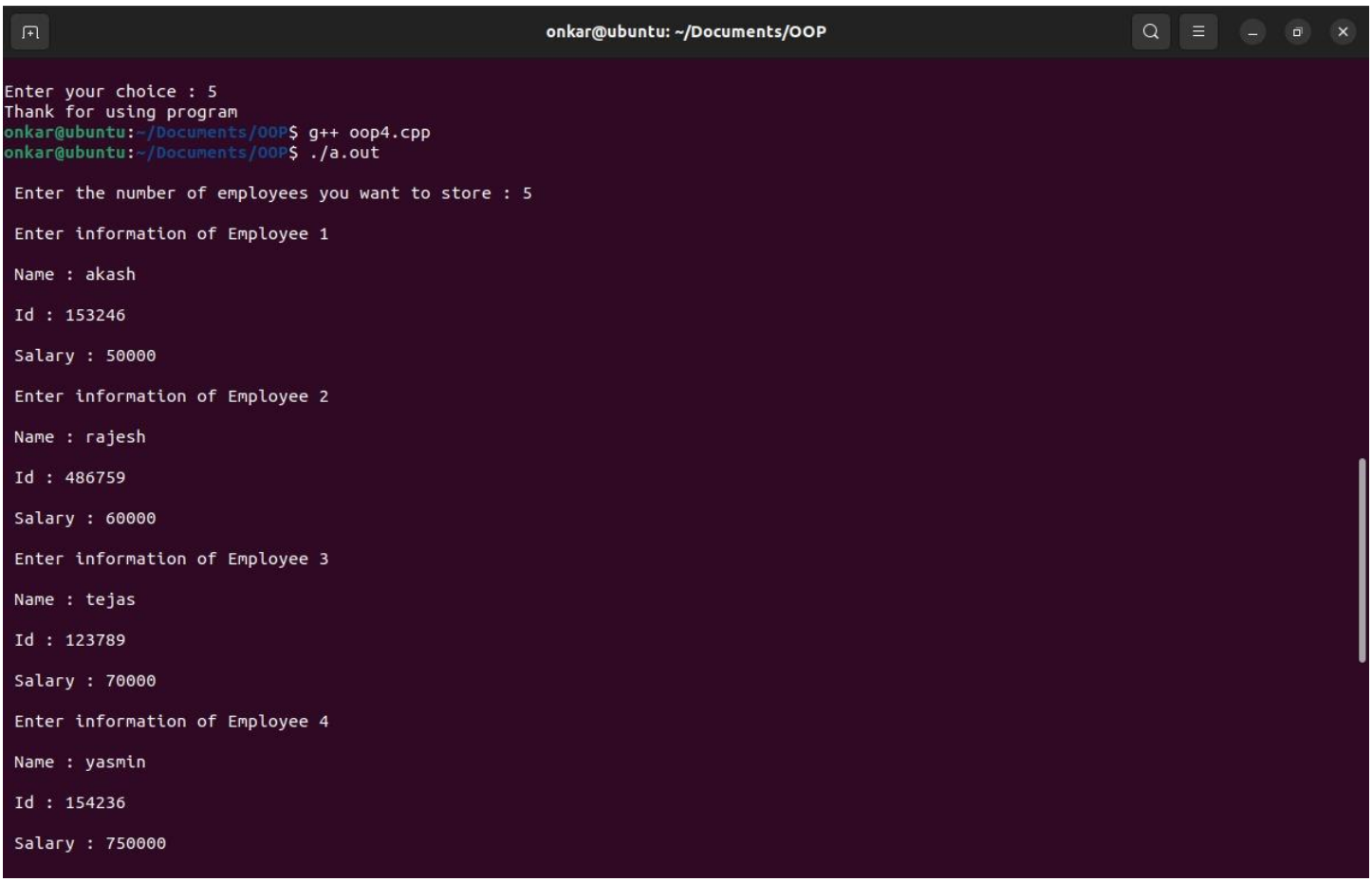
```
onkar@ubuntu: ~/Documents/OOP

onkar@ubuntu:~$ cd Documents/OOP
onkar@ubuntu:~/Documents/OOP$ g++ oop3.cpp
onkar@ubuntu:~/Documents/OOP$ ./a.out

* * * * * PUBLICATION DATABASE SYSTEM * * * * *
--------------------MENU----------------------
1. Add Information to Books
2. Add Information to Tapes
3. Display Books Information
4. Display Tapes Information
5. Exit

Enter your choice : 1

Enter the Publication information :
Enter Title of the Publication : lifeline
Enter Price of Publication : 250
Enter Page Count of Book : 100

* * * * * PUBLICATION DATABASE SYSTEM * * * * *
--------------------MENU----------------------
1. Add Information to Books
2. Add Information to Tapes
3. Display Books Information
4. Display Tapes Information
5. Exit

Enter your choice : 2

Enter the Publication information :
Enter Title of the Publication : lifeline
Enter Price of Publication : 50
Enter Play Duration of the Tape : 20

* * * * * PUBLICATION DATABASE SYSTEM * * * * *
--------------------MENU----------------------
1. Add Information to Books
2. Add Information to Tapes
3. Display Books Information
4. Display Tapes Information
```

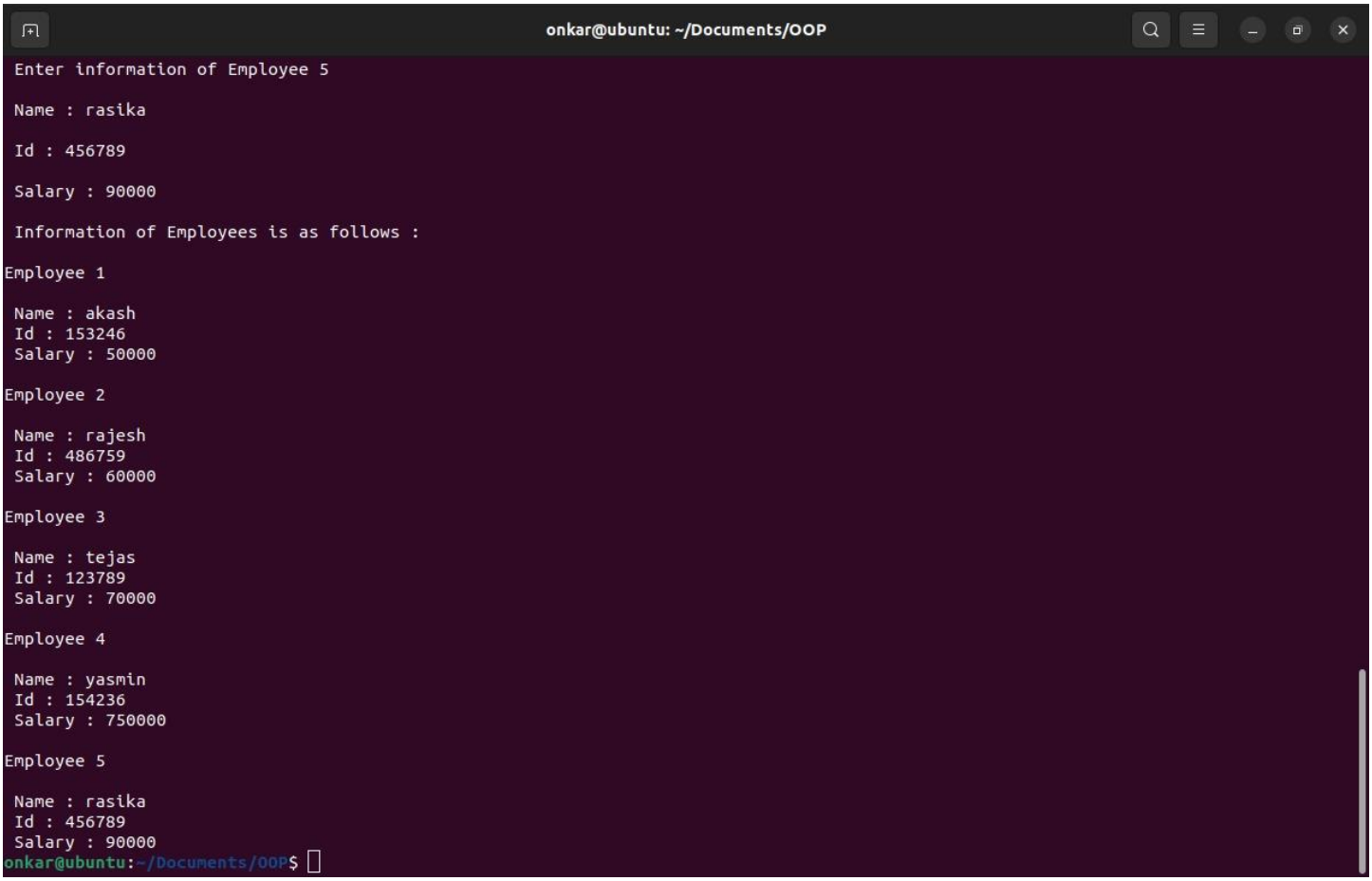
```
onkar@ubuntu: ~/Documents/OOP

4. Display Tapes Information
5. Exit

Enter your choice : 3

* * * * BOOK PUBLICATION DATABASE SYSTEM * * * *
