Modern Education Society's
College of Engineering, Pune

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SEMESTER/YEAR: Sem – 3 / 2022	**ROLL NO: F21111015**
DATE OF PERFORMANCE: 14/09/2022	**DATE OF SUBMISSION: 21/09/2022**
EXAMINED BY: Mrs. N.R. Mhaske	**EXPERIMENT NO: DSL A-09**

TITLE: PERFORM VARIOUS OPERATIONS ON MATRICES

PROBLEM STATEMENT: Write a **Python** program to compute following computation on matrix:

A) Addition of two matrices B) Subtraction of two matrices
C) Multiplication of two matrices D) Transpose of a matrix

OBJECTIVES:

1. To understand structure of 2DArray.
2. To understand how to Create, Display and perform various operations on 2D array.

OUTCOMES:

1. To analyze the problems to apply suitable algorithm and data structure.
2. To understand concept of multi-dimensional array.

PRE-REQUISITES:

1. Knowledge of python programming
2. Knowledge of 2D array and matrix operations.

APPARATUS:

Computer Machine, python3 installed, etc.

QUESTIONS:

1. What is sparse matrix? Explain with example.

2. Write algorithm to perform fast transpose on sparse matrix.

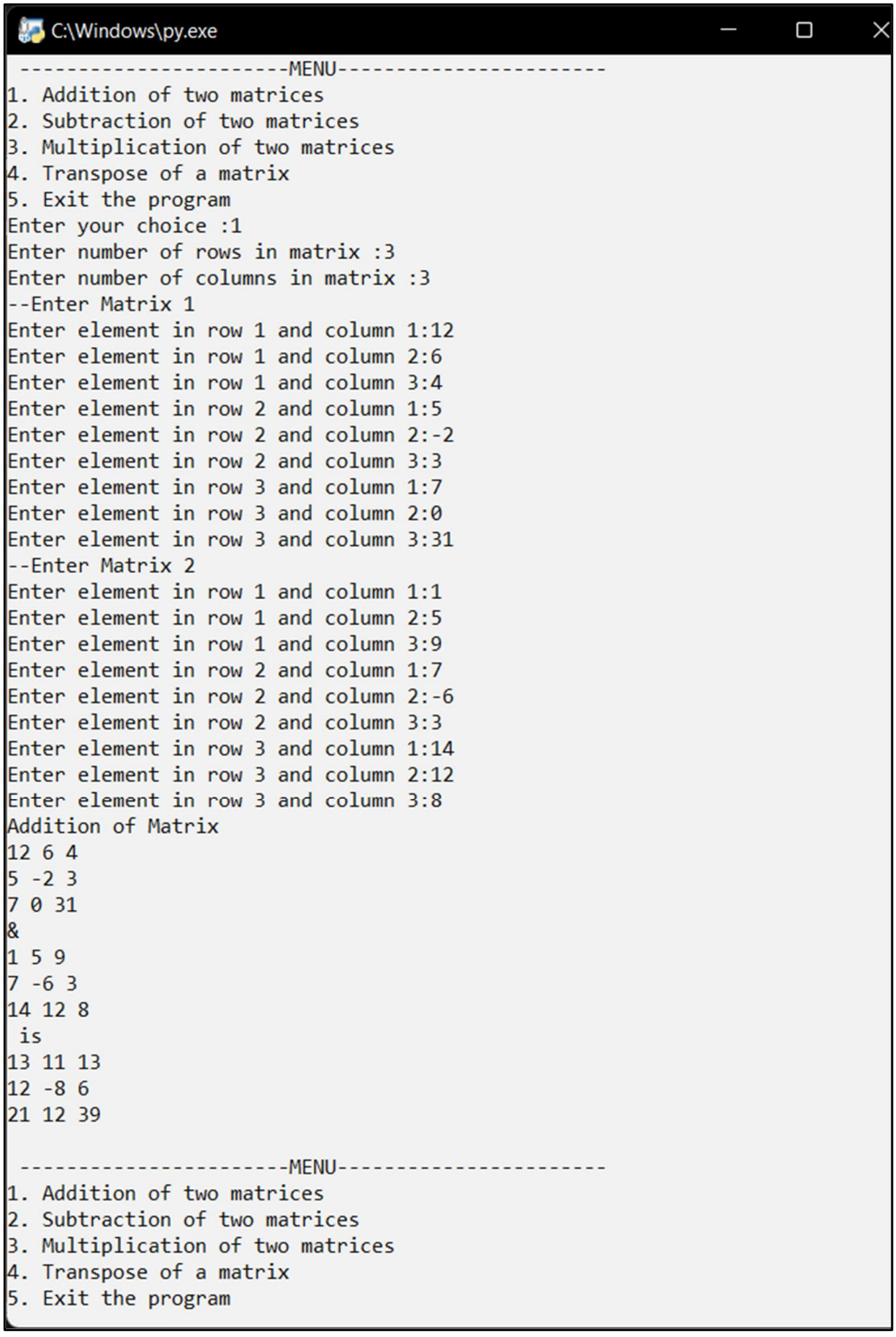
SOURCE CODE:

