LAB-1

Q1. Write a C program for

1. **Pass the matrices as parameters**
2. **Addition\Substraction**
3. **Sum of rows & columns**
4. **Multiplication**
5. **Sum of principle\non principle diagonal elements**
6. **Transpose of matrix**
7. **Symmetric or not**

Aim : To execute all the above operations.

CODE:

```
 #include <stdio.h>
#define MAX_SIZE 100


// Function to input a matrix
void inputMatrix(int matrix[MAX_SIZE][MAX_SIZE], int rows, int cols) {
    printf("Enter the elements of the matrix:\n");
    for (int i = 0; i < rows; i++) {
        for (int j = 0; j < cols; j++) {
            scanf("%d", &matrix[i][j]);
        }
    }
}


// Function to print a matrix
void printMatrix(int matrix[MAX_SIZE][MAX_SIZE], int rows, int cols) {
    printf("Matrix:\n");
    for (int i = 0; i < rows; i++) {
        for (int j = 0; j < cols; j++) {
            printf("%d ", matrix[i][j]);
        }
        printf("\n");
    }
}


// Function to add two matrices
```

```
void addMatrices(int matrix1[MAX_SIZE][MAX_SIZE], int matrix2[MAX_SIZE][MAX_SIZE], int
rows, int cols) {
    int result[MAX_SIZE][MAX_SIZE];
    for (int i = 0; i < rows; i++) {
        for (int j = 0; j < cols; j++) {
            result[i][j] = matrix1[i][j] + matrix2[i][j];
        }
    }
    printf("Addition of matrices:\n");
    printMatrix(result, rows, cols);
}

// Function to subtract two matrices
void subtractMatrices(int matrix1[MAX_SIZE][MAX_SIZE], int
matrix2[MAX_SIZE][MAX_SIZE], int rows, int cols) {
    int result[MAX_SIZE][MAX_SIZE];
    for (int i = 0; i < rows; i++) {
        for (int j = 0; j < cols; j++) {
            result[i][j] = matrix1[i][j] - matrix2[i][j];
        }
    }
    printf("Subtraction of matrices:\n");
    printMatrix(result, rows, cols);
}

// Function to multiply two matrices
void multiplyMatrices(int matrix1[MAX_SIZE][MAX_SIZE], int rows1, int cols1, int
matrix2[MAX_SIZE][MAX_SIZE], int rows2, int cols2) {
    if (cols1 != rows2) {
        printf("Error: Matrices cannot be multiplied.\n");
        return;
    }

    int result[MAX_SIZE][MAX_SIZE];
    for (int i = 0; i < rows1; i++) {
        for (int j = 0; j < cols2; j++) {
            result[i][j] = 0;
            for (int k = 0; k < cols1; k++) {
                result[i][j] += matrix1[i][k] * matrix2[k][j];
            }
        }
    }
    printf("Multiplication of matrices:\n");
    printMatrix(result, rows1, cols2);
}

// Function to calculate the sum of diagonal or non-diagonal elements in a matrix
void sumDiagonalNonDiagonal(int matrix[MAX_SIZE][MAX_SIZE], int rows, int cols, char choice)
{
    int sum = 0;
    if (choice == 'D' || choice == 'd') {
        for (int i = 0; i < rows; i++) {
            sum += matrix[i][i];
        }
        printf("Sum of diagonal elements: %d\n", sum);
    } else if (choice == 'N' || choice == 'n') {
        for (int i = 0; i < rows; i++) {
            for (int j = 0; j < cols; j++) {
                if (i != j) {
                    sum += matrix[i][j];
                }
            }
        }
        printf("Sum of non-diagonal elements: %d\n", sum);
    } else {
        printf("Invalid choice. Please enter D or N.\n");
    }
}
```