-------------------------------------------------
Title of Publication : lifeline
Publication Price : 250
Page Count : 100
-------------------------------------------------

* * * * * PUBLICATION DATABASE SYSTEM * * * * *
--------------------MENU----------------------
1. Add Information to Books
2. Add Information to Tapes
3. Display Books Information
4. Display Tapes Information
5. Exit

Enter your choice : 4

* * * * TAPE PUBLICATION DATABASE SYSTEM * * * *
-------------------------------------------------
Title of Publication : lifeline
Publication Price : 50
Play Time : 20 min
-------------------------------------------------

* * * * * PUBLICATION DATABASE SYSTEM * * * * *
--------------------MENU----------------------
1. Add Information to Books
2. Add Information to Tapes
3. Display Books Information
4. Display Tapes Information
5. Exit

Enter your choice : 5
Thank for using program
onkar@ubuntu:~/Documents/OOP$
```

Q.4. Write a C++ program that creates an output file, writes information to it, closes the file, open it again as an input file and read the information from the file

```
#include<iostream>

#include<fstream>
using namespace std;
class Employee              // declaring class employee
{
 string Name;
 int ID;
 double salary;
 public:
 void accept()
 {
 cout<<"\n Name : ";
 cin.ignore();
getline(cin,Name);
 cout<<"\n Id : ";
 cin>>ID;
 cout<<"\n Salary : ";
 cin>>salary;
 }
 void display()
 {
 cout<<"\n Name : "<<Name;
 cout<<"\n Id : "<<ID;
 cout<<"\n Salary : "<<salary<<endl;
 }
};

int main()
{
 Employee o[5];
 fstream f;
 int i,n;

 f.open("oop4.txt",ios::out);
 cout<<"\n Enter the number of employees you want to store : ";
 cin>>n;
 for(i=0;i<n;i++)
 {
 cout<<"\n Enter information of Employee "<<i+1<<"\n";
 o[i].accept();
 f.write((char*)&o[i],sizeof o[i]);
 }

 f.close();

 f.open("oop4.txt",ios::in);
 cout<<"\n Information of Employees is as follows : \n";
```

```
 for(i=0;i<n;i++)
 {
 cout<<"\nEmployee "<<i+1<<"\n";
 f.write((char*)&o[i],sizeof o[i]);
 o[i].display();
 }
 f.close();

 return 0;
}
```

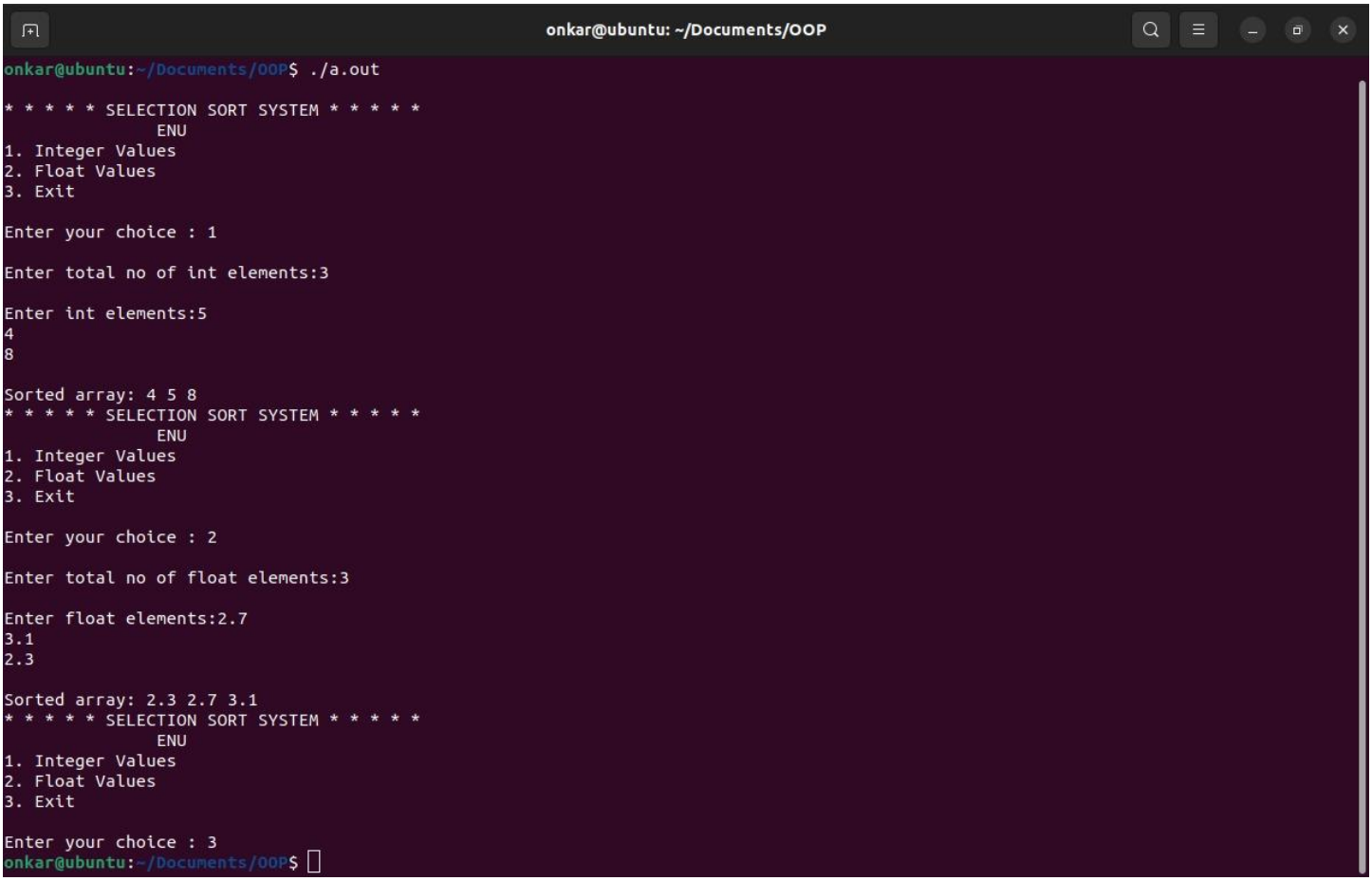



onkar@ubuntu: ~/Documents/OOP
Enter information of Employee 5
Name : rasika
Id : 456789
Salary : 90000
Information of Employees is as follows :
Employee 1
Name : akash
Id : 153246
Salary : 50000
Employee 2
Name : rajesh
Id : 486759
Salary : 60000
Employee 3
Name : tejas
Id : 123789
Salary : 70000
Employee 4
Name : yasmin
Id : 154236
Salary : 750000
Employee 5
Name : rasika
Id : 456789
Salary : 90000
onkar@ubuntu:~/Documents/OOP$

Q.5. Write a function template for selection sort that inputs, sorts and outputs an integer array and a float array.

