



OOP

Modern College of Engineering

Shivajinagar, Pune 5. Roll no: 21027

Assignment no.2

SEA

Title:- Database of student's information system.

Problem statement:

Develop a program in C++ to create a database of student's information system containing the following info- Name, Rollno, class, Div, DOB, Blood grp, mobile no, adress, Driving license no. & other. make use of Constructor, default constructor, copy constructor, destructor, static member functions, friend class, this pointer, inline code & dynamic memory allocation operators- new & delete as well as exception handling.

Aim:- To learn about oop, friend function, constructor & destructors, static member functions etc & implement them in program.

Prerequisites:- Basics of oop, classes, objects & member functions, C++ ide & compiler.

Theory:-

➤ Class:-

It is the one of the most used feature of oop.

Class is nothing but encapsulation of data & coding. classes are an expanded version of structures. structure can contain multiple variables.



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Classes can contain multiple variables, also contains functions as class member.

A class definition starts with keyword class followed by class name & the class body, enclosed by a pair of curly braces.

e.g. class student
 { public:
 data members;
 member functions;
 };

2) Objects:

When class is defined, only the specification for the object is defined; no memory is allocated. To use the data & access functions defined in the class, we need to create objects.

Syntax: to define object:

class name objectVariableName;

3) Constructor:

A class constructor is a special member function of class that is executed whenever we create new objects of that class. Every time an instance of a class is created the constructor method is called.

The constructor has the same name as the class & doesn't return any type (not even void)

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Constructors are very useful for setting initial values for certain member variables.

Constructors can be defined either inside class definition or outside class definition using class name & scope resolution `::` operator.

A constructor can never be private.

Constructor declaration & definition:

```

class student
{
    int s;
    public:
        student(); ← // constructor definition declared
}

student :: student() // constructor definition
    ↑           ↑
class name    constructor
{
    s = 0;
}
    
```

Types of Constructors:-

- ① Default
- ② Parameterized
- ③ Copy

① Default :- is the constructor which doesn't take any argument. It has no parameter.

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② Parameterized :- These are the constructors with parameter. Using these constructors we can provide diff. values to data members of diff. objects, by passing appropriate values as argument.

③ Copy constructor :- These are special type of constructors which takes an object as argument, & is used to copy values of data members of one object into other object.

e.g.

```
int main()
{
    student s1;
    s1.name = "MAHESH";
    student s2(s1); ← copy constructor.
    cout << s2.name;
}
```

4) Destructor:-

A destructor is a special member function of a class that is executed whenever an object of its class goes out of scope or whenever the delete expression is applied to a pointer to the object of that class.

A destructor will have exact same name as the class, prefixed with a tilde (~)

e.g.

```
~student()
{
}
}
```


5) friend class & function:

A friend function is a function that has access to the private & protected data of the class. We declare a friend function using friend keyword inside body of the class.

syntax:

```
class classname
{
    ---
    friend returntype functionname(arg);
    ---
}
```

we can also use a friend class in C++ using friend keyword.

When a class is declared a friend class, all the member functions of the friend class become friend functions.

e.g.

```
class classB;

class classA
{
    friend class classB;
    ---
}

class classB
{
    ---
}
```


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6) This pointer

In c++, this pointer is used to represent the address of an object inside a member function.

e.g. Consider an object obj calling one of its member function say method() as obj.method().

Then, this pointer will hold the address of object obj inside the member function method().

The this pointer acts as implicit argument to all the member functions.

e.g. this → data member = a ;

7) Dynamic memory allocation operators.

Many times, we are not aware in advance how much memory we will need to store particular information in a defined variable & the size of required memory can be determined at runtime.

New :- we can allocate memory at runtime within the heap for the variable of a given type using special operator in c++ which returns the address of space allocated. This operator is called new operator.

Delete : If we are ^{in need} of dynamically allocated memory anymore, we will use delete operator, which ~~de~~ deallocates memory that was previously allocated by new operator.