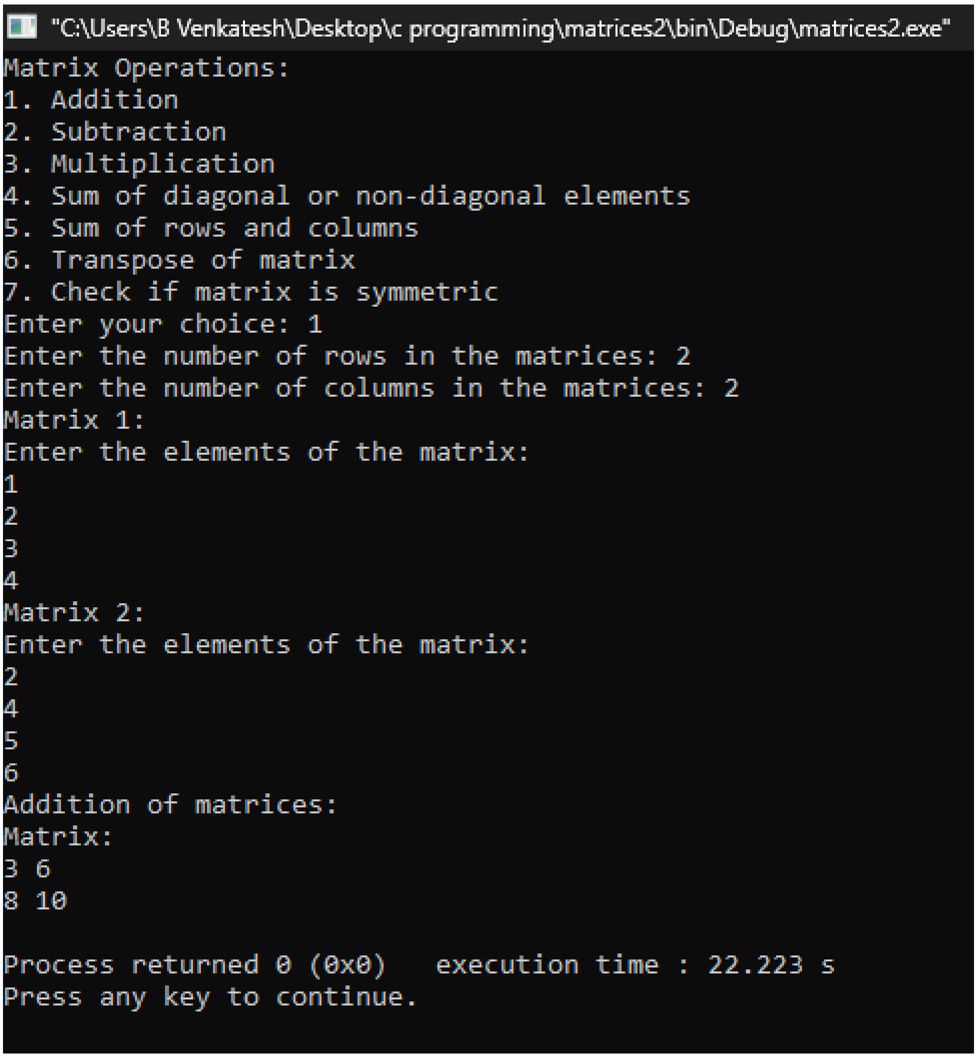
```c
// Function to calculate the sum of rows and columns in a matrix
void sumRowsColumns(int matrix[MAX_SIZE][MAX_SIZE], int rows, int cols) {
    int rowSum[MAX_SIZE] = {0};
    int colSum[MAX_SIZE] = {0};

    for (int i = 0; i < rows; i++) {
        for (int j = 0; j < cols; j++) {
            rowSum[i] += matrix[i][j];
            colSum[j] += matrix[i][j];
        }
    }

    printf("Sum of rows:\n");
    for (int i = 0; i < rows; i++) {
        printf("Row %d: %d\n", i + 1, rowSum[i]);
    }

    printf("Sum of columns:\n");
    for (int j = 0; j < cols; j++) {
        printf("Column %d: %d\n", j + 1, colSum[j]);
    }
}

// Function to transpose a matrix
void transposeMatrix(int matrix[MAX_SIZE][MAX_SIZE], int rows, int cols) {
    int transposed[MAX_SIZE][MAX_SIZE];
    for (int i = 0; i < rows; i++) {
        for (int j = 0; j < cols; j++) {
            transposed[j][i] = matrix[i][j];
        }
    }
    printf("Transposed matrix:\n");
    printMatrix(transposed, cols, rows);
}
```

```
// Function to check if a matrix is symmetric
int isSymmetricMatrix(int matrix[MAX_SIZE][MAX_SIZE], int rows, int cols) {
    if (rows != cols) {
        return 0;
    }

    for (int i = 0; i < rows; i++) {
        for (int j = 0; j < cols; j++) {
            if (matrix[i][j] != matrix[j][i]) {
                return 0;
            }
        }
    }

    return 1;
}

int main() {
    int choice;
    printf("Matrix Operations:\n");
    printf("1. Addition\n");
    printf("2. Subtraction\n");
    printf("3. Multiplication\n");
    printf("4. Sum of diagonal or non-diagonal elements\n");
    printf("5. Sum of rows and columns\n");
    printf("6. Transpose of matrix\n");
    printf("7. Check if matrix is symmetric\n");
    printf("Enter your choice: ");
    scanf("%d", &choice);

    int rows, cols;
    printf("Enter the number of rows in the matrices: ");
    scanf("%d", &rows);