```
#include<iostream>

using namespace std;
int n;
#define size 10
template<class T>
void sel(T A[size])
{
    int i,j,min;
    T temp;
    for(i=0;i<n-1;i++)
    {
        min=i;
        for(j=i+1;j<n;j++)
        {
            if(A[j]<A[min])
            min=j;
        }
        temp=A[i];
        A[i]=A[min];
        A[min]=temp;
    }
    cout<<"\nSorted array:";
    for(i=0;i<n;i++)
    {
        cout<<" "<<A[i];
    }
}

int main()
{
    int A[size];
    float B[size];
    int i;
    int ch;
    do
    {
        cout<<"\n* * * * * SELECTION SORT SYSTEM * * * * *";
        cout<<"\n\t\t\bENU";
        cout<<"\n1. Integer Values";
        cout<<"\n2. Float Values";
        cout<<"\n3. Exit";
        cout<<"\n\nEnter your choice : ";
        cin>>ch;

        switch(ch)
        {
            case 1:
```

```
                cout<<"\nEnter total no of int elements:";
                        cin>>n;
                        cout<<"\nEnter int elements:";
                        for(i=0;i<n;i++)
                        {
                                cin>>A[i];
                        }
                        sel(A);
                break;

            case 2:
                cout<<"\nEnter total no of float elements:";
                        cin>>n;
                        cout<<"\nEnter float elements:";
                        for(i=0;i<n;i++)
                        {
                                cin>>B[i];
                        }
                        sel(B);
                break;

            case 3:
                exit(0);
        }
    }
    while(ch!=3);
   return 0;
}
```


onkar@ubuntu: ~/Documents/OOP
onkar@ubuntu:~/Documents/OOP$ ./a.out
* * * * * SELECTION SORT SYSTEM * * * * *
ENU
1. Integer Values
2. Float Values
3. Exit
Enter your choice : 1
Enter total no of int elements:3
Enter int elements:5
4
8
Sorted array: 4 5 8
* * * * * SELECTION SORT SYSTEM * * * * *
ENU
1. Integer Values
2. Float Values
3. Exit
Enter your choice : 2
