

DERRI COLUMBUS ROMATE

15/ENG02/017

COMPUTER ENGINEERING

ENG 382 [ENGINEERING MATHEMATICS IV]

ASSIGNMENT III

Question

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

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

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

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

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

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

Row3 - $\frac{1}{1}$ Row1

$$1 - 1 \times 1 = 0$$

$$3 - 1 \times 1 = 2$$

$$-3 - 1 \times (-2) = -1$$

$$-1 - 1 \times 1 = -2$$

$$2 - 1 \times 5 = -3$$

$$1 - 1 \times (-1) = 2$$

$$-15 - 1 \times 4 = -19$$

Solution

Writing the given equation in matrix form

| | | | | | | | |
|----|----|----|----|----|----|-------|-----|
| 1 | 1 | -2 | 1 | 3 | -1 | T_1 | 4 |
| 2 | -1 | 1 | 2 | 1 | -3 | T_2 | 20 |
| 1 | 3 | -3 | -1 | 2 | 1 | T_3 | -15 |
| 5 | 2 | -1 | 1 | 2 | 1 | T_4 | -3 |
| -3 | 1 | 2 | 3 | 1 | 3 | T_5 | 16 |
| 4 | 3 | 1 | -6 | -3 | -2 | T_6 | -27 |

Row4 - $\frac{5}{1}$ Row1

$$5 - 5 \times 1 = 0$$

$$2 - 5 \times 1 = -3$$

$$-1 - 5 \times (-2) = 9$$

$$-1 - 5 \times 1 = -6$$

$$2 - 5 \times 3 = -13$$

$$1 - 5 \times (-1) = 6$$

$$-3 - 5 \times 4 = -23$$

The Augmented form

| | | | | | | |
|----|----|----|----|----|----|-----|
| 1 | 1 | -2 | 1 | 3 | -1 | 4 |
| 2 | -1 | 1 | 2 | 1 | -3 | 20 |
| 1 | 3 | -3 | -1 | 2 | 1 | -15 |
| 5 | 2 | -1 | 1 | 2 | 1 | -3 |
| -3 | 1 | 2 | 3 | 1 | 3 | 16 |
| 4 | 3 | 1 | -6 | -3 | -2 | -27 |

Row5 - $(-\frac{3}{1})$ Row1

$$-3 + 3 \times 1 = 0$$

$$-1 + 3 \times 1 = 2$$

$$2 + 3 \times (-2) = -4$$

$$3 + 3 \times 1 = 6$$

$$1 + 3 \times 3 = 10$$

$$-6 - 4 \times 1 = -10$$

$$-3 - 4 \times 3 = -15$$

$$-2 - 4 \times (-1) = 2$$

$$-29 - 4 \times 4 = -43$$

Modify Row2, Row3, Row4, Row5 and Row6

| | | | | | | |
|---|----|----|----|-----|----|-----|
| 1 | 1 | -2 | 1 | 3 | -1 | 4 |
| 0 | -3 | 5 | 0 | -5 | -1 | 12 |
| 0 | 2 | -1 | -2 | -1 | 2 | -19 |
| 0 | -3 | 9 | -6 | -13 | 6 | -23 |
| 0 | 2 | -4 | 6 | 10 | 0 | 28 |
| 0 | -1 | 9 | 10 | -15 | 2 | -43 |