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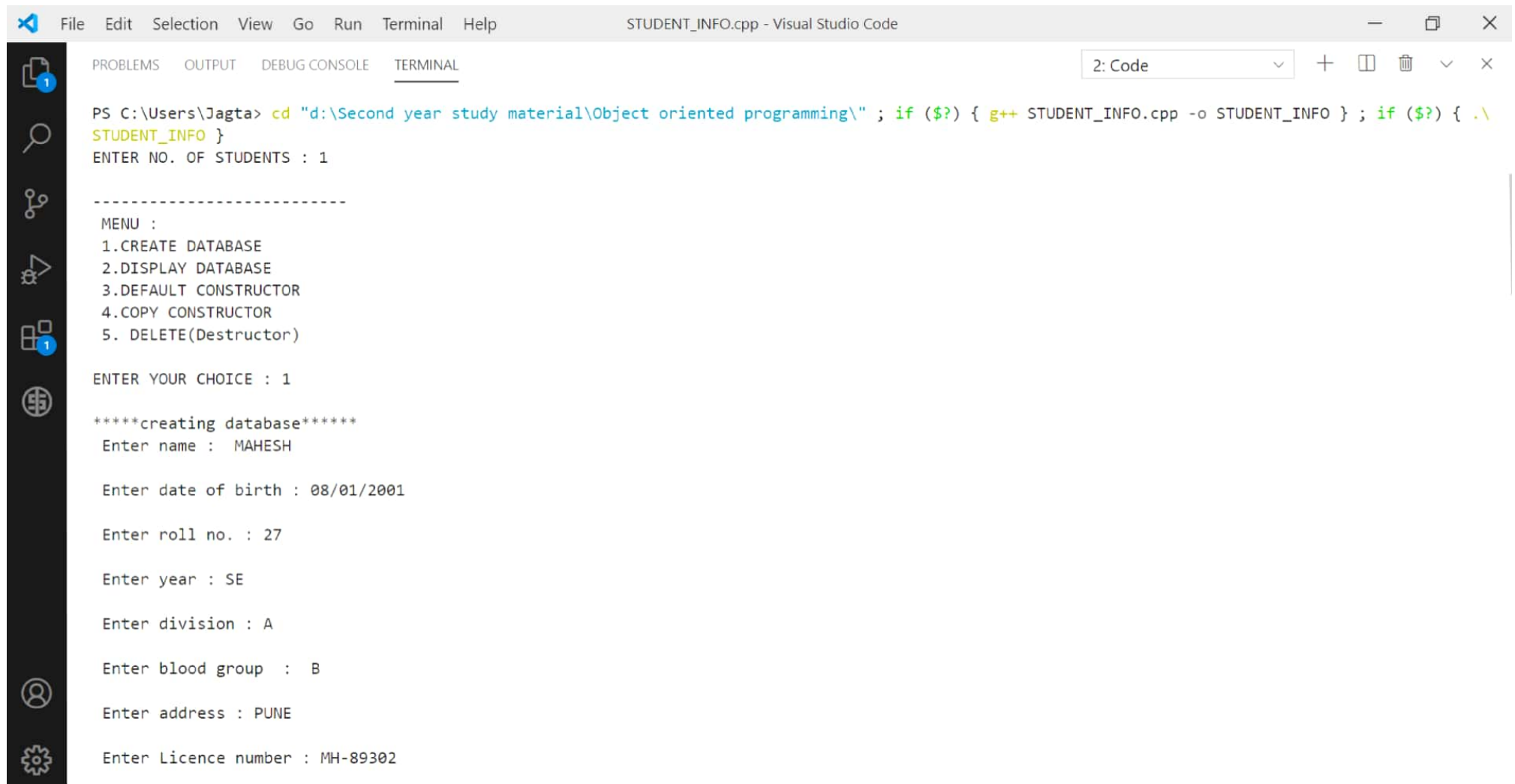
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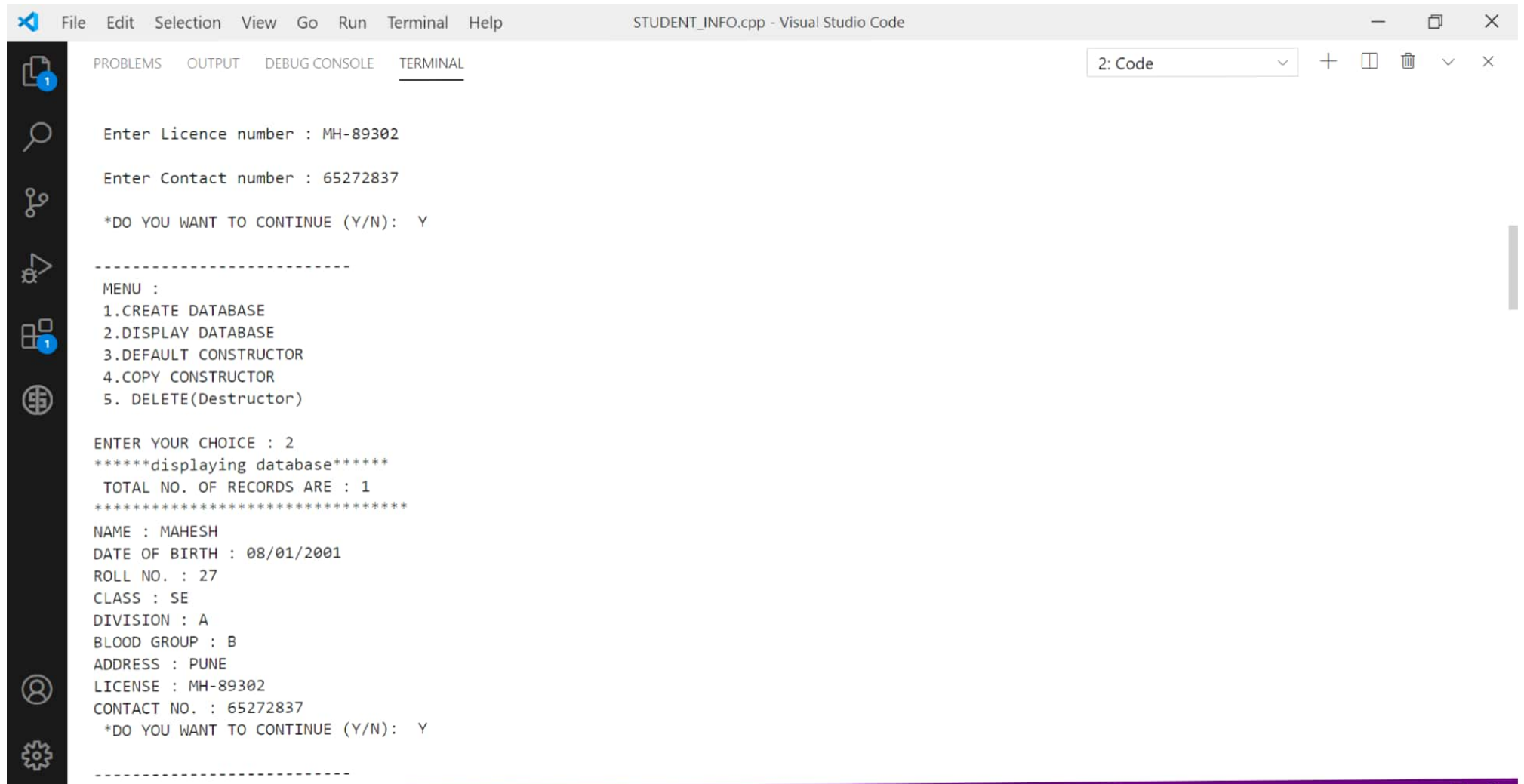
Conclusion:-