Enter total no of float elements:3
Enter float elements:2.7
3.1
2.3
Sorted array: 2.3 2.7 3.1
* * * * * SELECTION SORT SYSTEM * * * * *
ENU
1. Integer Values
2. Float Values
3. Exit
Enter your choice : 3
onkar@ubuntu:~/Documents/OOP$

Q.6. Write C++ program using STL for sorting and searching user defined records such as personal records (Name, DOB, Telephone number etc) using vector container.

```
#include <iostream>
#include <algorithm>
#include <vector>
using namespace std;

class Item
{
    public:
    char name[10];
    int quantity;
    int cost;
    int code;
    bool operator==(const Item& i1)
    {
        if(code==i1.code)
        return 1;
        return 0;
    }
    bool operator<(const Item& i1)
    {
        if(code<i1.code)
        return 1;
        return 0;
    }
};
vector<Item> o1;
void print(Item &i1);
void display();
void insert();
void search();
void dlt();
bool compare(const Item &i1, const Item &i2)
{
    return i1.cost < i2.cost;
}
int main()
{
    int ch;
    do
    {
        cout<<"\n* * * * * Menu * * * * *";
        cout<<"\n1.Insert";
        cout<<"\n2.Display";
        cout<<"\n3.Search";
        cout<<"\n4.Sort";
        cout<<"\n5.Delete";
```

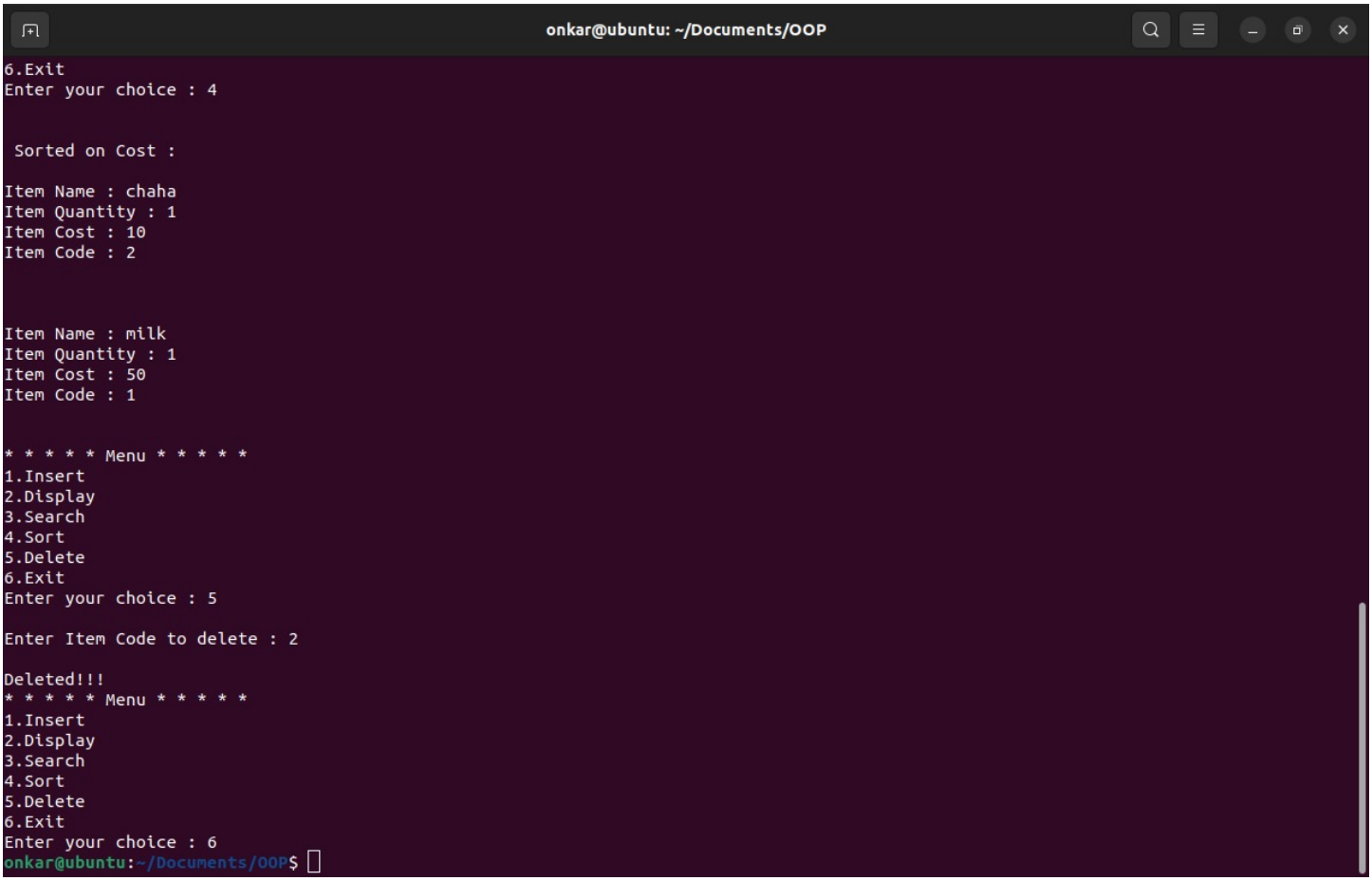
```
        cout<<"\n6.Exit";
        cout<<"\nEnter your choice : ";
        cin>>ch;

        switch(ch)
        {
            case 1:
                insert();
                break;

            case 2:
                display();
                break;

            case 3:
                search();
                break;

            case 4:
                sort(o1.begin(),o1.end(),compare);
                cout<<"\n\n Sorted on Cost : ";
                display();
                break;

            case 5:
                dlt();
                break;

            case 6:
                exit(0);
        }

    }
    while(ch!=7);
    return 0;
}

void insert()
{
    Item i1;
    cout<<"\nEnter Item Name : ";
    cin>>i1.name;
