VIRAL PANCHAL
HW03.

Q.1) Inverse using Gaussian elimination:

Process:

① Augmented matrix $[A | I]$ → 4x4 (Given)

② $A_{4 \times 4}$ → upper triangular form
    ↳ Partial pivoting to be considered

③ Back substitution to get the solution

(Program attached)

Q.2) LU decomposition → No pivoting

$A_{4 \times 4}$ → Given

Process: for L & U
                    ↙   ↘ Upper triangular
            lower triangular   form matrix
            form matrix

Q.3) Truss :

6 points/pins where forces are acting

Resolving forces in horizontal & vertical directions

$x(1) = D + F \cos\theta_1 = 0$ $y(1) = A + F \sin\theta_1 = 0$

$x(2) = E - D - 6\cos\theta_2 = 0$ $y(2) = 6\sin\theta_2 - 2000 = 0$

$x(3) = I + L\cos\theta_4 - H\cos\theta_3 - E = 0$

$y(3) = L\sin\theta_4 + H\sin\theta_3 - 2500 = 0$

$x(4) = K + H\cos\theta_3 + 6\cos\theta_2 - F\cos\theta_1 = 0$

$y(4) = -H\sin\theta_4 - 6\sin\theta_2 - F\sin\theta_1 = 0$

$x(5) = B - I = 0$ $y(5) = C + J = 0$

$x(6) = -K - L\cos\theta_4 = 0$ $y(6) = +J + L\sin\theta_4 = 0$

given: $x = \begin{bmatrix} A \\ B \\ C \\ D \\ E \\ F \\ G \\ H \\ I \\ J \\ K \\ L \end{bmatrix}$

$A x = B$

$\downarrow$

13×13
Matrix
(shown in Matlab).

Q.4) Thomas algorithm:

$$x_1 + x_2 = 5$$
$$2x_1 - x_2 + 5x_3 = -9$$
$$3x_2 - 4x_3 + 2x_4 = 19$$
$$2x_3 + 6x_4 = 2$$

$$\begin{array}{c}b \leftarrow \\ a \leftarrow \end{array}\begin{bmatrix} 1 & 1 & 0 & 0 \\ 2 & -1 & 5 & 0 \\ 0 & 3 & -4 & 2 \\ 0 & 0 & 2 & 6 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 5 \\ -9 \\ 19 \\ 2 \end{bmatrix} \quad \leftarrow rhs$$

$$a = \begin{bmatrix} 2 & 3 & 2 \end{bmatrix}$$
$$b = \begin{bmatrix} 1 & -1 & -4 & 6 \end{bmatrix}$$
$$c = \begin{bmatrix} 1 & 5 & 2 \end{bmatrix}$$

Matlab program attached