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Elect/Elect Engr.

ENG 382 Assignment III

Assignment 3

$$T_1 + T_2 - 2T_3 + T_4 + 3T_5 - T_6 = 4$$

$$2T_1 - T_2 + T_3 + 2T_4 + T_5 - 3T_6 = 20$$

$$T_1 + 3T_2 - 3T_3 - T_4 + 2T_5 + T_6 = -15$$

$$5T_1 + 2T_2 - T_3 - T_4 + 2T_5 + T_6 = -3$$

$$-3T_1 - T_2 + 2T_3 + 3T_4 + T_5 + 3T_6 = 16$$

$$4T_1 + 3T_2 + T_3 - 6T_4 - 3T_5 - 2T_6 = -27$$

$$\tilde{A}^{(1)} = \begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 2 & -1 & 1 & 2 & 1 & -3 \\ 1 & 3 & -3 & -1 & 2 & 1 \\ 5 & 2 & -1 & -1 & 2 & 1 \\ -3 & -1 & 2 & 3 & 1 & 3 \\ 4 & 3 & 1 & -6 & -3 & -2 \end{bmatrix} = \begin{bmatrix} 4 \\ 20 \\ -15 \\ -3 \\ 16 \\ -27 \end{bmatrix}$$

$$\tilde{A}^{(2)} = \begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -1.5 & 2.5 & 0 & -2.5 & -0.5 \\ 0 & 2 & -1 & -2 & -1 & 2 \\ 0 & -0.6 & 1.8 & -1.2 & -2.6 & 1.2 \\ 0 & -0.667 & 1.333 & -2 & -3.333 & 0 \\ 0 & -0.25 & 2.25 & -2.5 & -3.75 & 0.5 \end{bmatrix} = \begin{bmatrix} 4 \\ 6 \\ -19 \\ -4.6 \\ -9.333 \\ -10.75 \end{bmatrix}$$

$E_2 - E_1 \Rightarrow$
 $E_3 - E_1 \Rightarrow$
 $E_4 - E_1 \Rightarrow$
 $E_5/3 - E_1 \Rightarrow$
 $E_6/4 - E_1 \Rightarrow$

Dividing through E_3 by 2 & swap (Pivot) with E_2 .

$$\tilde{A}^{(3)} = \begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & 1 & -0.5 & -1 & -0.5 & 1 \\ 0 & -1.5 & 2.5 & 0 & -2.5 & -0.5 \\ 0 & -0.6 & 1.8 & -1.2 & -2.6 & 1.2 \\ 0 & -0.667 & 1.333 & -2 & -3.333 & 0 \\ 0 & -0.25 & 2.25 & -2.5 & -3.75 & 0.5 \end{bmatrix} = \begin{bmatrix} 4 \\ 9.5 \\ 6 \\ -4.6 \\ -9.333 \\ -10.75 \end{bmatrix}$$

$$\tilde{A}^{(3)} = \begin{pmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & 1 & -0.5 & -1 & -0.5 & 1 \\ 0 & 0 & 1.167 & -1 & -2.167 & 0.667 \\ 0 & 0 & 2.5 & -3 & -4.833 & 3 \\ 0 & 0 & 1.499 & -3.999 & -5.497 & 1 \\ 0 & 0 & 8.5 & -11 & -15.5 & 3 \end{pmatrix} = \begin{pmatrix} 4 \\ -9.5 \\ -5.5 \\ -17.167 \\ -23.493 \\ -52.5 \end{pmatrix}$$

Divide through E4 by 2.5 and swap with E3.

$$\tilde{A}^{(3)} = \begin{pmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & 1 & -0.5 & -1 & -0.5 & 1 \\ 0 & 0 & 1 & -1.2 & -1.933 & 1.2 \\ 0 & 0 & 1.167 & -1 & -2.167 & 0.667 \\ 0 & 0 & 1.499 & -3.999 & -5.497 & 1 \\ 0 & 0 & 8.5 & -11 & -15.5 & 3 \end{pmatrix} = \begin{pmatrix} 4 \\ -9.5 \\ -6.867 \\ -5.5 \\ -23.493 \\ -52.5 \end{pmatrix}$$

$$\tilde{A}^{(4)} = \begin{pmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & 1 & -0.5 & -1 & -0.5 & 1 \\ 0 & 0 & 1 & -1.2 & -1.933 & 1.2 \\ 0 & 0 & 0 & 0.343 & 0.076 & -0.628 \\ 0 & 0 & 0 & -1.463 & -1.734 & -5.353 \\ 0 & 0 & 0 & -0.094 & 0.109 & -0.847 \end{pmatrix} = \begin{pmatrix} 4 \\ -9.5 \\ -6.867 \\ 2.154 \\ -8.805 \\ 0.691 \end{pmatrix}$$