```

```
printf("Enter the number of columns in the matrices: ");
scanf("%d", &cols);

int matrix1[MAX_SIZE][MAX_SIZE];
int matrix2[MAX_SIZE][MAX_SIZE];

switch (choice) {
    case 1:
        printf("Matrix 1:\n");
        inputMatrix(matrix1, rows, cols);
        printf("Matrix 2:\n");
        inputMatrix(matrix2, rows, cols);
        addMatrices(matrix1, matrix2, rows, cols);
        break;
    case 2:
        printf("Matrix 1:\n");
        inputMatrix(matrix1, rows, cols);
        printf("Matrix 2:\n");
        inputMatrix(matrix2, rows, cols);
        subtractMatrices(matrix1, matrix2, rows, cols);
        break;
    case 3:
        printf("Matrix 1:\n");
        inputMatrix(matrix1, rows, cols);
        printf("Matrix 2:\n");
        inputMatrix(matrix2, cols, rows);
        multiplyMatrices(matrix1, rows, cols, matrix2, cols, rows);
        break;
    case 4:
        printf("Matrix:\n");
        inputMatrix(matrix1, rows, cols);
        printf("Enter 'D' for diagonal elements or 'N' for non-diagonal elements: ");
        char sumChoice;
        scanf(" %c", &sumChoice);
```

```
            sumDiagonalNonDiagonal(matrix1, rows, cols, sumChoice);
            break;
        case 5:
            printf("Matrix:\n");
            inputMatrix(matrix1, rows, cols);
            sumRowsColumns(matrix1, rows, cols);
            break;
        case 6:
            printf("Matrix:\n");
            inputMatrix(matrix1, rows, cols);
            transposeMatrix(matrix1, rows, cols);
            break;
        case 7:
            printf("Matrix:\n");
            inputMatrix(matrix1, rows, cols);
            if (isSymmetricMatrix(matrix1, rows, cols)) {
                printf("The matrix is symmetric.\n");
            } else {
                printf("The matrix is not symmetric.\n");
            }
            break;
        default:
            printf("Invalid choice.\n");
            break;
    }

    return 0;
}
```

