

Task 2: Utilize Constructors and Destructors (Car Class in C++)

Objective:

The objective of this task is to understand and implement constructors and destructors in C++. This task focuses on object initialization and destruction during program execution.

Problem Statement

Enhance the Car class by performing the following:

- Add a parameterized constructor to initialize make, model, and year
- Implement a destructor that displays a message when the object is destroyed

Concepts Used

- Constructor
- Destructor
- Object Lifecycle
- Encapsulation

Source Code (C++)

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

class Car {
private:
    string make;
    string model;
    int year;

public:
    // Constructor
    Car(string m, string mo, int y) {
        make = m;
        model = mo;
    }
};
```

```

        year = y;
        cout << "Car object created using constructor." << endl;
    }

    // Getter functions
    string getMake() {
        return make;
    }

    string getModel() {
        return model;
    }

    int getYear() {
        return year;
    }

    // Destructor
    ~Car() {
        cout << "Car object destroyed using destructor." << endl;
    }
};

int main() {
    Car car1("Toyota", "Corolla", 2022);

    cout << "Car Make: " << car1.getMake() << endl;
    cout << "Car Model: " << car1.getModel() << endl;
    cout << "Car Year: " << car1.getYear() << endl;

    return 0;
}

```

Explanation of the Code

1. The Car class contains private data members to enforce encapsulation.
2. A parameterized constructor initializes all attributes when an object is created.
3. The constructor prints a message to indicate object creation.
4. Getter functions are used to access private data members safely.
5. The destructor is automatically called when the object goes out of scope.
6. The destructor prints a message indicating object destruction.

Program Output

```
student@student-virtual-machine:~/25SUB4508_LSP/25SUB4508_56133/ClassWork/day17$ g++ car_constructor_destructor.cpp
student@student-virtual-machine:~/25SUB4508_LSP/25SUB4508_56133/ClassWork/day17$ ll
total 44
drwxrwxr-x 3 student student 4096 Jan 9 00:25 ./
drwxrwxr-x 24 student student 4096 Jan 8 23:49 ../
-rwxrwxr-x 1 student student 24384 Jan 9 00:25 a.out*
-rw-rw-r-- 1 student student 694 Jan 9 00:18 car_class.cpp
-rw-rw-r-- 1 student student 789 Jan 9 00:18 car_constructor_destructor.cpp
drwxrwxr-x 2 student student 4096 Jan 8 23:49 cw/
student@student-virtual-machine:~/25SUB4508_LSP/25SUB4508_56133/ClassWork/day17$ ./a.out
Car object created using constructor.
Car Make: Toyota
Car Model: Corolla
Car Year: 2022
Car object destroyed using destructor.
student@student-virtual-machine:~/25SUB4508_LSP/25SUB4508_56133/ClassWork/day17$
```

Conclusion

This task successfully demonstrates the use of constructors and destructors in C++. Constructors ensure automatic initialization of objects, while destructors handle cleanup when objects are destroyed. These are core concepts in Object-Oriented Programming.