**Practical – 1**

**Aim**: Write program to perform different operations on Matrices like (Addition,

Subtraction, Multiplication Transpose of Matrix, etc…)

**Theory:** Matrices are fundamental mathematical structures used in various fields including mathematics, physics, computer science, and more. They consist of rows and columns of numbers. Matrix operations such as addition, subtraction, multiplication, and transpose are fundamental in linear algebra and computational mathematics.

* **Matrix Addition and Subtraction**: Matrices must have the same dimensions to be added or subtracted. This involves adding or subtracting corresponding elements of the matrices.
* **Matrix Multiplication**: In matrix multiplication, the number of columns in the first matrix must match the number of rows in the second matrix. The resulting matrix will have dimensions based on the rows of the first and the columns of the second matrix.
* **Matrix Transpose**: Transposing a matrix involves flipping its rows and columns. The rows of the original matrix become the columns of the transposed matrix and vice versa.

**Acceptance Criteria:**

* **User Input:** The program should prompt the user to input the dimensions and elements of two matrices.
* **Validity Check:** Ensure that the matrices entered by the user have appropriate dimensions for the specified operations.
* **Matrix Operations:** Perform addition, subtraction, multiplication, and transpose operations on the matrices as per the user's input.
* **Display:** Output the original matrices and the results of the operations.

**Code:**

def matrix\_addition(mat1, mat2):

    result = [[0 for j in range(len(mat1[0]))] for i in range(len(mat1))]

    for i in range(len(mat1)):

        for j in range(len(mat1[0])):

            result[i][j] = mat1[i][j] + mat2[i][j]

    return result

def matrix\_subtraction(mat1, mat2):

    result = [[0 for j in range(len(mat1[0]))] for i in range(len(mat1))]

    for i in range(len(mat1)):

        for j in range(len(mat1[0])):

            result[i][j] = mat1[i][j] - mat2[i][j]

    return result

def matrix\_multiplication(mat1, mat2):

    result = [[0 for j in range(len(mat2[0]))] for i in range(len(mat1))]

    for i in range(len(mat1)):

        for j in range(len(mat2[0])):

            for k in range(len(mat2)):

                result[i][j] += mat1[i][k] \* mat2[k][j]

    return result

def matrix\_transpose(mat):

    result = [[0 for j in range(len(mat))] for i in range(len(mat[0]))]

    for i in range(len(mat)):

        for j in range(len(mat[0])):

            result[j][i] = mat[i][j]

    return result

def display\_matrix(mat):

    for row in mat:

        print(row)

rows1 = int(input("Enter the number of rows for the first matrix: "))

cols1 = int(input("Enter the number of columns for the first matrix: "))

rows2 = int(input("Enter the number of rows for the second matrix: "))

cols2 = int(input("Enter the number of columns for the second matrix: "))

matrix1 = [[int(input(f"Enter element [{i + 1}][{j + 1}] for matrix 1: ")) for j in range(cols1)] for i in range(rows1)]

matrix2 = [[int(input(f"Enter element [{i + 1}][{j + 1}] for matrix 2: ")) for j in range(cols2)] for i in range(rows2)]

print("\nMatrix 1:")

display\_matrix(matrix1)

print("\nMatrix 2:")

display\_matrix(matrix2)

add\_result = matrix\_addition(matrix1, matrix2)

print("\nAddition Result:")

display\_matrix(add\_result)

sub\_result = matrix\_subtraction(matrix1, matrix2)

print("\nSubtraction Result:")

display\_matrix(sub\_result)

mul\_result = matrix\_multiplication(matrix1, matrix2)

print("\nMultiplication Result:")

display\_matrix(mul\_result)

transpose\_result1 = matrix\_transpose(matrix1)

transpose\_result2 = matrix\_transpose(matrix2)

print("\nTranspose of Matrix 1:")

display\_matrix(transpose\_result1)

print("\nTranspose of Matrix 2:")

display\_matrix(transpose\_result2)

**INPUT:**

Enter the number of rows for the first matrix: 3

Enter the number of columns for the first matrix: 3

Enter the number of rows for the second matrix: 3

Enter the number of columns for the second matrix: 3

Enter element [1][1] for matrix 1: 1

Enter element [1][2] for matrix 1: 2

Enter element [1][3] for matrix 1: 3

Enter element [2][1] for matrix 1: 4

Enter element [2][2] for matrix 1: 5

Enter element [2][3] for matrix 1: 6

Enter element [3][1] for matrix 1: 7

Enter element [3][2] for matrix 1: 8

Enter element [3][3] for matrix 1: 9

Enter element [1][1] for matrix 2: 9

Enter element [1][2] for matrix 2: 8

Enter element [1][3] for matrix 2: 7

Enter element [2][1] for matrix 2: 6

Enter element [2][2] for matrix 2: 5

Enter element [2][3] for matrix 2: 4

Enter element [3][1] for matrix 2: 3

Enter element [3][2] for matrix 2: 2

Enter element [3][3] for matrix 2: 1

**OUTPUT:**

Matrix 1:

[1, 2, 3]

[4, 5, 6]

[7, 8, 9]

Matrix 2:

[9, 8, 7]

[6, 5, 4]

[3, 2, 1]

Addition Result:

[10, 10, 10]

[10, 10, 10]

[10, 10, 10]

Subtraction Result:

[-8, -6, -4]

[-2, 0, 2]

[4, 6, 8]

Multiplication Result:

[30, 24, 18]

[84, 69, 54]

[138, 114, 90]

Transpose of Matrix 1:

[1, 4, 7]

[2, 5, 8]

[3, 6, 9]

Transpose of Matrix 2:

[9, 6, 3]

[8, 5, 2]

[7, 4, 1]

**Conclusion:**

In this program we have studied about the operation of matrix on (addition, subtraction, multiplications and transpose of matrix). We have taken input from user (user def). So, we have executed the program of operations on matrix successfully**.**