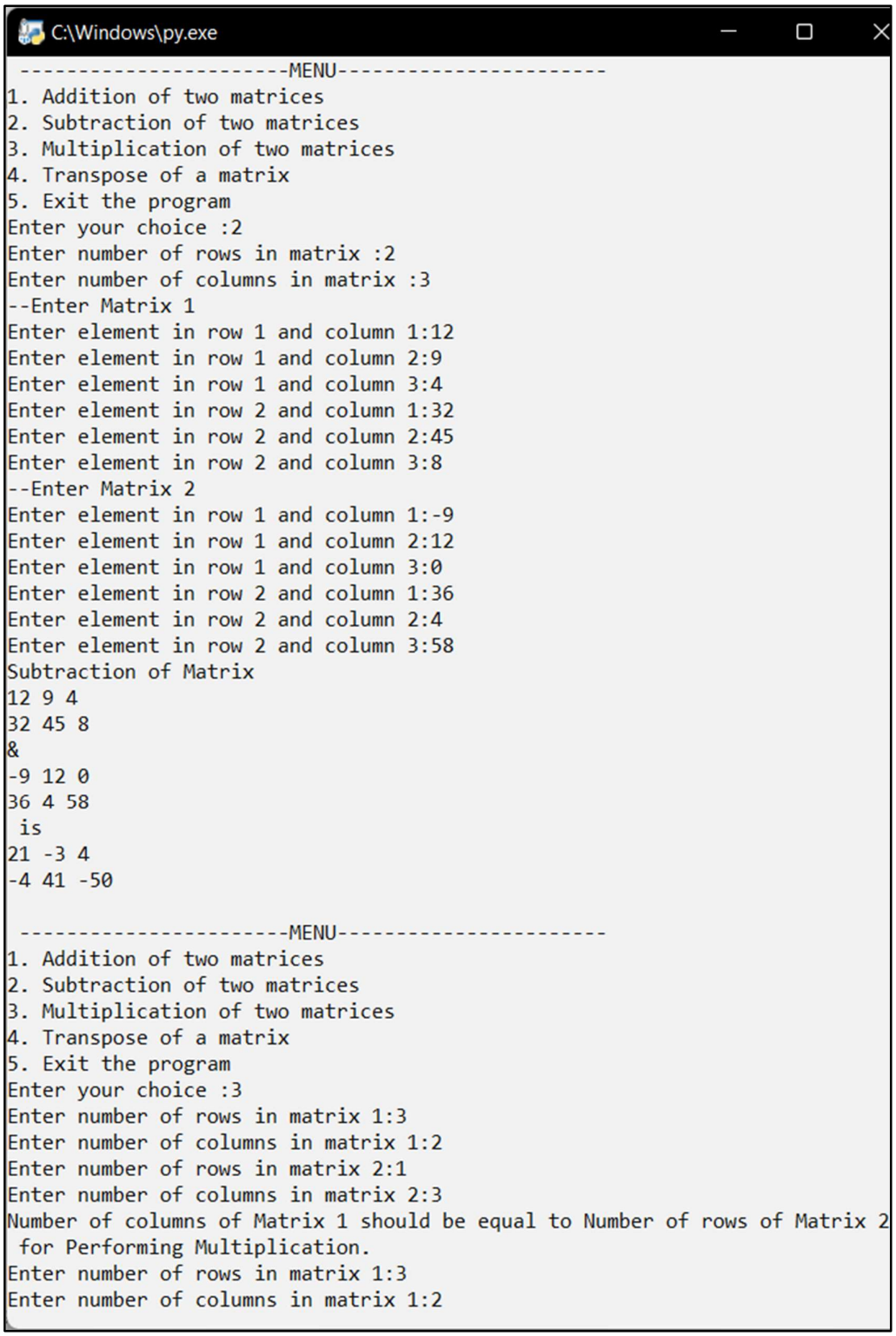
```
def display(matrix):
    for row in matrix:
        for element in row:
            print(element,end = " ")
        print()

def read(row,col):
    matrix = []
    for i in range(row):
        matrix.append([])
        for j in range(col):
            elmt = int(input(f"Enter element in row {i+1} and column
{j+1}:"))
            matrix[i].append(elmt)
    return matrix

def addition(mat1,mat2):
    r1 = len(mat1)
    c1 = len(mat1[0])
    add = []
    for i in range(r1):
        add.append([])
        for j in range(c1):
            add[i].append(mat1[i][j]+mat2[i][j])
    return add

def subtraction(mat1,mat2):
    r1 = len(mat1)
    c1 = len(mat1[0])
    sub = []
    for i in range(r1):
        sub.append([])
        for j in range(c1):
            sub[i].append(mat1[i][j]-mat2[i][j])
    return sub

def multiplication(mat1,mat2):
    r1 = len(mat1)
    c1,c2 = len(mat1[0]),len(mat2[0])
    multi = []
    for i in range(r1):
        multi.append([])
        for j in range(c2):
            sum = 0
            for k in range(c1):
                sum += mat1[i][k]*mat2[k][j]
            multi[i].append(sum)
    return multi

def transpose(matrix):
    trans = []
    row = len(matrix)
```

