**PSG COLLEGE OF TECHNOLOGY, COIMBATORE -641 004**

**Department of Applied Mathematics and Computational Sciences**

**II Semester MSc Software Systems**

**18XW26 Data Structures Lab – Arrays**

**Problem Sheet – 4**

**Solve the following problems by writing efficient programs:**

1. Write a C program to read a two-dimensional matrix A and perform the following.
2. Find triple representation sparse matrix T of matrix A
3. Find transpose of the matrix A
4. Find transpose of the matrix T, the result should be ordered column wise.
5. Write a C program to read 2 two-dimensional matrices A and B. Find their triple representation sparse matrices T1 and T2, and then perform matrix addition on T1 and T2. Display the resultant matrix.

*Sample input and output:*

Matrix A: 0 1 0 0

0 0 0 2

0 13 0 0

8 0 0 4

Matrix B: 7 0 1 0

0 0 0 8

3 4 0 0

0 0 7 0

T1 = 4 4 5

0 1 1

1 3 2

2 1 13

3 0 8

3 3 4

T2 = 4 4 6

0 0 7

0 2 1

1 3 8

2 0 3

2 1 4

3 2 7

T1+T2= 4 4 9

0 0 7

0 1 1

0 2 1

1 3 10

2 0 3

2 1 17

3 0 8

3 2 7

3 3 4

1. Consider the following sparse matrices A and B.

A:

0 0 0 0 4 0

0 0 7 0 0 0

0 0 0 0 0 8

6 0 0 0 0 0

0 0 0 0 1 0

B:

0 0 0 0 4 0

0 0 7 0 0 0

0 0 0 0 0 2

5 0 0 0 0 0

0 0 0 0 2 0

Write a C Program to convert a sparse matrix to triple representation, also identify the given matrices are ‘twins’ or not by taking triple representations as inputs. Two sparse matrices are known as ‘twins’ if they have same number of non-zero elements, and all non-zero elements are placed in same index positions. For example, if A[1,5]=4 then B[1,5] also has a non zero element.

If given matrices are twins then perform matrix addition based on the following constraints.

1. If A[i,j]=B[i,j] then Result[i,j]=1
2. If A[i,j]>B[i,j] then Result[i,j]=2
3. If A[i,j]<B[i,j] then Result[i,j]=-2

Verify the algorithm by taking the given matrices’ values and show the results.