    cout<<"\nEnter Item Quantity : ";
    cin>>i1.quantity;
    cout<<"\nEnter Item Cost : ";
    cin>>i1.cost;
    cout<<"\nEnter Item Code : ";
    cin>>i1.code;
    o1.push_back(i1);
}
```

```
void display()
{
    for_each(o1.begin(),o1.end(),print);
}

void print(Item &i1)
{
    cout<<"\n";
    cout<<"\nItem Name : "<<i1.name;
    cout<<"\nItem Quantity : "<<i1.quantity;
    cout<<"\nItem Cost : "<<i1.cost;
    cout<<"\nItem Code : "<<i1.code;
    cout<<"\n\n";
}

void search()
{
    vector<Item>::iterator p;
    Item i1;
    cout<<"\nEnter Item Code to search : ";
    cin>>i1.code;
    p=find(o1.begin(),o1.end(),i1);
    if(p==o1.end())
    {
        cout<<"\nNot found!!!";
    }
    else
    {
        cout<<"\nFound!!!";
    }
}

void dlt()
{
    vector<Item>::iterator p;
    Item i1;
    cout<<"\nEnter Item Code to delete : ";
    cin>>i1.code;
    p=find(o1.begin(),o1.end(),i1);
    if(p==o1.end())
    {
        cout<<"\nNot found!!!";
    }
    else
    {
        o1.erase(p);
        cout<<"\nDeleted!!!";
    }
```

```
}
```

```
onkar@ubuntu: ~/Documents/OOP
onkar@ubuntu:~/Documents/OOP$ g++ oop6.cpp
onkar@ubuntu:~/Documents/OOP$ ./a.out

* * * * * Menu * * * * *
1.Insert
2.Display
3.Search
4.Sort
5.Delete
6.Exit
Enter your choice : 1

Enter Item Name : milk

Enter Item Quantity : 1

Enter Item Cost : 50

Enter Item Code : 1

* * * * * Menu * * * * *
1.Insert
2.Display
3.Search
4.Sort
5.Delete
6.Exit
Enter your choice : 1

Enter Item Name : chaha

Enter Item Quantity : 1

Enter Item Cost : 10

Enter Item Code : 2

* * * * * Menu * * * * *
1.Insert
2.Display
```

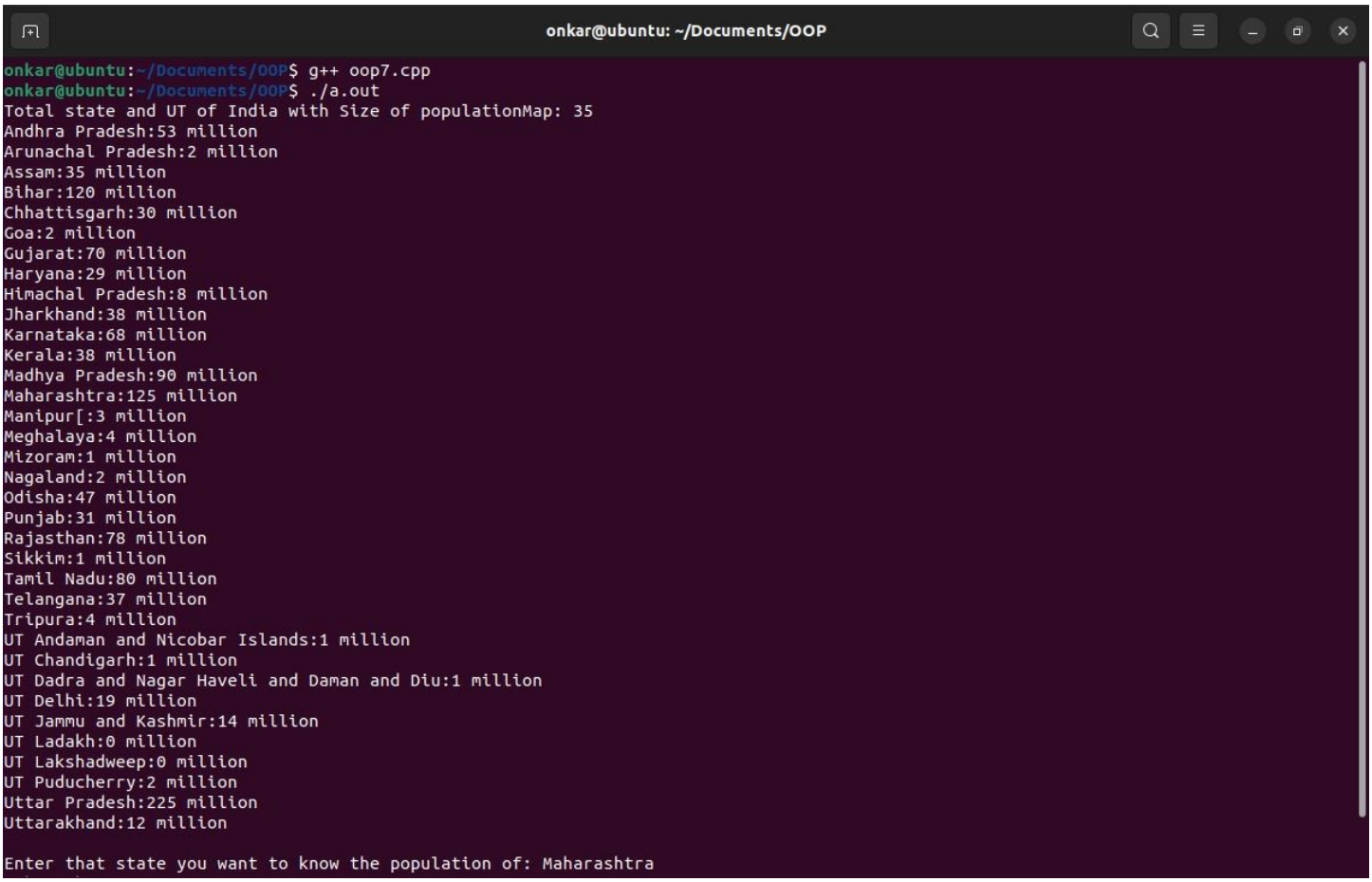
```
onkar@ubuntu: ~/Documents/OOP
Enter your choice : 2


Item Name : milk
Item Quantity : 1
Item Cost : 50
Item Code : 1



Item Name : chaha
Item Quantity : 1
Item Cost : 10
Item Code : 2


* * * * * Menu * * * * *
1.Insert
2.Display
3.Search
4.Sort
5.Delete
6.Exit
Enter your choice : 3

Enter Item Code to search : 2

Found!!!
