Introduction to Programming and Data Structures, 2023-24, Semester-II
Assignment 06

Maximum Marks: **200**   Submission Deadline: **2023-Nov-16**
Topic: Matrix Algorithms

Assignment problem # AP0601

- (Gaussian elimination). Let A be an $n \times n$ matrix with entries in a field K. A is invertible if and only if it be can be taken to the identity matrix by a finite sequence of row operations (interchanges, addition of a multiple of one row to another, multiplication of a row by an element of K). A is not invertible if and only if it can be taken to a matrix with a zero row.

- **Problem**: Let us consider the field $K = \mathbb{Z}_p$. Given a file containing a square matrix do the following operations.

  1. **Inverse**: find the inverse of it, if exists. Display the inverse matrix in the terminal. There should be at least two functions to compute and display the inverse that must be called from main function. Write the program to find inverse in a single file.

  2. **Eigenvalue:** find a dominant eigenvalue and corresponding dominant eigenvector, using power method. There should be separate display function for displaying the results. Write the program in a single file for these computation.

  3. **Project Building**: Build a project based on these two separate files. The project should contain test, src, and include, directories. and readme file.

- **Input**: A path to the input file (say "input_matrix.txt")

  - The first line contains two positive integers n and p, the order of the matrix and order of the group.

  - It follows n lines where in each line is the row of the matrix where the elements are separated by spaces.

- **Output:** Inverse, Determinant, eigenvalue and eigenvector in the terminal.

[80+90+30]