Row3 + $\frac{2}{3}$ Row2

$$2 + \frac{2}{3} \times (-3) = 0$$

$$-1 + \frac{2}{3} \times 5 = \frac{7}{3}$$

$$-2 + \frac{2}{3} \times 0 = -2$$

$$-1 + \frac{2}{3} \times (-5) = -\frac{13}{3}$$

$$2 + \frac{2}{3} \times (-1) = \frac{4}{3}$$

$$-19 + \frac{2}{3} \times 12 = -11$$

Row4 - $\frac{3}{2}$ Row3

$$-3 + \frac{3}{2} \times 2 = 0$$

$$9 + \frac{3}{2} \times (-1) = \frac{15}{2}$$

$$-6 + \frac{3}{2} \times (-2) = -9$$

$$-13 + \frac{3}{2} \times (-1) = -\frac{29}{2}$$

$$6 + \frac{3}{2} \times 2 = 9$$

$$-23 + \frac{3}{2} \times (-19) = -\frac{103}{2}$$

Row5 - $\frac{2}{3}$ Row4

$$2 + \frac{2}{3} \times (-3) = 0$$

$$-4 + \frac{2}{3} \times 9 = 2$$

$$6 + \frac{2}{3} \times (-6) = 2$$

$$10 + \frac{2}{3} \times (-13) = \frac{4}{3}$$

$$0 + \frac{2}{3} \times 6 = 4$$

$$28 + \frac{2}{3} \times (-23) = \frac{38}{3}$$

Row6 - $(-\frac{1}{2})$ Row5

$$-1 + \frac{1}{2} \times 2 = 0$$

$$9 + \frac{1}{2} \times (-4) = 7$$

$$-10 + \frac{1}{2} \times 6 = -7$$

$$-15 + \frac{1}{2} \times 10 = -10$$

$$2 + \frac{1}{2} \times 0 = 2$$

$$-43 + \frac{1}{2} \times 28 = -29$$

Modify Row3, Row4, Row5, and Row6

| | | | | | | |
|---|----|----------------|----|-----------------|---------------|------------------|
| 1 | 1 | -2 | 1 | 3 | -1 | 4 |
| 0 | -3 | 5 | 0 | -5 | -1 | 12 |
| 0 | 0 | $\frac{7}{3}$ | -2 | $-\frac{13}{3}$ | $\frac{4}{3}$ | -11 |
| 0 | 0 | $\frac{15}{2}$ | -9 | $\frac{29}{2}$ | 9 | $-\frac{103}{2}$ |
| 0 | 0 | 2 | 2 | $-\frac{4}{3}$ | 4 | $\frac{38}{3}$ |
| 0 | 0 | 7 | -7 | -10 | 2 | -29 |

Row4 - $\frac{45}{14}$ Row3

$$\frac{15}{2} - \frac{45}{14} \times \frac{7}{3} = 0$$

$$-9 - \frac{45}{14} \times (-2) = -\frac{18}{7}$$

$$-14.5 - \frac{45}{14} \times (-\frac{13}{3}) = -\frac{4}{7}$$

$$-9 - \frac{45}{14} \times \frac{4}{3} = \frac{33}{7}$$

$$-\frac{103}{2} - \frac{45}{14} \times (-11) = -\frac{113}{7}$$

Row5 - $\frac{4}{15}$ Row4

$$2 - \frac{4}{15} \times \frac{15}{2} = 0$$

$$2 - \frac{4}{15} \times (-9) = \frac{22}{5}$$

$$\frac{4}{3} - \frac{4}{15} \times (-14.5) = \frac{26}{5}$$

$$4 - \frac{4}{15} \times 9 = \frac{8}{5}$$

$$\frac{38}{3} - \frac{4}{15} \times (-\frac{103}{2}) = \frac{132}{5}$$

Row6 - $\frac{7}{2}$ Row5

$$7 - \frac{7}{2} \times 2 = 0$$

$$-7 - \frac{7}{2} \times \frac{4}{3} = -\frac{35}{3}$$

$$-10 - \frac{7}{2} \times \frac{4}{3} = -\frac{44}{3}$$

$$2 - \frac{7}{2} \times 4 = -12$$

$$-29 - \frac{7}{2} \times \frac{38}{3} = -\frac{220}{3}$$

Modify Rows 5 and Row 6

| | | | | | | |
|---|----|---------------|-----------------|-----------------|----------------|------------------|
| 1 | 1 | -2 | 1 | 3 | -1 | 4 |
| 0 | -3 | 5 | 0 | -5 | -1 | 12 |
| 0 | 0 | $\frac{7}{3}$ | -2 | $-\frac{13}{3}$ | $\frac{4}{3}$ | -11 |
| 0 | 0 | 0 | $-\frac{18}{7}$ | $-\frac{4}{7}$ | $\frac{33}{7}$ | $-\frac{113}{7}$ |
| 0 | 0 | 0 | 44 | $\frac{26}{5}$ | $\frac{8}{5}$ | 264 |
| 0 | 0 | 0 | -14 | $-\frac{44}{3}$ | -12 | $-\frac{220}{3}$ |

Row 5 + $\frac{77}{45}$ Row 4

$$44 + \frac{77}{45} \times (-\frac{18}{7}) = 0$$

$$\frac{26}{5} + \frac{77}{45} \times (-\frac{4}{7}) = \frac{38}{9}$$

$$\frac{8}{5} + \frac{77}{45} \times \frac{33}{7} = \frac{29}{3}$$

$$264 + \frac{77}{45} \times (-\frac{113}{7}) = -\frac{11}{9}$$

Row 6 + $\frac{14}{44}$ Row 5

$$-14 + \frac{14}{44} \times 44 = 0$$

$$-\frac{44}{3} + \frac{14}{44} \times (\frac{26}{5}) = \frac{62}{33}$$

$$-12 + \frac{14}{44} \times (\frac{8}{5}) = -\frac{76}{11}$$

$$-\frac{220}{3} + \frac{14}{44} \times (264) = \frac{32}{3}$$

Modify Rows and Row 6

| | | | | | | |
|---|----|---------------|-----------------|-----------------|------------------|------------------|
| 1 | 1 | -2 | 1 | 3 | -1 | 4 |
| 0 | -3 | 5 | 0 | -5 | -1 | 12 |
| 0 | 0 | $\frac{7}{3}$ | -2 | $-\frac{13}{3}$ | $\frac{4}{3}$ | -11 |
| 0 | 0 | 0 | $-\frac{18}{7}$ | $-\frac{4}{7}$ | $\frac{33}{7}$ | $-\frac{113}{7}$ |
| 0 | 0 | 0 | 0 | $\frac{38}{9}$ | $\frac{29}{3}$ | $-\frac{11}{9}$ |
| 0 | 0 | 0 | 0 | $\frac{62}{33}$ | $-\frac{76}{11}$ | $\frac{32}{3}$ |

