

**1. Write suitable program segments for each of the following:**

- a) Determine the product of the major diagonal elements of a 6x6 two dimensional array.
- b) Output a 10x8 matrix in columnwise order.
- c) Declare a 6x6 matrix and initialize the major diagonal to zero.
- d) Initialize the odd columns of a 4x6 matrix to zero, and even columns to 1.
- e) Store the minor diagonal elements of a 7x7 matrix into a one dimensional array.
- f) Output columnwise, the first 20 elements of a 10x50 matrix.
- g) Declare a 6x6 matrix and initialize the upper triangular elements to zero.

**2. Write program segments for each of the following operations on the two dimensional array `numbers` declared as:**

```
double[][] numbers = new double[5][10];
```

- a) Output only the elements divisible by 5.
- b) Output only the columns with an odd index.
- c) Output only the negative elements and their positions (row and column indices).
- d) Initialize each element to the sum of row and column indices of that element.
- e) Initialize the rows with odd index to 1, rows with even index to 2.

**3. Define a method for each of the following problems. Notice that most of them should be void methods.**

- a) Read the elements of a two-dimensional array rowwise.
- b) Output the elements of a two-dimensional array rowwise.
- c) Output the elements of a two-dimensional array columnwise.
- d) Given a two-dimensional array, return a certain column of that array.
- e) Given a two-dimensional character array, return a certain row of that array.
- f) Given a two-dimensional array, find the maximum element in each row.
- g) Given a two-dimensional array, find the average of each column.
- h) Given a two-dimensional array, find the maximum element in a certain column.
- i) Given a two-dimensional array, find the minimum element in a certain row.
- j) Given a two-dimensional array, find the number of occurrences of a certain value in each column.
- k) Given a square matrix, return the major diagonal elements.
- l) Given a square matrix, return the minor diagonal elements.
- m) Given a square matrix, find the minimum major diagonal element.
- n) Given a square matrix, find the maximum minor diagonal element.
- o) Given a square matrix, find the sum of the major diagonal elements.
- p) Given a square matrix, find the product of the minor diagonal elements.
- q) Given a square matrix, find the sum of the major diagonal and the product of the minor diagonal elements.
- r) Given a square matrix, decide whether it is symmetric or not..
- s) Add two matrices.
- t) Multiply a matrix with a given vector.
- u) Multiply two square matrices.

**8. Analyze the following problems and develop a program for each of them, using the methods you defined in question 7, where necessary.**

- a) Given a 10x6 table, find the sum of cubes of the elements in each row, store them into a one dimensional array, and display the maximum and minimum values in that array.
- b) Given a 120x100 table within a file, find the sum of the absolute values of each column, and find the maximum and minimum of these sums.
- c) Given a 10x10 matrix, display the major diagonal elements and the minimum number in that diagonal.
- d) Given a 7x7 matrix, display the minor diagonal elements and the maximum number in that diagonal.
- e) Given two vectors with 5 numbers, and a 5x5 matrix, multiply the matrix with the sum of the vectors, and display the resulting matrix.
- f) Given two 3x3 matrices, display the sum and product of those matrices.
- g) Given a 5x100 character array, display the third row in reverse order.
- h) Read a 50x50 matrix rowwise from a file, find and output:
  - i) The sum of the diagonal
  - ii) The maximum of the last column
  - iii) The sum of the second row
  - iv) How many elements are positive
  - v) Position (row and column) of all negative elements
  - vi) Store these negative elements into a one dimensional array, and find their average.