RESULT:



"C:\Users\B Venkatesh\Desktop\c programming\matrices2\bin\Debug\matrices2.exe"

```
Matrix Operations:
1. Addition
2. Subtraction
3. Multiplication
4. Sum of diagonal or non-diagonal elements
5. Sum of rows and columns
6. Transpose of matrix
7. Check if matrix is symmetric
Enter your choice: 1
Enter the number of rows in the matrices: 2
Enter the number of columns in the matrices: 2
Matrix 1:
Enter the elements of the matrix:
1
2
3
4
Matrix 2:
Enter the elements of the matrix:
2
4
5
6
Addition of matrices:
Matrix:
3 6
8 10

Process returned 0 (0x0)   execution time : 22.223 s
Press any key to continue.
```

14/6/23 Exp-1.

Q1.] Write C or C++ program to do the following

i] Pass the matrices as palameters

ii] Addition /substraction

iii] Sum of row & columns

iv] Multiplication

v] Sum of principle /non-principle diagonal elements

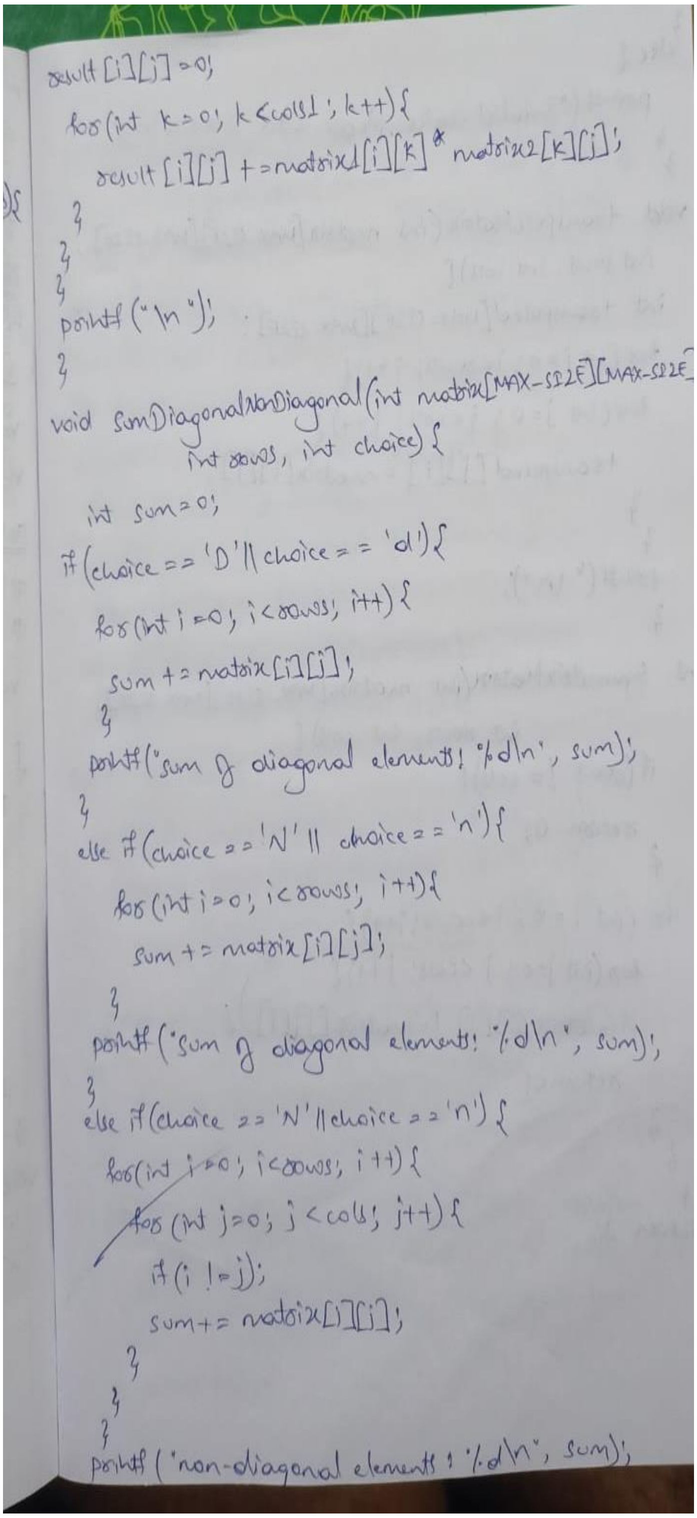
vi] Print the transpose of a given matrix