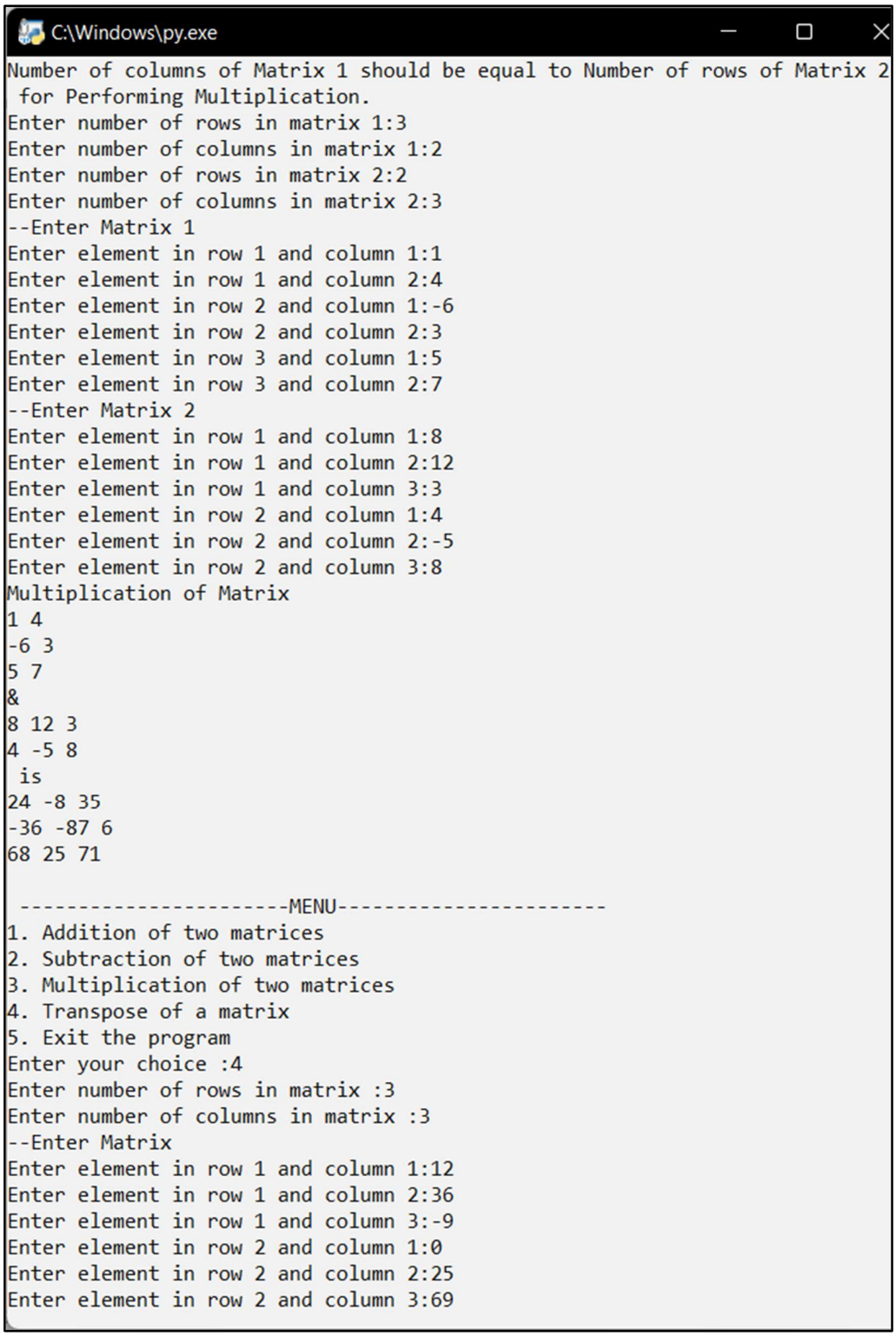
```
    col = len(matrix[0])
    for i in range(col):
        trans.append([])
        for j in range(row):
            elmt = matrix[j][i]
            trans[i].append(elmt)
    return trans

def main():
    while True:
        print("MENU".center(50,'-'))
        print("1. Addition of two matrices ")
        print("2. Subtraction of two matrices ")
        print("3. Multiplication of two matrices ")
        print("4. Transpose of a matrix ")
        print("5. Exit the program ")
        ch = input("Enter your choice :")
        if ch == '1':
            r1 = int(input("Enter number of rows in matrix :"))
            c1 = int(input("Enter number of columns in matrix :"))

            print("--Enter Matrix 1")
            mat1 = read(r1,c1)
            print("--Enter Matrix 2")
            mat2 = read(r1,c1)
            res = addition(mat1,mat2)
            print("Addition of Matrix ")
            display(mat1)
            print("&")
            display(mat2)
            print(" is ")
            display(res)

        elif ch == '2':
            r1 = int(input("Enter number of rows in matrix :"))
            c1 = int(input("Enter number of columns in matrix :"))

            print("--Enter Matrix 1")
            mat1 = read(r1,c1)
            print("--Enter Matrix 2")
            mat2 = read(r1,c1)
            res = subtraction(mat1,mat2)
            print("Subtraction of Matrix ")
            display(mat1)
            print("&")
            display(mat2)
            print(" is ")
            display(res)
        elif ch == '3':
            can_multi = False
            while not can_multi:
                r1 = int(input("Enter number of rows in matrix 1:"))
                c1 = int(input("Enter number of columns in matrix 1:"))
```

