VIT - Vellore

Name: RONIT MEXSON .
Email: ronit.mexson2024@vitstudent.ac.in
Roll no: 24BAI0036
Phone: 9999999999
Branch: ARUMUGA ARUN R_OOPS
Department: admin
Batch: VL2024250502365
Degree: admin

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BCSE102P_Structured and Object Oriented Programming Lab_VL2024250502365

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

```
// You are using GCC
#include<iostream>
#include <vector>
using namespace std;

class Matrix{
    int N;
    vector<vector<int>> arr;
    public:
        Matrix(int x) : N(x), arr(x, vector<int>(x)){}

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

        void printElements() const{
            cout << "Matrix:" << endl;
            for (const auto& num: arr){
                for (const auto& elem: num){
                    cout << elem << " ";
                }
                cout << endl;
            }
        }

        int determinant(const vector<vector<int>>&mat, int n){
            if (n==1) return mat[0][0];
            if (n==2) return (mat[0][0] * mat[1][1]) - (mat[0][1] * mat[1][0]);
```

```
        int det = 0;
        for (int col = 0; col < N; col++){
            vector<vector<int>> subMat(n-1, vector<int>(n-1));

            for (int i = 1; i < n; i++){
                int subCol = 0;
                for (int j = 0; j < n; j++){
                    if (j == col) continue;
                    subMat[i-1][subCol++] = mat[i][j];
                }
            }

            det += (col % 2 == 0 ? 1 : -1) * mat[0][col] * determinant(subMat,n-1);
        }
        return det;
    }

    void computeDeterminant(){
        cout << "Determinant: " << determinant(arr, N) << endl;
    }
};

int main(){
    int N;
    cin >> N;

    Matrix obj(N);

    obj.readMatrix();
    obj.printElements();
    obj.computeDeterminant();

    return 0;
}
```

Status : Correct **Marks : 10/10**