Divide through E4 by 0.343.

$$\tilde{A}^{(4)} = \begin{pmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & 1 & -0.5 & -1 & -0.5 & 1 \\ 0 & 0 & 1 & -1.2 & -1.933 & 1.2 \\ 0 & 0 & 0 & 1 & 0.222 & -1.831 \\ 0 & 0 & 0 & 0 & 0.969 & 2.194 \\ 0 & 0 & 0 & 0 & -1.382 & 10.842 \end{pmatrix} = \begin{pmatrix} 4 \\ -9.5 \\ -6.867 \\ 6.280 \\ -0.282 \\ -13.631 \end{pmatrix}$$

Divide through E_5 by 0.959

$$\tilde{A}^{(5)} = \begin{pmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & 1 & -0.5 & -1 & -0.5 & 1 \\ 0 & 0 & 1 & -1.2 & -1.933 & 1.2 \\ 0 & 0 & 0 & 1 & 0.222 & -1.831 \\ 0 & 0 & 0 & 0 & 1 & 2.288 \\ 0 & 0 & 0 & 0 & -1.382 & 10.842 \end{pmatrix} = \begin{pmatrix} 4 \\ -9.5 \\ -6.867 \\ 6.280 \\ -0.294 \\ -13.63 \end{pmatrix}$$

$$\tilde{A}^{(6)} = \begin{pmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & 1 & -0.5 & -1 & -0.5 & 1 \\ 0 & 0 & 1 & -1.2 & -1.933 & 1.2 \\ 0 & 0 & 0 & 1 & 0.222 & -1.831 \\ 0 & 0 & 0 & 0 & 1 & 2.288 \\ 0 & 0 & 0 & 0 & 0 & -10.133 \end{pmatrix} = \begin{pmatrix} 4 \\ -9.5 \\ -6.867 \\ 6.280 \\ -0.294 \\ 10.157 \end{pmatrix}$$

Background Substitution.

From E_6 in $\tilde{A}^{(6)}$: $-10.133 T_6 = 10.157$

$$T_6 = -1.002 \approx -1$$

From E_5 : $T_5 + 2.288 T_6 = -0.294$

$$T_5 = -0.294 - 2.288(-1.002)$$

$$T_5 = 1.999 \approx 2$$

From E_4 : $T_4 = -0.222(1.999) + 1.831(-1.002) + 6.280$

$$T_4 = 4.002 \approx 4$$

From E_3 : $T_3 = 1.2(4.002) + 1.933(1.999) - 1.2(-1.002) - 0.867$

$$T_3 = 3.002 \approx 3$$

From E_2 : $T_2 = 0.5(3.002) + 4.002 + 0.5(1.999) - (-1.002) - 9.5$

$$T_2 = -1.996 \approx -2$$

From E_1 : $T_1 = 4 - (-1.996) + 2(3.002) - 4.002 - 3(1.999) + (-1.002)$

$$T_1 = 0.999 \approx 1$$

$$T_1 = 1; T_2 = -2; T_3 = 3; T_4 = 4; T_5 = 2; T_6 = -1.$$

MA On MATLAB;

- function C = assign3(A,B)
- A = [11 -2 3 -1; 2 -1 2 1 -3; 3 -3 -1 2 1, 5 2 -1 -1 2 1, -3 -1 2 3 1 3;
4 3 1 -6 -3 -2];
- B = [4; 20; 15; -3; 16; -27];
- i = 1;
- X = [A, B];
- [m, n] = size(X);

- while i <= n
- if X(i,i) == 0
- disp('Diagonal element zero');
- return
- end
- C = X(i, n);

- function X = elimination(X, i, j)
- [m, n] = size(X);
- a = X(i, j)
- X(i, :) = X(i, :) / a;
- for k = 1:m
- if k == i
- continue
- end
- X(k, j) = X(k, j) - X(i, j) * X(k, i);
- End.

xxi On MATLAB;

- Command Window

- Clear

- Clc

- Close all

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

- $x = [4; 20; -16; -3; 16; -27]$

- $\text{inv}(A)$

- $b = \text{inv}(A) * x$