- The theory & analysis of OOP concepts was done.
- Implemented the student database system using different elements of OOP in C++.



The screenshot shows the Visual Studio Code interface with the 'TERMINAL' tab active. The terminal displays the execution of a C++ program named 'STUDENT_INFO.cpp'. The program prompts the user to enter the number of students (1), then displays a menu with five options: 1.CREATE DATABASE, 2.DISPLAY DATABASE, 3.DEFAULT CONSTRUCTOR, 4.COPY CONSTRUCTOR, and 5.DELETE(Destructor). The user selects option 1, and the program proceeds to create a database, prompting for a name (MAHESH), date of birth (08/01/2001), roll number (27), year (SE), division (A), blood group (B), address (PUNE), and licence number (MH-89302).

```
PS C:\Users\Jagta> cd "d:\Second year study material\Object oriented programming\" ; if ($?) { g++ STUDENT_INFO.cpp -o STUDENT_INFO } ; if ($?) { .\STUDENT_INFO }  
ENTER NO. OF STUDENTS : 1  
  
-----  
MENU :  
1.CREATE DATABASE  
2.DISPLAY DATABASE  
3.DEFAULT CONSTRUCTOR  
4.COPY CONSTRUCTOR  
5. DELETE(Destructor)  
  
ENTER YOUR CHOICE : 1  
  
*****creating database*****  
Enter name : MAHESH  
  
Enter date of birth : 08/01/2001  
  
Enter roll no. : 27  
  
Enter year : SE  
  
Enter division : A  
  
Enter blood group : B  
  
Enter address : PUNE  
  
Enter Licence number : MH-89302
```