* * * * * Menu * * * * *
1.Insert
2.Display
3.Search
4.Sort
5.Delete
6.Exit
Enter your choice : 4


 Sorted on Cost :
```

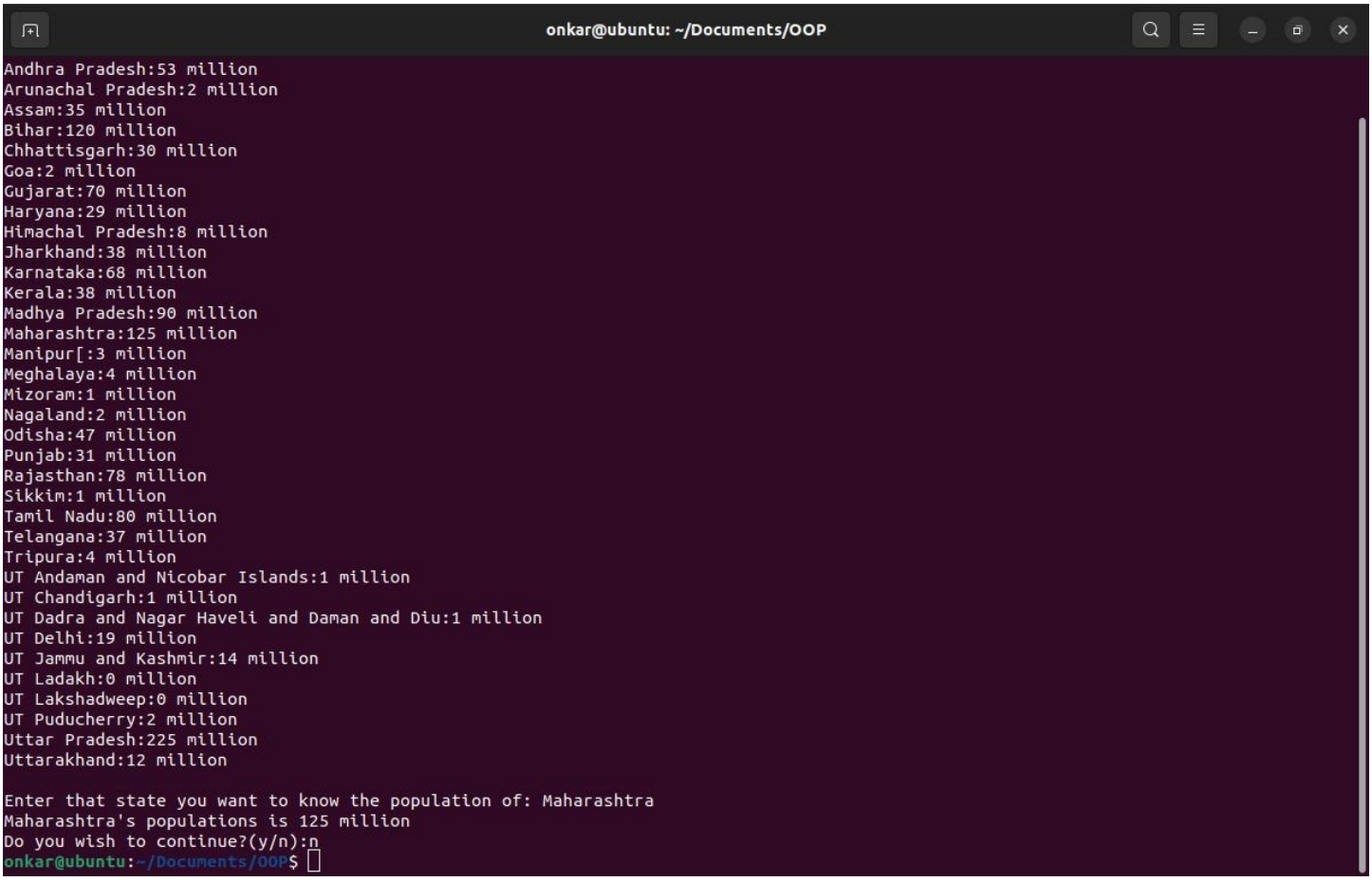

onkar@ubuntu: ~/Documents/OOP
6.Exit
Enter your choice : 4
Sorted on Cost :
Item Name : chaha
Item Quantity : 1
Item Cost : 10
Item Code : 2
Item Name : milk
Item Quantity : 1
Item Cost : 50
Item Code : 1
* * * * * Menu * * * * *
1.Insert
2.Display
3.Search
4.Sort
5.Delete
6.Exit
Enter your choice : 5
Enter Item Code to delete : 2
Deleted!!!
* * * * * Menu * * * * *
1.Insert
2.Display
3.Search
4.Sort
5.Delete
6.Exit
Enter your choice : 6
onkar@ubuntu:~/Documents/OOP$

Q.7. Write a program in C++ to use map associative container. The keys will be the names of states and the values will be the populations of the states. When the program runs, the user is prompted to type the name of a state. The program then looks in the map, using the state name as an index and returns the population of the state.

