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18/02/2023

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$$\begin{aligned}T_1 + T_2 - 2T_3 + T_4 + 3T_5 - T_6 &= 1 \\2T_1 - T_2 + T_3 + 2T_4 + T_5 - 3T_6 &= 20 \\T_1 + 3T_2 - 3T_3 - T_4 + 2T_5 + T_6 &= -15 \\5T_1 + 2T_2 - T_3 - T_4 + 2T_5 + T_6 &= -3 \\-3T_1 - T_2 + 2T_3 + 3T_4 + T_5 + 3T_6 &= 16 \\4T_1 + 3T_2 + T_5 - 6T_4 - 3T_5 - 2T_6 &= -27\end{aligned}$$

Transforming the equations to matrix

$$\begin{array}{l} \text{Row 1} \\ \text{Row 2} \\ \text{Row 3} \\ \text{Row 4} \\ \text{Row 5} \\ \text{Row 6} \end{array} \left[ \begin{array}{cccccc} 1 & 1 & -2 & 1 & 3 & -1 \\ 2 & -1 & 1 & 2 & 1 & -3 \\ 1 & 3 & -3 & -1 & 2 & 1 \\ 5 & 2 & -1 & -1 & 2 & 1 \\ -3 & -1 & 2 & 3 & 1 & 3 \\ 4 & 3 & 1 & -6 & -3 & -2 \end{array} \right] \begin{pmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{pmatrix} = \begin{pmatrix} 1 \\ 20 \\ -15 \\ -3 \\ 16 \\ -27 \end{pmatrix}$$

Using a factor of (2) to multiply Row 1 and subtract 2

$$\begin{array}{cccccc} 2C(2)1, & -1-2C(1), & 1-(2)C(2), & 2-(2)C(1), & 1-(2)C(3), & -3-(2)C(2) \\ 0 & -3 & 5 & 0 & 5 & 1 \\ 20-C(2)C(4) & & & & & \\ 12 & & & & & \end{array}$$

using a factor of (1) to multiply Row 1 and subtract Row 3

$$\begin{array}{cccccc} 1+C(1)C(1), & 3-C(1)C(1), & 3-C(1)C(2), & -1-C(1)C(1), & 2-C(1)C(3), & 1-C(1)C(2) \\ 18-C(1)4 & 2 & -1 & 2 & -4 & 2 \\ -19 & & & & & \end{array}$$

Using a factor (5) to multiply Row 5 and subtract Row 4

$$\begin{array}{cccccc} 5-C(5)C(1), & 2-C(5)C(1), & -1-(5)C(2), & -1-C(5)C(1), & 2-C(5)C(3) \\ 0 & -3 & 9 & -6 & -13 \\ 1-C(5)C(1), & -3-C(5)C(4) & & & \\ 6 & -24 & & & \end{array}$$

Using a factor (-3) to multiply Row 1 and subtract Row 5



$$-3 - (-3)(1), -1 - (-3)(1), 2 - (-3)(-2), 3 - (-3)(1), 1 - (-3)(3), 3 - (-3)(-1),$$

$$0 \quad 2 \quad -4 \quad 6 \quad 10 \quad 0$$

$$16 - (-3) \neq$$

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Using a factor (4) to multiply Row 1 and subtract Row 6

$$4 - (4)(1), 3 - (4)(1), 1 - (4)(-2), -6 - (4)(1), 3 - (4)(3), -2 - (4)(-1), -27 - (4)(4)$$

$$0 \quad -1 \quad 9 \quad -10 \quad -15 \quad 2 \quad -43$$

The matrix becomes

$$\begin{pmatrix} 1 & 4 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & -5 & -1 \\ 0 & 2 & -1 & -2 & -1 & 2 \\ 0 & -3 & 9 & -6 & -13 & 6 \\ 0 & 2 & -4 & 6 & 10 & 0 \\ 0 & 1 & 9 & 10 & -15 & 2 \end{pmatrix} \begin{pmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{pmatrix} \rightarrow \begin{pmatrix} 4 \\ 12 \\ -19 \\ -23 \\ 28 \\ -43 \end{pmatrix}$$

Using a factor of  $(-\frac{2}{3})$  to multiply Row 2 and subtract from Row 3

$$2 - (-\frac{2}{3})(3), -1 - (-\frac{2}{3})(5), -2 - (-\frac{2}{3})(0), -1 - (-\frac{2}{3})(-5), 2 - (-\frac{2}{3})(-1), -19 - (-\frac{2}{3})(1)$$

$$0 \quad -2.3333 \quad -2 \quad -4.3333 \quad 1.3333 \quad -11$$

Using a factor of (1) to multiply Row 2 and subtract Row 4

$$-3 - (1)(3), 9 - (1)(5), -6 - (1)(0), -13 - (1)(-5), 6 - (1)(-1), 23 - (1)(6)$$

$$0 \quad 4 \quad -6 \quad -8 \quad 7 \quad -33$$

using a factor of  $(-\frac{2}{3})$  to multiply Row 2 and subtract Row 3

$$2 - (-\frac{2}{3})(3), -4 - (-\frac{2}{3})(5), 6 - (-\frac{2}{3})(0), 10 - (-\frac{2}{3})(-5), 0 - (-\frac{2}{3})(-1), 28 - (-\frac{2}{3})(12)$$