The image shows a Visual Studio Code window with the file 'STUDENT_INFO.cpp' open. The terminal output displays the execution of a C++ program that manages student data. The program prompts for a licence number and contact number, then asks if the user wants to continue. A menu is shown with five options: 1. CREATE DATABASE, 2. DISPLAY DATABASE, 3. DEFAULT CONSTRUCTOR, 4. COPY CONSTRUCTOR, and 5. DELETE(Destructor). The user selects option 2, and the program displays the details of a student named MAHESH, including date of birth, roll number, class, division, blood group, address, and license number. The program then asks if the user wants to continue again.

```
File Edit Selection View Go Run Terminal Help
STUDENT_INFO.cpp - Visual Studio Code

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
2: Code

Enter Licence number : MH-89302

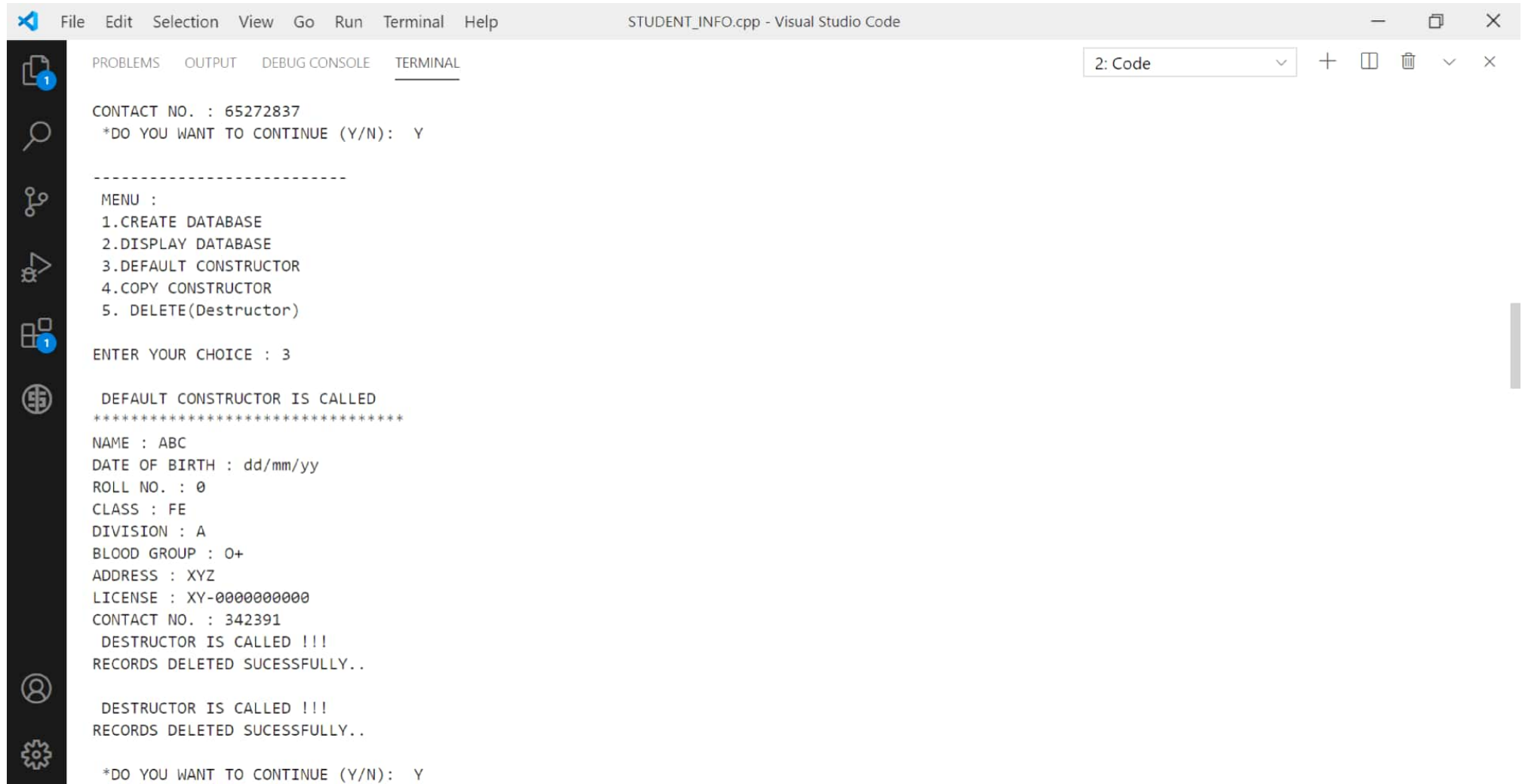
Enter Contact number : 65272837

*DO YOU WANT TO CONTINUE (Y/N): Y

-----
MENU :
1.CREATE DATABASE
2.DISPLAY DATABASE
3.DEFAULT CONSTRUCTOR
4.COPY CONSTRUCTOR
5. DELETE(Destructor)

ENTER YOUR CHOICE : 2
*****displaying database*****
TOTAL NO. OF RECORDS ARE : 1
*****
NAME : MAHESH
DATE OF BIRTH : 08/01/2001
ROLL NO. : 27
CLASS : SE
DIVISION : A
BLOOD GROUP : B
ADDRESS : PUNE
LICENSE : MH-89302
CONTACT NO. : 65272837
*DO YOU WANT TO CONTINUE (Y/N): Y

-----
```



