

## VIT - Vellore

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### BCSE102P\_Structured and Object Oriented Programming Lab\_VL2024250502354

#### **VIT V\_Structured and OOP\_Lab 5\_COD\_Hard\_Constructors Destructors**

Attempt : 1

Total Mark : 10

Marks Obtained : 10

#### **Section 1 : Coding**

##### **1. Problem Statement**

Write a program that calculates the determinant of a square matrix. The program should take the size of the square matrix as input, followed by the elements of the matrix. It should then display the matrix and calculate the determinant. Finally, it should output the determinant value.

The Matrix class has the following member functions:

Matrix(int n): Constructor that takes an integer n as a parameter to initialize a square matrix of size n by dynamically allocating memory.

void readMatrix(): Reads the elements of the matrix from the standard input.

`void displayMatrix()`: Displays the matrix on the standard output.

`int determinant()`: Calculates and returns the determinant of the matrix using a recursive approach.

`int determinantOfSubMatrix(int** subMatrix, int subSize)`: Helper function used by `determinant()` to calculate the determinant of a submatrix.

### **Answer**

```
#include <iostream>
#include <vector>
using namespace std;
class Matrix {
private:
    int n;
    vector<vector<int>>> data;
public:
    Matrix(int size) : n(size), data(size, vector<int>(size)) {}

    void readMatrix() {
        for (int i = 0; i < n; i++) {
            for (int j = 0; j < n; j++) {
                cin >> data[i][j];
            }
        }
    }

    void displayMatrix() const {
        cout << "Matrix:" << endl;
        for (const auto &row : data) {
            for (int val : row) {
                cout << val << " ";
            }
            cout << endl;
        }
    }

    int determinant() {
        if (n == 1) return data[0][0];
        if (n == 2) return (data[0][0] * data[1][1]) - (data[0][1] * data[1][0]);

        int det = 0;
```

```

for (int i = 0; i < n; i++) {
    vector<vector<int>> subMatrix(n - 1, vector<int>(n - 1));
    for (int row = 1; row < n; row++) {
        int colIndex = 0;
        for (int col = 0; col < n; col++) {
            if (col == i) continue;
            subMatrix[row - 1][colIndex++] = data[row][col];
        }
    }
    Matrix subMat(n - 1);
    subMat.data = subMatrix;
    det += (i % 2 == 0 ? 1 : -1) * data[0][i] * subMat.determinant();
}
return det;
};
int main() {
    int n;
    cin >> n;

    Matrix matrix(n);
    matrix.readMatrix();
    matrix.displayMatrix();

    cout << "Determinant: " << matrix.determinant() << endl;

    return 0;
}

```

**Status :** Correct

**Marks :** 10/10