vii] Symmetric or not

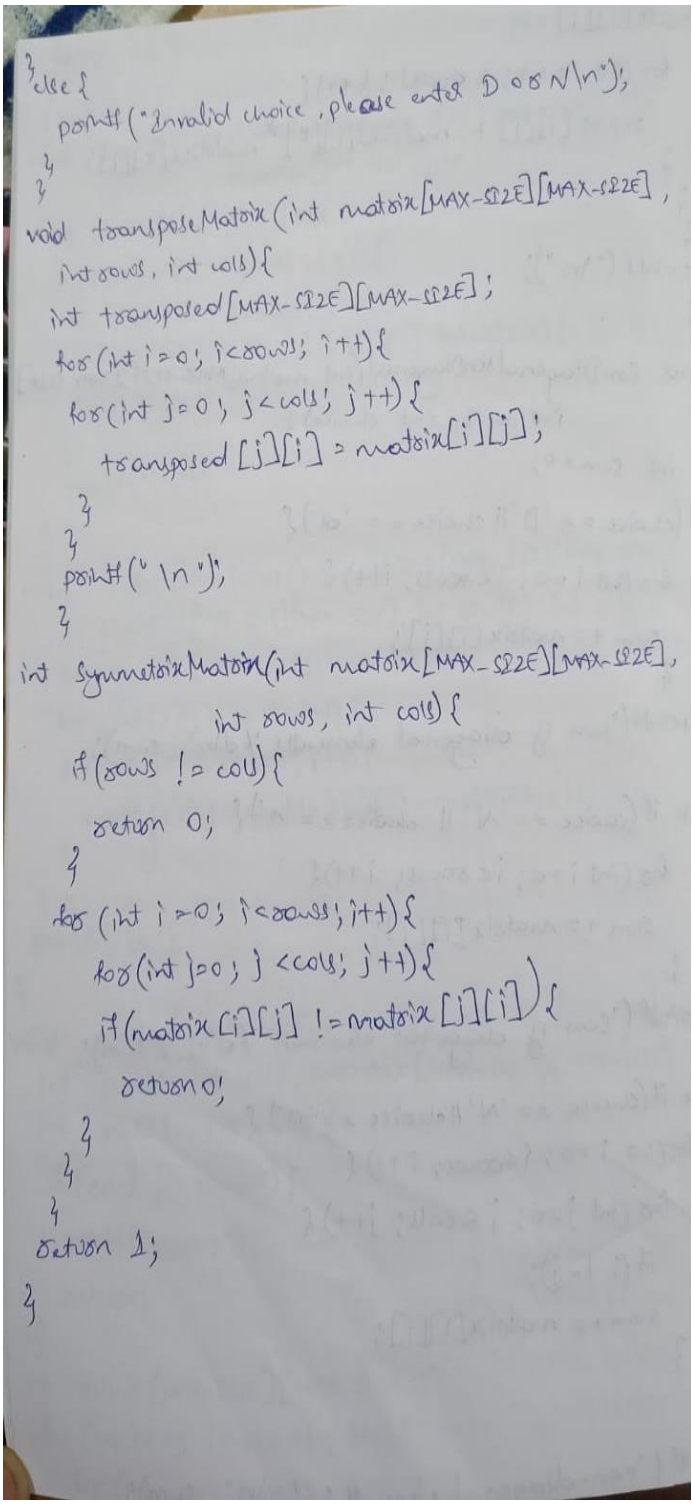
soln:-

```
#include<stdio.h>
#define MAX_SIZE 100
void inputMatrix(int matrix[MAX_SIZE][MAX_SIZE], int
                        rows ,int cols)
{
  printf("Enter the elements of the matrix:\n");
  for(int i=0; i< rows; i++){
    for(int j=0;j< cols; j++){
      scanf("%d", &matrix[i][j]);
    }
  }
}
void printMatrix(int matrix[MAX_SIZE][MAX_SIZE],int ro
                        int cols){
  printf("Matrix:\n");
  for(int i=0;i<rows; i++){
  for(int j=0;j<cols; j++){
  printf("%d", matrix[i][j]);
  }
```