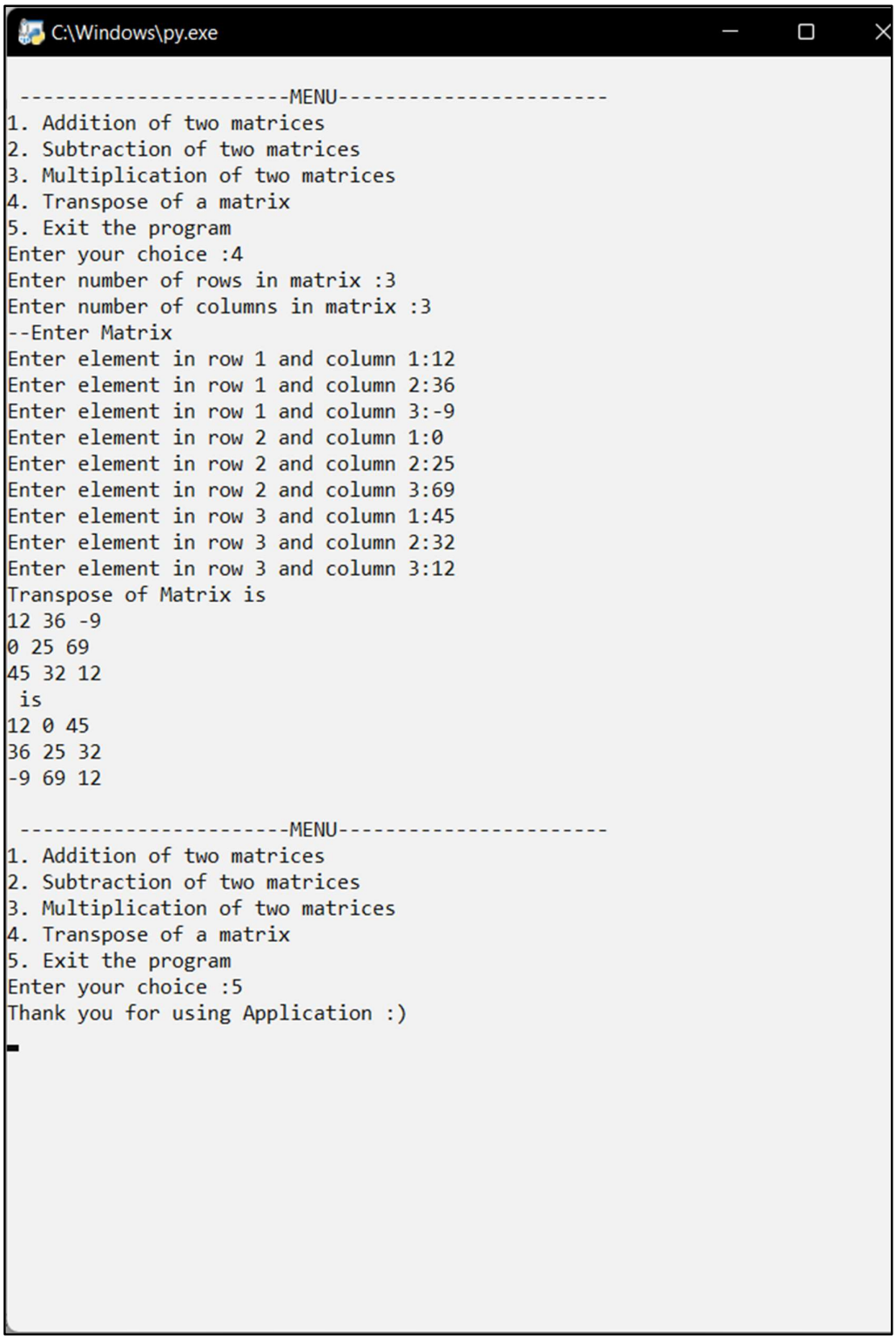
```
                r2 = int(input("Enter number of rows in matrix 2:"))
                c2 = int(input("Enter number of columns in matrix 2:"))

                if (c1!=r2):
                    print("Number of columns of Matrix 1 should be
equal to Number of rows of Matrix 2 for Performing Multiplication.")
                else:
                    can_multi = True
            print("--Enter Matrix 1")
            mat1 = read(r1,c1)
            print("--Enter Matrix 2")
            mat2 = read(r2,c2)
            res = multiplication(mat1,mat2)
            print("Multiplication of Matrix ")
            display(mat1)
            print("&")
            display(mat2)
            print(" is ")
            display(res)
        elif ch == '4':
            r1 = int(input("Enter number of rows in matrix :"))
            c1 = int(input("Enter number of columns in matrix :"))

            print("--Enter Matrix ")
            mat1 = read(r1,c1)
            res = transpose(mat1)
            print("Transpose of Matrix is ")
            display(mat1)
            print(" is ")
            display(res)
        elif ch == '5':
            print("Thank you for using Application :)")
            break
        else:
            print("Please enter a valid choice.")

main()
```