Row 6 - $\frac{93}{207}$ Row 5

$$\frac{62}{33} - \frac{93}{207} \times \frac{38}{9} = 0$$

$$-\frac{76}{11} - \frac{93}{207} \times \frac{29}{3} = -\frac{213}{19}$$

$$\frac{32}{3} + \frac{93}{207} \times (-\frac{11}{9}) = \frac{213}{19}$$

Modify Row 6

| | | | | | | |
|---|----|---------------|-----------------|-----------------|-------------------|------------------|
| 1 | 1 | -2 | 1 | 3 | -1 | 4 |
| 0 | -3 | 5 | 0 | -5 | -1 | 12 |
| 0 | 0 | $\frac{7}{3}$ | -2 | $-\frac{13}{3}$ | $\frac{4}{3}$ | -11 |
| 0 | 0 | 0 | $-\frac{18}{7}$ | $-\frac{4}{7}$ | $\frac{33}{7}$ | $-\frac{113}{7}$ |
| 0 | 0 | 0 | 0 | $\frac{38}{9}$ | $\frac{29}{3}$ | $-\frac{11}{9}$ |
| 0 | 0 | 0 | 0 | 0 | $-\frac{213}{19}$ | $\frac{213}{19}$ |

The matrix form will be;

| | | | | | | | |
|---|----|---------------|-----------------|-----------------|-------------------|-------|------------------|
| 1 | 1 | -2 | 1 | 3 | -1 | T_1 | 4 |
| 0 | -3 | 5 | 0 | -5 | $\frac{4}{3}$ | T_2 | 12 |
| 0 | 0 | $\frac{7}{3}$ | -2 | $-\frac{13}{3}$ | $\frac{33}{7}$ | T_3 | -11 |
| 0 | 0 | 0 | $-\frac{18}{7}$ | $-\frac{4}{7}$ | $\frac{29}{3}$ | T_4 | $-\frac{113}{7}$ |
| 0 | 0 | 0 | 0 | $\frac{38}{9}$ | $\frac{29}{3}$ | T_5 | $-\frac{11}{9}$ |
| 0 | 0 | 0 | 0 | 0 | $-\frac{213}{19}$ | T_6 | $\frac{213}{19}$ |

To get $T_1, T_2, T_3, T_4, T_5, T_6$

$$-\frac{213}{19} T_6 = \frac{213}{19} \Rightarrow T_6 = -1 //$$

$$\frac{38}{9} T_5 + \frac{29}{3} T_6 = -\frac{11}{9}$$

Recall that $T_6 = -1$

$$\frac{38}{9} T_5 + \frac{29}{3} (-1) = -\frac{11}{9}$$

$$\frac{38}{9} T_5 = -\frac{11}{9} + \frac{29}{3}$$

$$\frac{38}{9} T_5 = \frac{76}{9}$$

$$\frac{9}{38} \times \frac{38}{9} T_5 = \frac{76}{9} \times \frac{9}{38}$$

$$T_5 = 2 //$$

$$-\frac{18}{7} T_4 - \frac{4}{7} T_5 + \frac{33}{7} T_6 = -\frac{113}{7}$$

$$-\frac{18}{7} T_4 - \frac{4}{7} (2) + \frac{33}{7} (-1) = -\frac{113}{7}$$

$$-\frac{18}{7} T_4 = -\frac{11}{7} + \frac{8}{7} + \frac{33}{7}$$

$$-\frac{18}{7} T_4 = \frac{72}{7}$$

$$\frac{7}{18} \times \frac{18}{7} T_4 = \frac{72}{7} \times \frac{7}{18}$$

$$T_4 = 4 //$$

$$\frac{7}{3} T_3 - 2 T_4 - \frac{13}{3} T_5 + \frac{4}{3} T_6 = -11$$

$$\frac{7}{3} T_3 - 2(4) - \frac{13}{3}(2) + \frac{4}{3}(-1) = -11$$

$$\frac{7}{3} T_3 = -11 + 8 + \frac{26}{3} + \frac{4}{3}$$

$$T_3 = 3 //$$

VISTALINE

$$-3T_2 + 5T_3 - 5T_5 - T_6 = 12$$

$$-3T_2 + 5(3) - 5(2) - (-1) = 12$$

$$-3T_2 + 15 - 10 + 1 = 12$$

$$-3T_2/3 = 12 - 6/-3$$

$$T_2 = 6/3$$

$$T_2 = -2 //$$

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

$$T_1 + (-2) + (-2)(3) + 4 + 3(2) - 1(-1) = 4$$

$$T_1 - 2 - 6 + 4 + 6 + 1 = 4$$

$$T_1 - 2 + 5 = 4$$

$$T_1 + 3 = 4$$

$$T_1 = 4 - 3$$

$$T_1 = 1 //$$