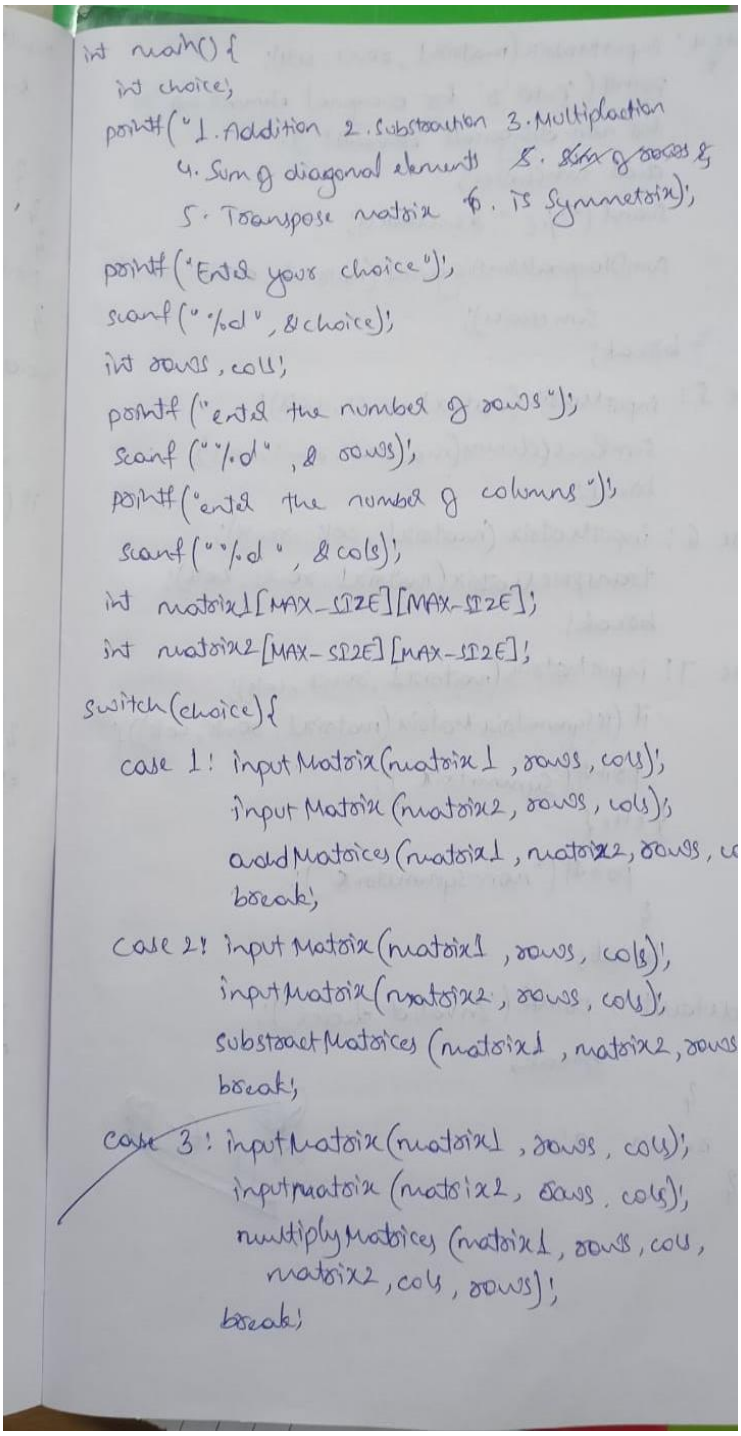
```
  printf("\n");
  }
}
void addMatrices(int matrix1[MAX_SIZE][MAX_SIZE], int
            matrix2[MAX_SIZE][MAX_SIZE],int rows, int cols){
  int result[MAX_SIZE][MAX_SIZE];
  for(int i=0; i<rows; i++){
   for(int j=0; j<cols; j++){
    result[i][j] = matrix1[i][j] +matrix2[i][j];
   }
  }
  printf("\n");
}
void subtractMatrices(int matrix1[MAX_SIZE][MAX_SIZE],
  int matrix2[MAX_SIZE][MAX_SIZE], int rows , int cols){
  int result[MAX_SIZE][MAX_SIZE];
  for (int i=0; i<rows; i++) {
  for(int j=0;j<cols; j++){
   result [i][j] = matrix1[i][j] - matrix2[i][j];
  }
 }
 printf("\n");
}
void multiplyMatrices(int matrix1[MAX_SIZE][MAX_SIZE],
  int rows1, int cols1, matrix2 [MAX_SIZE][MAX_SIZE],
  int rows2, int cols2) {
  if (cols1 != rows2) {
  printf("Error");
  return;
 }
int result[MAX_SIZE][MAX_SIZE];
for (int i=0; i<rows1; i++){
  for (int j=0; j<cols2; j++) {
```