OUTPUT:


C:\Windows\py.exe
----------MENU----------
1. Addition of two matrices
2. Subtraction of two matrices
3. Multiplication of two matrices
4. Transpose of a matrix
5. Exit the program
Enter your choice :1
Enter number of rows in matrix :3
Enter number of columns in matrix :3
--Enter Matrix 1
Enter element in row 1 and column 1:12
Enter element in row 1 and column 2:6
Enter element in row 1 and column 3:4
Enter element in row 2 and column 1:5
Enter element in row 2 and column 2:-2
Enter element in row 2 and column 3:3
Enter element in row 3 and column 1:7
Enter element in row 3 and column 2:0
Enter element in row 3 and column 3:31
--Enter Matrix 2
Enter element in row 1 and column 1:1
Enter element in row 1 and column 2:5
Enter element in row 1 and column 3:9
Enter element in row 2 and column 1:7
Enter element in row 2 and column 2:-6
Enter element in row 2 and column 3:3
Enter element in row 3 and column 1:14
Enter element in row 3 and column 2:12
Enter element in row 3 and column 3:8
Addition of Matrix
12 6 4
5 -2 3
7 0 31
&
1 5 9
7 -6 3
14 12 8
is
13 11 13
12 -8 6
21 12 39
----------MENU----------
1. Addition of two matrices
2. Subtraction of two matrices
3. Multiplication of two matrices
4. Transpose of a matrix
5. Exit the program