The screenshot shows the Visual Studio Code interface with the 'TERMINAL' tab active. The terminal displays the output of a C++ program named 'STUDENT_INFO.cpp'. The program prompts for a contact number, asks if the user wants to continue, and then presents a menu with five options: 1. CREATE DATABASE, 2. DISPLAY DATABASE, 3. DEFAULT CONSTRUCTOR, 4. COPY CONSTRUCTOR, and 5. DELETE(Destructor). The user enters '3', and the program outputs the details of a student named ABC, including their date of birth, roll number, class, division, blood group, address, and license. It then confirms that the destructor is called and records are deleted successfully. The program asks if the user wants to continue again, and the user enters 'Y'.

```
STUDENT_INFO.cpp - Visual Studio Code

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

CONTACT NO. : 65272837
*DO YOU WANT TO CONTINUE (Y/N): Y

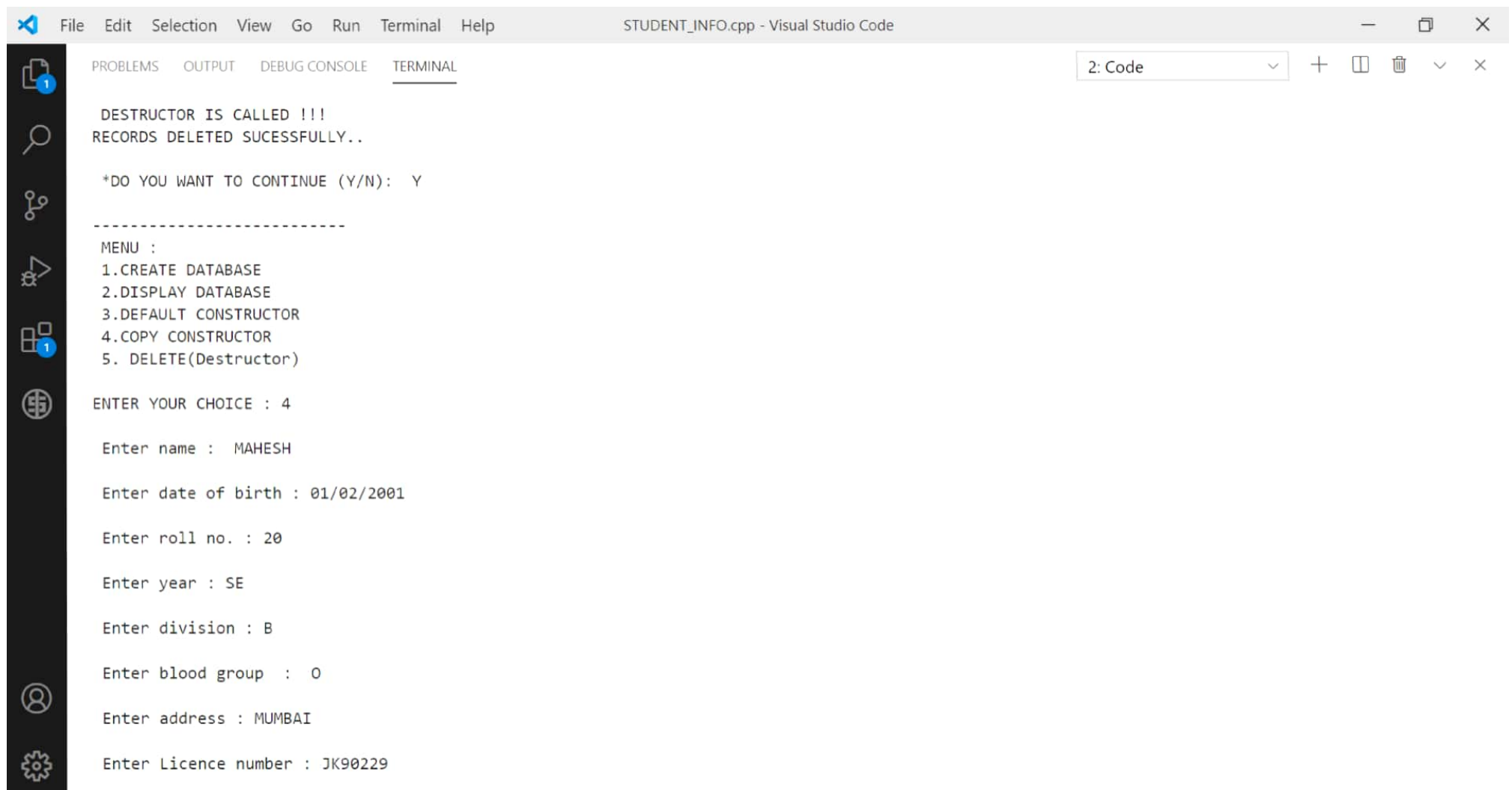
-----
MENU :
1.CREATE DATABASE
2.DISPLAY DATABASE
3.DEFAULT CONSTRUCTOR
4.COPY CONSTRUCTOR
5. DELETE(Destructor)

ENTER YOUR CHOICE : 3

DEFAULT CONSTRUCTOR IS CALLED
*****
NAME : ABC
DATE OF BIRTH : dd/mm/yy
ROLL NO. : 0
CLASS : FE
DIVISION : A
BLOOD GROUP : O+
ADDRESS : XYZ
LICENSE : XY-0000000000
CONTACT NO. : 342391
DESTRUCTOR IS CALLED !!!
RECORDS DELETED SUCESSFULLY..

DESTRUCTOR IS CALLED !!!
RECORDS DELETED SUCESSFULLY..

*DO YOU WANT TO CONTINUE (Y/N): Y
```