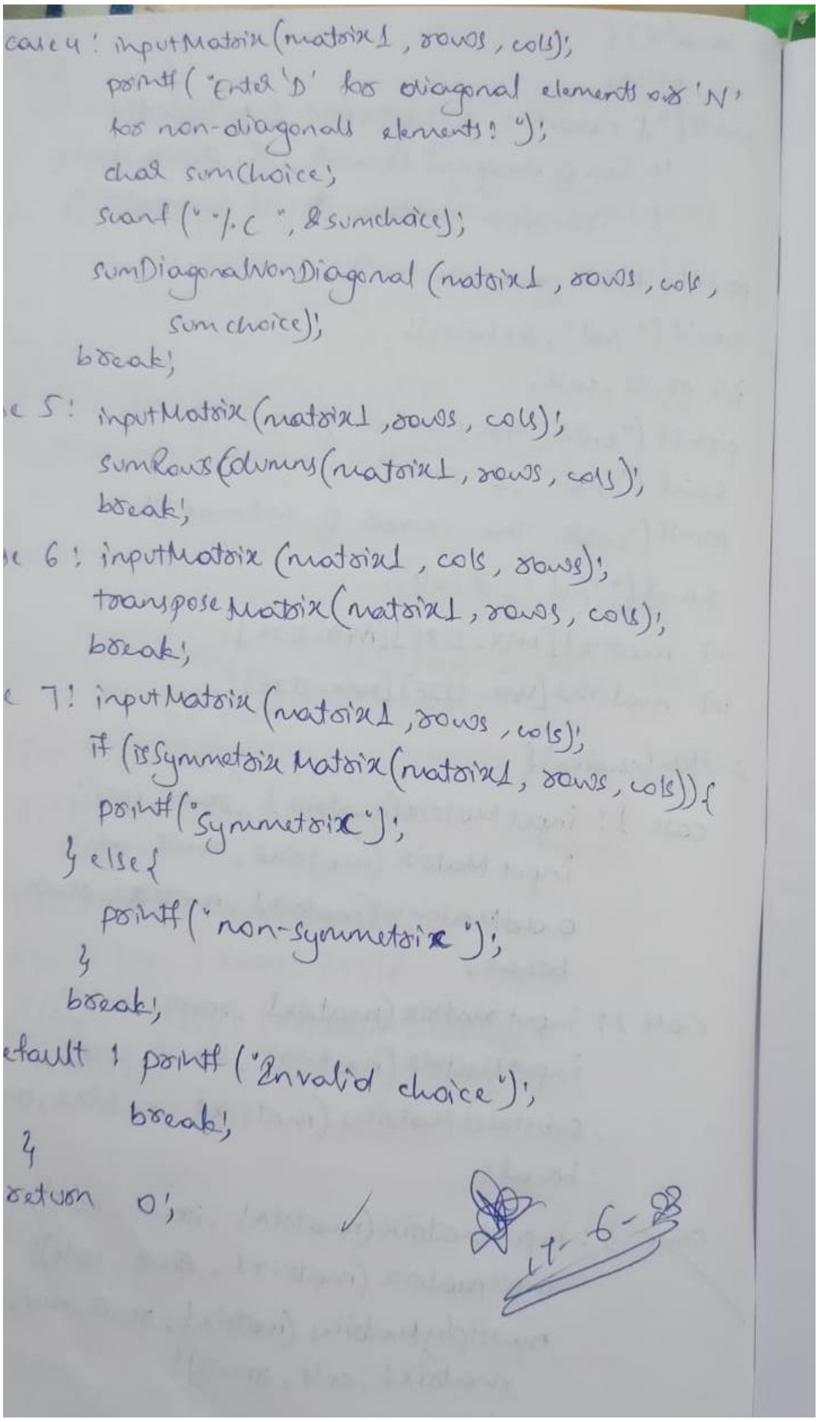
```
result[i][j]=0;
 for(int k=0; k<cols1; k++){
   result[i][j]+=matrix1[i][k]*matrix2[k][j];
 }
}
}
printf("\n");
}
void sumDiagonalNonDiagonal(int matrix[MAX-SIZE][MAX-SIZE
              int rows, int choice){
  int sum=0;
 if(choice=='D'||choice=='d'){
   for(int i=0; i<rows; i++){
    sum+=matrix[i][j];
   }
  printf("sum of diagonal elements: %d\n", sum);
 }
 else if(choice=='N'|| choice=='n'){
    for(int i=0; i<rows; i++){
      sum+=matrix[i][j];
    }
  printf("sum of diagonal elements: %d\n", sum);
 }
 else if(choice=='N'||choice=='n'){
   for(int i=0; i<rows; i++){
    for (int j=0; j<cols; j++){
      if(i!=j);
      sum+=matrix[i][i];
     }
   }
  }
 printf("non-diagonal elements: %d\n", sum);
```



```
}else{
  printf("Invalid choice, please enter D or N\n");
 }
}
void transposeMatrix(int matrix[MAX-SIZE][MAX-SIZE],
  int rows, int cols){
 int transposed[MAX-SIZE][MAX-SIZE];
 for(int i=0; i<rows; i++){
  for(int j=0; j<cols; j++){
    transposed[j][i]=matrix[i][j];
  }
 }
 printf("\n");
 }
int SymmetrixMatrix(int matrix[MAX_SIZE][MAX_SIZE],
               int rows, int cols){
  if(rows != cols){
   return 0;
  }
 for (int i=0; i<rows; i++){
   for(int j=0; j<cols; j++){
   if(matrix[i][j] !=matrix[j][i]){
     return 0;
   }
  }
 }
 return 1;
}
```



```
int main(){
  int choice;
  printf("1.Addition 2.Substraction 3.Multiplaction
        4. Sum of diagonal elements 5. ~~Sum~~ of rows &
        5. Transpose matrix 6. is Symmetrix);