C:\Windows\py.exe
----------MENU----------
1. Addition of two matrices
2. Subtraction of two matrices
3. Multiplication of two matrices
4. Transpose of a matrix
5. Exit the program
Enter your choice :2
Enter number of rows in matrix :2
Enter number of columns in matrix :3
--Enter Matrix 1
Enter element in row 1 and column 1:12
Enter element in row 1 and column 2:9
Enter element in row 1 and column 3:4
Enter element in row 2 and column 1:32
Enter element in row 2 and column 2:45
Enter element in row 2 and column 3:8
--Enter Matrix 2
Enter element in row 1 and column 1:-9
Enter element in row 1 and column 2:12
Enter element in row 1 and column 3:0
Enter element in row 2 and column 1:36
Enter element in row 2 and column 2:4
Enter element in row 2 and column 3:58
Subtraction of Matrix
12 9 4
32 45 8
&
-9 12 0
36 4 58
is
21 -3 4
-4 41 -50
----------MENU----------
1. Addition of two matrices
2. Subtraction of two matrices
3. Multiplication of two matrices
4. Transpose of a matrix
5. Exit the program
Enter your choice :3
Enter number of rows in matrix 1:3
Enter number of columns in matrix 1:2
Enter number of rows in matrix 2:1
Enter number of columns in matrix 2:3
Number of columns of Matrix 1 should be equal to Number of rows of Matrix 2
for Performing Multiplication.
Enter number of rows in matrix 1:3
Enter number of columns in matrix 1:2


C:\Windows\py.exe
Number of columns of Matrix 1 should be equal to Number of rows of Matrix 2
for Performing Multiplication.
Enter number of rows in matrix 1:3
Enter number of columns in matrix 1:2
Enter number of rows in matrix 2:2
Enter number of columns in matrix 2:3
--Enter Matrix 1
Enter element in row 1 and column 1:1
Enter element in row 1 and column 2:4
Enter element in row 2 and column 1:-6
Enter element in row 2 and column 2:3
Enter element in row 3 and column 1:5
Enter element in row 3 and column 2:7
--Enter Matrix 2
Enter element in row 1 and column 1:8
Enter element in row 1 and column 2:12
Enter element in row 1 and column 3:3
Enter element in row 2 and column 1:4
Enter element in row 2 and column 2:-5
Enter element in row 2 and column 3:8
Multiplication of Matrix
1 4
-6 3
5 7
&
8 12 3
4 -5 8
is
24 -8 35
-36 -87 6
68 25 71
----------MENU----------
1. Addition of two matrices
2. Subtraction of two matrices
3. Multiplication of two matrices
4. Transpose of a matrix
5. Exit the program
Enter your choice :4
Enter number of rows in matrix :3
Enter number of columns in matrix :3
--Enter Matrix
Enter element in row 1 and column 1:12
Enter element in row 1 and column 2:36
Enter element in row 1 and column 3:-9
Enter element in row 2 and column 1:0
Enter element in row 2 and column 2:25
Enter element in row 2 and column 3:69


C:\Windows\py.exe
----------MENU----------
1. Addition of two matrices
2. Subtraction of two matrices
3. Multiplication of two matrices
4. Transpose of a matrix
5. Exit the program
Enter your choice :4
Enter number of rows in matrix :3
Enter number of columns in matrix :3
--Enter Matrix
Enter element in row 1 and column 1:12
Enter element in row 1 and column 2:36
Enter element in row 1 and column 3:-9
Enter element in row 2 and column 1:0
Enter element in row 2 and column 2:25
Enter element in row 2 and column 3:69
Enter element in row 3 and column 1:45
Enter element in row 3 and column 2:32
Enter element in row 3 and column 3:12
Transpose of Matrix is
12 36 -9
0 25 69
45 32 12
is
12 0 45
36 25 32
-9 69 12
----------MENU----------
1. Addition of two matrices
2. Subtraction of two matrices
3. Multiplication of two matrices
4. Transpose of a matrix
5. Exit the program
Enter your choice :5
Thank you for using Application :)