The image shows a Visual Studio Code window with the file 'STUDENT_INFO.cpp' open. The terminal output displays the execution of a C++ program. The program starts by calling a destructor and deleting records successfully. It then asks if the user wants to continue (Y/N), to which 'Y' is entered. A menu is displayed with five options: 1. CREATE DATABASE, 2. DISPLAY DATABASE, 3. DEFAULT CONSTRUCTOR, 4. COPY CONSTRUCTOR, and 5. DELETE(Destructor). The user enters '4' as their choice. Subsequently, the program prompts for user input: 'Enter name : MAHESH', 'Enter date of birth : 01/02/2001', 'Enter roll no. : 20', 'Enter year : SE', 'Enter division : B', 'Enter blood group : 0', 'Enter address : MUMBAI', and 'Enter Licence number : JK90229'.

```
File Edit Selection View Go Run Terminal Help STUDENT_INFO.cpp - Visual Studio Code
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
DESTRUCTOR IS CALLED !!!
RECORDS DELETED SUCESSFULLY..

*DO YOU WANT TO CONTINUE (Y/N): Y

-----
MENU :
1.CREATE DATABASE
2.DISPLAY DATABASE
3.DEFAULT CONSTRUCTOR
4.COPY CONSTRUCTOR
5. DELETE(Destructor)

ENTER YOUR CHOICE : 4

Enter name : MAHESH

Enter date of birth : 01/02/2001

Enter roll no. : 20

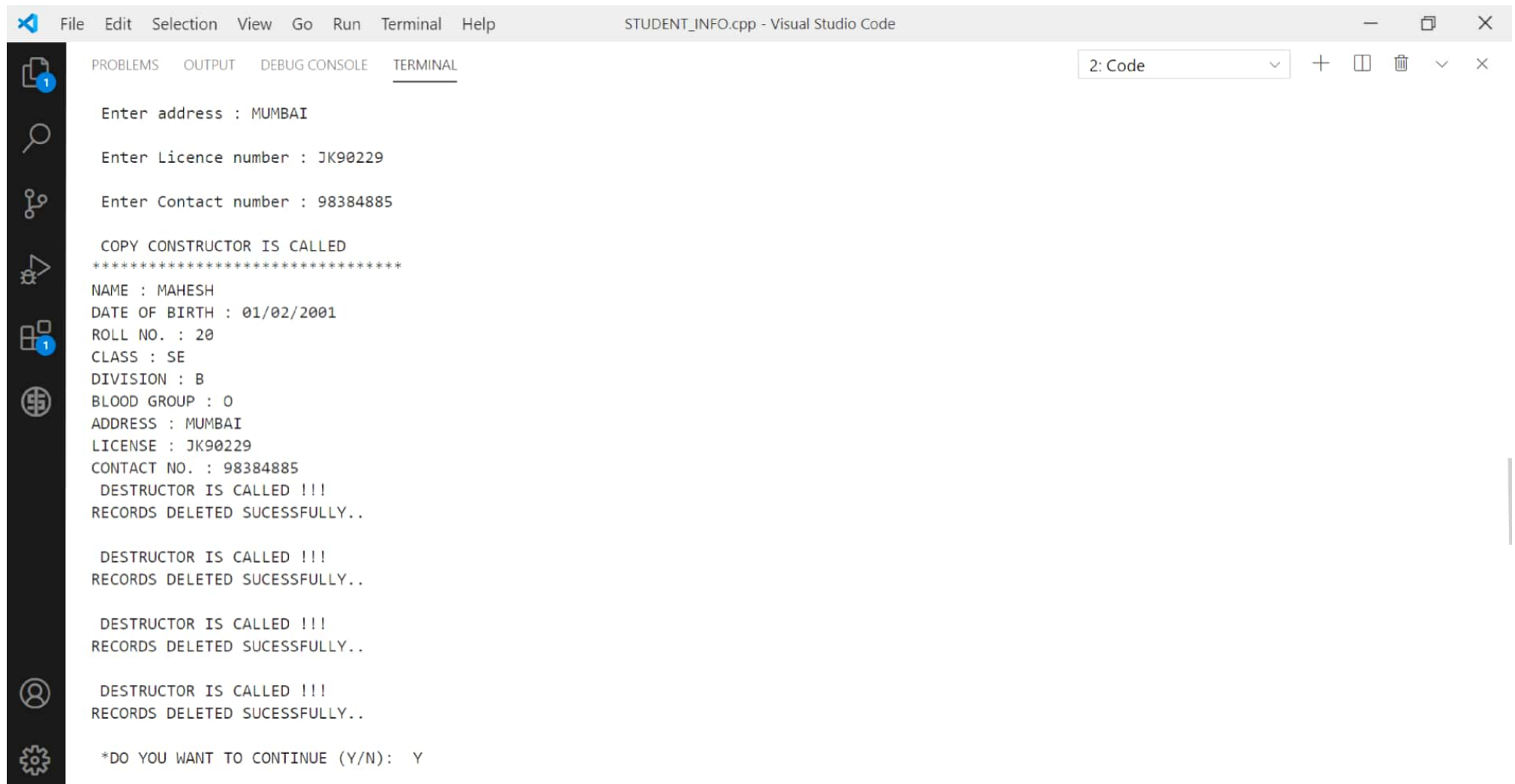
Enter year : SE

Enter division : B

Enter blood group : 0

Enter address : MUMBAI

Enter Licence number : JK90229
```