  printf("Enter your choice");
  scanf("%d", &choice);
  int rows, cols;
  printf("enter the number of rows");
  scanf("%d", & rows);
  printf("enter the number of columns");
  scanf("%d", & cols);
  int matrix1[MAX-SIZE][MAX-SIZE];
  int matrix2[MAX-SIZE][MAX-SIZE];
switch(choice){
   case 1: inputMatrix(matrix1, rows, cols);
           inputMatrix(matrix2, rows, cols);
           addMatrices(matrix1, matrix2, rows, c
           break;
   case 2: inputMatrix(matrix1, rows, cols);
           inputMatrix(matrix2, rows, cols);
           substractMatrices (matrix1, matrix2, rows
           break;
   case 3: inputMatrix(matrix1, rows, cols);
           inputmatrix (matrix2, rows, cols);
           multiplyMatrices (matrix1, rows, cols,
              matrix2, cols, rows);
           break;
```



```
case 4: inputMatrix(matrix1, rows, cols);
        printf("Enter 'D' for diagonal elements or 'N'
        for non-diagonals elements: ");
        char sumChoice;
        scanf(" %c ", &sumchoice);
        sumDiagonalNonDiagonal (matrix1, rows, cols,
             sum choice);
      break;
e 5: inputMatrix(matrix1, rows, cols);
     sumRowsColumns(matrix1, rows, cols);
     break;
e 6: inputMatrix (matrix1, cols, rows);
     transposeMatrix(matrix1, rows, cols);
     break;
 7: inputMatrix (matrix1, rows, cols);
    if (isSymmetrix Matrix(matrix1, rows, cols)){
     printf("Symmetrix");
   }else{
     printf("non-symmetrix");
   }
   break;
efault : printf("Invalid choice");
         break;
 }
return 0;
```

✓ 17-6-23