$$0 \quad -0.6666 \quad 6 \quad 6.6666 \quad -0.6666 \quad 36$$

using a factor of  $(\frac{1}{3})$  to multiply Row 2 and subtract Row 2

$$-1 - (\frac{1}{3})(-3), -4 - (\frac{1}{3})(5), -10 - (\frac{1}{3})(0), -15 - (\frac{1}{3})(-5), 2 - (\frac{1}{3})(4), -43 - (\frac{1}{3})(1)$$

$$0 \quad 9.9333 \quad -10 \quad -15.3333 \quad 2.3333 \quad -47$$

The new matrix becomes



$$\begin{pmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & -5 & -1 \\ 0 & 0 & 2.333 & -2 & -4.333 & 1.333 \\ 0 & 0 & 4 & 6 & -8 & 7 \\ 0 & 0 & 0.666 & 6 & 6.666 & -0.666 \\ 0 & 0 & 7.333 & -10 & -13.333 & 2.333 \end{pmatrix} \begin{pmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{pmatrix} = \begin{pmatrix} 4 \\ 12 \\ -11 \\ -35 \\ -36 \\ -47 \end{pmatrix}$$

Using a factor of 0.2856 to multiply Row 3 and subtract Row 6

$$-0.6666(-0.2856)(2.3333), 6 - (-0.2856)(-2), 6.6666 - (-0.2856)(-4.3333)$$

$$0, 5.4285, 5.4285$$

$$-0.666 - (-0.2856)(1.3333), 36 - (-0.2856)(-1)$$

$$-0.26571, -32.8571$$

Using a factor of  $(7.3333/2.3333)$  to multiply Row 2 and subtract Row 6

The new matrix becomes

$$(1) \begin{pmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & -5 & -1 \\ 0 & 0 & 2.3333 & -2 & -4.3333 & 1.3333 \\ 0 & 0 & 0 & -2.5714 & -0.5714 & 4.7142 \\ 0 & 0 & 0 & 0 & 4.2222 & 9.6666 \\ 0 & 0 & 0 & 0 & 0 & -11.2105 \end{pmatrix} \begin{pmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{pmatrix} = \begin{pmatrix} 4 \\ 12 \\ -11 \\ -16.1429 \\ -1.2222 \\ 11.2105 \end{pmatrix}$$

Using back substitution

$$-11.2105 T_6 = 11.2105$$

$$T_6 = \frac{11.2105}{-11.2105} = -1$$

$$4.2222 T_5 + 9.6666 T_6 = -1.2222$$

$$T_5 = \frac{-1.2222 - 9.6666(-1)}{4.2222} = 2$$

$$-2.5714 T_4 - 0.5714 T_5 + 4.7142 T_6 = -16.1429$$

$$T_4 = \frac{-16.1429 - 4.7142(-1) + 0.5714 \times 2}{-2.5714} = 4$$

$$2.3333 T_3 - 2 T_4 - 4.3333 T_5 + 1.3333 T_6 = -11$$

$$T_3 = \frac{-11 - 1.3333(-1) - 4.3333(2) + 2(4)}{2.3333} = 3$$



$$+3T_2 + 5T_3 + 6T_4 - 5T_5 - T_6 = 12$$

$$T_2 = \frac{12 + (-1) + 5(2) - 5(3)}{-3} = -2$$

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

$$T_1 = \frac{4 + 6(-1) - 3(2) - 4 + 2(3) - (-2)}{1} = 1$$

Therefore

$$T_1 = 1$$

$$T_2 = -2$$

$$T_3 = 3$$

$$T_4 = 4$$

$$T_5 = 2$$

$$T_6 = -1$$

$$7.3333 - (3.1428)(2.3333), -10 - (3.1428)(-2), -13.3333(3.1428)$$

$$C \cdot 4.3333$$

$$0$$

$$-3.71429$$

$$0.2857$$

$$C \cdot 4.3333(1), 2.3333 - (3.1428)(4.3333), -47 - (3.1428)(-1)$$

$$-1.85714$$

$$-12.4286$$

The matrix becomes

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & -5 & -1 \\ 0 & 0 & 2.3333 & -2 & -4.5333 & 1.3333 \\ 0 & 0 & 0 & -2.571 & -6.5714 & 4.7142 \\ 0 & 0 & 0 & 5.4285 & 5.4285 & 0.2857 \\ 0 & 0 & 0 & -3.7142 & 6.2857 & -1.8571 \end{bmatrix} \begin{bmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{bmatrix} = \begin{bmatrix} 4 \\ 12 \\ -4 \\ -16.1429 \\ 32.8571 \\ -12.4286 \end{bmatrix}$$

Using a factor  $(5.4285/-2.571)$  to multiply Row 4 and subtract from Rows

$$5.4285 - (-2.1114)(-2.571), 5.4285 - (-2.1114)(-6.5714), 0.2857 - (-2.1114)$$

$$C \cdot 4.7142$$

$$0$$

$$4.2222$$

$$9.6666$$

$$C \cdot 4.7142, -32.8571 - (-2.1114)(-16.1429)$$

$$1.2222$$