The image shows a screenshot of the Visual Studio Code interface. The top menu bar includes File, Edit, Selection, View, Go, Run, Terminal, and Help. The title bar indicates the file is 'STUDENT_INFO.cpp - Visual Studio Code'. The left sidebar contains icons for Explorer, Search, Source Control, Run and Debug, Extensions, Testing, and Settings. The main editor area shows the 'TERMINAL' tab with the following output:

```
Enter address : MUMBAI

Enter Licence number : JK90229

Enter Contact number : 98384885

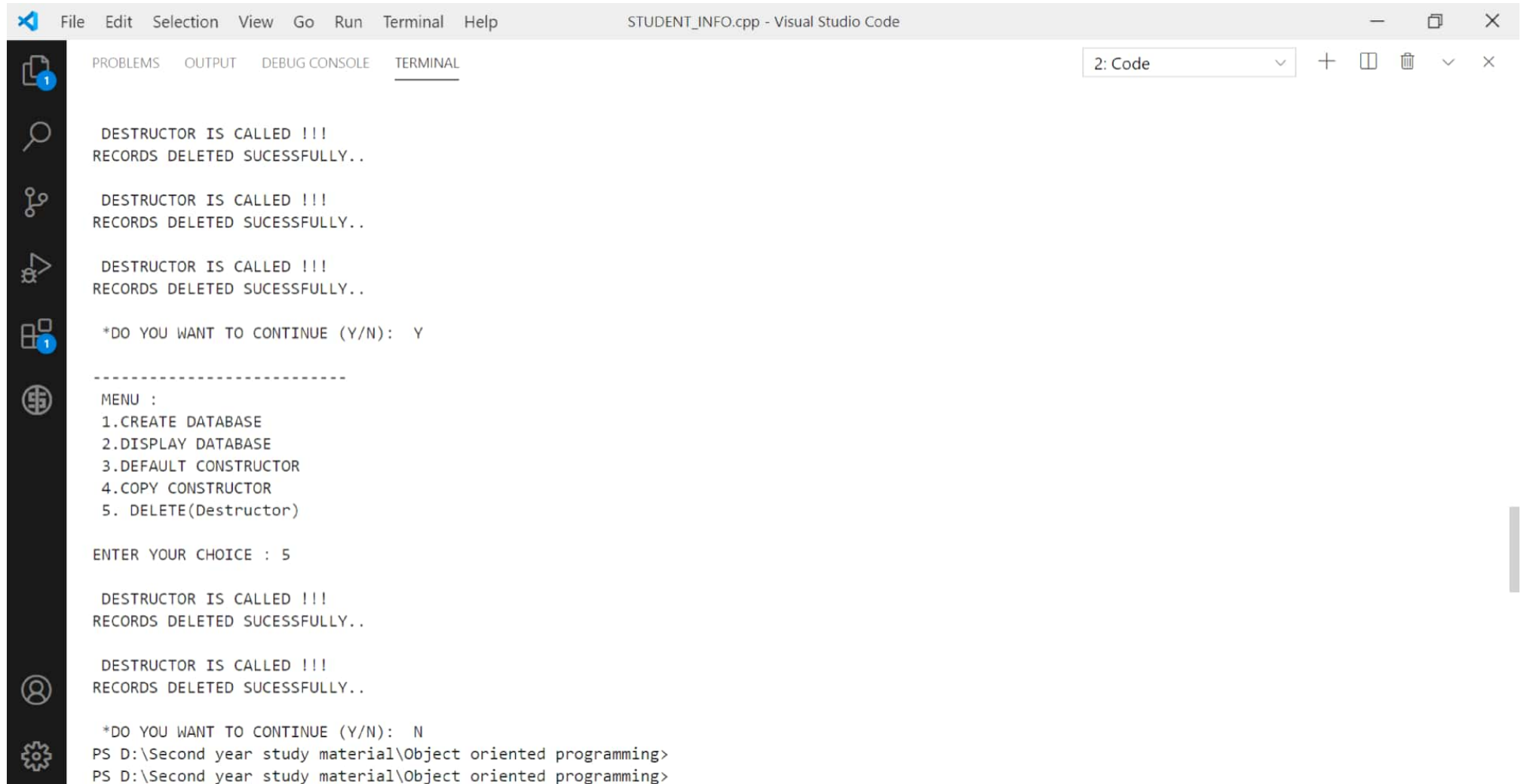
COPY CONSTRUCTOR IS CALLED
*****
NAME : MAHESH
DATE OF BIRTH : 01/02/2001
ROLL NO. : 20
CLASS : SE
DIVISION : B
BLOOD GROUP : O
ADDRESS : MUMBAI
LICENSE : JK90229
CONTACT NO. : 98384885
DESTRUCTOR IS CALLED !!!
RECORDS DELETED SUCESSFULLY..

DESTRUCTOR IS CALLED !!!
RECORDS DELETED SUCESSFULLY..

DESTRUCTOR IS CALLED !!!
RECORDS DELETED SUCESSFULLY..

DESTRUCTOR IS CALLED !!!
RECORDS DELETED SUCESSFULLY..

*DO YOU WANT TO CONTINUE (Y/N): Y
```

