**Program 4**

**Name:Pranav Mahajan**

**Roll no. :D4**

#include <iostream>

using namespace std;

class MAT {

private:

int rows, cols;

int \*\*data;

public:

// Function to create and input matrix

void create(int m, int n) {

rows = m;

cols = n;

data = new int\*[rows];

for (int i = 0; i < rows; ++i) {

data[i] = new int[cols];

for (int j = 0; j < cols; ++j) {

cout << "Enter element [" << i << "][" << j << "]: ";

cin >> data[i][j];

}

}

}

void show() {

for (int i = 0; i < rows; ++i) {

for (int j = 0; j < cols; ++j) {

cout << data[i][j] << " ";

}

cout << endl;

}

}

void del() {

for (int i = 0; i < rows; ++i) {

delete[] data[i];

}

delete[] data;

}

MAT add(const MAT& other) const {

MAT result;

result.rows = rows;

result.cols = cols;

result.data = new int\*[rows];

for (int i = 0; i < rows; ++i) {

result.data[i] = new int[cols];

for (int j = 0; j < cols; ++j) {

result.data[i][j] = data[i][j] + other.data[i][j];

}

}

return result;

}

MAT subtract(const MAT& other) const {

MAT result;

result.rows = rows;

result.cols = cols;

result.data = new int\*[rows];

for (int i = 0; i < rows; ++i) {

result.data[i] = new int[cols];

for (int j = 0; j < cols; ++j) {

result.data[i][j] = data[i][j] - other.data[i][j];

}

}

return result;

}

MAT multiply(const MAT& other) const {

MAT result;

result.rows = rows;

result.cols = other.cols;

result.data = new int\*[rows];

for (int i = 0; i < rows; ++i) {

result.data[i] = new int[result.cols];

for (int j = 0; j < result.cols; ++j) {

result.data[i][j] = 0;

for (int k = 0; k < cols; ++k) {

result.data[i][j] += data[i][k] \* other.data[k][j];

}

}

}

return result;

}

MAT transpose() const {

MAT result;

result.rows = cols;

result.cols = rows;

result.data = new int\*[cols];

for (int i = 0; i < cols; ++i) {

result.data[i] = new int[rows];

for (int j = 0; j < rows; ++j) {

result.data[i][j] = data[j][i];

}

}

return result;

}

};

int main() {

MAT mat1, mat2, result;

int rows, cols;

// Input the dimensions of matrices from the user and input values

cout << "Enter the number of rows and columns for matrix 1: ";

cin >> rows >> cols;

mat1.create(rows, cols);

cout << endl << "The 1st Matrix" << endl;

mat1.show();

cout << endl;

cout << "The number of rows and columns for matrix 2: ";

cout << rows << "\*" << cols << endl;

mat2.create(rows, cols);

cout << endl << "The 2nd Matrix" << endl;

mat2.show();

cout << endl;

result = mat1.add(mat2);

cout << "Matrix 1 + Matrix 2:" << endl;

result.show();

cout << endl;

result = mat1.subtract(mat2);

cout << "Matrix 1 - Matrix 2:" << endl;

result.show();

cout << endl;

result = mat1.multiply(mat2);

cout << "Matrix 1 \* Matrix 2:" << endl;

result.show();

cout << endl;

cout << "Transpose of Matrix 1:" << endl;

result = mat1.transpose();

result = mat2.transpose();

result.show();

cout << endl;

// Delete matrices to free memory

mat1.del();

mat2.del();

return 0;

}

Output

Enter the number of rows and columns for matrix 1: 2

2

Enter element [0][0]: 1

Enter element [0][1]: 2

Enter element [1][0]: 3

Enter element [1][1]: 6

The 1st Matrix

1 2

3 6

The number of rows and columns for matrix 2: 2\*2

Enter element [0][0]: 5

Enter element [0][1]: 4

Enter element [1][0]: 7

Enter element [1][1]: 8

The 2nd Matrix

5 4

7 8

Matrix 1 + Matrix 2:

6 6

10 14

Matrix 1 - Matrix 2:

-4 -2

-4 -2

Matrix 1 \* Matrix 2:

19 20

57 60

Transpose of Matrix 1:

5 7

4 8