```
#include <iostream>

#include <map>
#include <string>
#include <utility>

using namespace std;

int main()
{
    typedef map<string,int> mapType;
    mapType populationMap;

    populationMap.insert(pair<string, float>("Maharashtra", 125));
    populationMap.insert(pair<string, float>("Uttar Pradesh", 225));
    populationMap.insert(mapType::value_type("Bihar", 120));
    populationMap.insert(mapType::value_type("West Bengal", 100));
    populationMap.insert(make_pair("Madhya Pradesh", 90));
    populationMap.insert(make_pair("Tamil Nadu", 80));
    populationMap.insert(make_pair("Rajasthan", 78));
    populationMap.insert(make_pair("Andhra Pradesh", 53));
    populationMap.insert(make_pair("Odisha", 47));
    populationMap.insert(make_pair("Kerala", 38));
    populationMap.insert(make_pair("Telangana", 37));
    populationMap.insert(make_pair("Assam", 35));
    populationMap.insert(make_pair("Jharkhand", 38));
    populationMap.insert(make_pair("Karnataka", 68));
    populationMap.insert(make_pair("Gujarat", 70));
    populationMap.insert(make_pair("Punjab", 31));
    populationMap.insert(make_pair("Chhattisgarh", 30));
    populationMap.insert(make_pair("Haryana", 29));
    populationMap.insert(make_pair("UT Delhi", 19));
    populationMap.insert(make_pair("UT Jammu and Kashmir", 14));
    populationMap.insert(make_pair("Uttarakhand", 12));
    populationMap.insert(make_pair("Himachal Pradesh", 8));
    populationMap.insert(make_pair("Tripura", 04));
    populationMap.insert(make_pair("Meghalaya", 4));
    populationMap.insert(make_pair("Manipur[", 3));
    populationMap.insert(make_pair("Nagaland", 2));
    populationMap.insert(make_pair("Goa", 2));
    populationMap.insert(make_pair("Arunachal Pradesh", 2));
    populationMap.insert(make_pair("UT Puducherry", 2));
    populationMap.insert(make_pair("Mizoram", 1));
    populationMap.insert(make_pair("UT Chandigarh", 1));
    populationMap.insert(make_pair("Sikkim", 1));
```

```
    populationMap.insert(make_pair("UT Dadra and Nagar Haveli and Daman and Diu", 1));
    populationMap.insert(make_pair("UT Andaman and Nicobar Islands", 1));
    populationMap.insert(make_pair("UT Lakshadweep", 0.0003));
    populationMap.insert(make_pair("UT Ladakh", 0.00006));

    mapType::iterator iter = --populationMap.end();
    populationMap.erase(iter);

    cout << "Total state and UT of India with Size of populationMap: " <<
populationMap.size() << '\n';

    for (iter = populationMap.begin(); iter != populationMap.end(); ++iter)
    {
     cout << iter->first <<":" << iter->second << " million\n";
    }

    char c;
    do
    {
        string state;
        cout<<"\nEnter that state you want to know the population of: ";
        cin>>state;
        iter = populationMap.find(state);
        if( iter != populationMap.end() )
            cout << state <<"'s populations is "
                << iter->second << " million\n";
        else
            cout << "State is not in populationMap" << '\n';

        cout<<"Do you wish to continue?(y/n):";
        cin>>c;
    }while(c=='y'||c=='Y');

    populationMap.clear();

    return 0;
}
```


onkar@ubuntu: ~/Documents/OOP
onkar@ubuntu:~/Documents/OOP$ g++ oop7.cpp
onkar@ubuntu:~/Documents/OOP$ ./a.out
Total state and UT of India with Size of populationMap: 35
Andhra Pradesh:53 million
Arunachal Pradesh:2 million
Assam:35 million
Bihar:120 million
Chhattisgarh:30 million
Goa:2 million
Gujarat:70 million
Haryana:29 million
Himachal Pradesh:8 million
Jharkhand:38 million
Karnataka:68 million
Kerala:38 million
Madhya Pradesh:90 million
Maharashtra:125 million
Manipur[:3 million
Meghalaya:4 million
Mizoram:1 million
Nagaland:2 million
Odisha:47 million
Punjab:31 million
Rajasthan:78 million
Sikkim:1 million
Tamil Nadu:80 million
Telangana:37 million
Tripura:4 million
UT Andaman and Nicobar Islands:1 million
UT Chandigarh:1 million
UT Dadra and Nagar Haveli and Daman and Diu:1 million
UT Delhi:19 million
UT Jammu and Kashmir:14 million
UT Ladakh:0 million
UT Lakshadweep:0 million
UT Puducherry:2 million
Uttar Pradesh:225 million
Uttarakhand:12 million
Enter that state you want to know the population of: Maharashtra


onkar@ubuntu: ~/Documents/OOP
Andhra Pradesh:53 million
Arunachal Pradesh:2 million
Assam:35 million
Bihar:120 million
Chhattisgarh:30 million
Goa:2 million
Gujarat:70 million
Haryana:29 million
Himachal Pradesh:8 million
Jharkhand:38 million
Karnataka:68 million
Kerala:38 million
Madhya Pradesh:90 million
Maharashtra:125 million
Manipur[:3 million
Meghalaya:4 million
Mizoram:1 million
Nagaland:2 million
Odisha:47 million
Punjab:31 million
Rajasthan:78 million
Sikkim:1 million
Tamil Nadu:80 million
Telangana:37 million
Tripura:4 million
UT Andaman and Nicobar Islands:1 million
UT Chandigarh:1 million
UT Dadra and Nagar Haveli and Daman and Diu:1 million
UT Delhi:19 million
UT Jammu and Kashmir:14 million
UT Ladakh:0 million
UT Lakshadweep:0 million
UT Puducherry:2 million
Uttar Pradesh:225 million
Uttarakhand:12 million
Enter that state you want to know the population of: Maharashtra
Maharashtra's populations is 125 million
Do you wish to continue?(y/n):n
onkar@ubuntu:~/Documents/OOP$