The image shows a screenshot of the Visual Studio Code interface. The top menu bar includes File, Edit, Selection, View, Go, Run, Terminal, and Help. The title bar indicates the file is 'STUDENT_INFO.cpp - Visual Studio Code'. The left sidebar contains icons for Explorer, Search, Source Control, Run and Debug, Extensions, and Settings. The main area is the 'TERMINAL' tab, showing the output of a C++ program. The program's output includes messages about destructor calls, successful record deletions, a menu with five options (1. CREATE DATABASE, 2. DISPLAY DATABASE, 3. DEFAULT CONSTRUCTOR, 4. COPY CONSTRUCTOR, 5. DELETE(Destructor)), and a choice of 5. It also shows a confirmation prompt 'DO YOU WANT TO CONTINUE (Y/N): Y' and another confirmation prompt 'DO YOU WANT TO CONTINUE (Y/N): N'. The terminal window has a dropdown menu set to '2: Code' and standard window controls (minimize, maximize, close) on the right.

```
File Edit Selection View Go Run Terminal Help
STUDENT_INFO.cpp - Visual Studio Code

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL 2: Code + [ ] [X] [X] [X] [X]

DESTRUCTOR IS CALLED !!!
RECORDS DELETED SUCESSFULLY..

DESTRUCTOR IS CALLED !!!
RECORDS DELETED SUCESSFULLY..

DESTRUCTOR IS CALLED !!!
RECORDS DELETED SUCESSFULLY..

*DO YOU WANT TO CONTINUE (Y/N): Y

-----
MENU :
1.CREATE DATABASE
2.DISPLAY DATABASE
3.DEFAULT CONSTRUCTOR
4.COPY CONSTRUCTOR
5. DELETE(Destructor)

ENTER YOUR CHOICE : 5

DESTRUCTOR IS CALLED !!!
RECORDS DELETED SUCESSFULLY..

DESTRUCTOR IS CALLED !!!
RECORDS DELETED SUCESSFULLY..

*DO YOU WANT TO CONTINUE (Y/N): N
PS D:\Second year study material\Object oriented programming>
PS D:\Second year study material\Object oriented programming>
```