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Dept: Mech Eng

Course Code: ENG 883

Assignment III

$$\left\{ \begin{array}{l} T_1 + T_2 - 2T_3 + T_4 + 8T_5 - T_6 = 4 \\ 2T_1 - T_2 + T_3 + 2T_4 + T_5 - 2T_6 = 20 \\ T_1 + 8T_2 - 8T_3 - T_4 + 2T_5 + T_6 = -15 \\ 5T_1 + 2T_2 - T_3 + 3T_4 + 2T_5 + T_6 = -3 \\ -3T_1 + T_2 + 2T_3 - 6T_4 + T_5 + 8T_6 = 16 \\ -4T_1 + 3T_2 + T_3 + 6T_4 - 3T_5 - 2T_6 = -27 \end{array} \right.$$

Soln

$$\left[\begin{array}{cccccc} 1 & 1 & -2 & 1 & 8 & -1 \\ 2 & -1 & 1 & 2 & 1 & -2 \\ 1 & 8 & -8 & -1 & 2 & 1 \\ 5 & 2 & -1 & 3 & 2 & 1 \\ -3 & 1 & 2 & -6 & 1 & 8 \\ -4 & 3 & 1 & 6 & -3 & -2 \end{array} \right] \left[\begin{array}{c} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{array} \right] = \left[\begin{array}{c} 4 \\ 20 \\ -15 \\ -3 \\ 16 \\ -27 \end{array} \right]$$

$$\left[\begin{array}{cccccc} 1 & 1 & -2 & 1 & 8 & -1 \\ 2 & -1 & 1 & 2 & 1 & -2 \\ 1 & 8 & -8 & -1 & 2 & 1 \\ 5 & 2 & -1 & 3 & 2 & 1 \\ -3 & 1 & 2 & -6 & 1 & 8 \\ -4 & 3 & 1 & 6 & -3 & -2 \end{array} \right] \left[\begin{array}{c} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{array} \right] = \left[\begin{array}{c} 4 \\ 20 \\ -15 \\ -3 \\ 16 \\ -27 \end{array} \right]$$

$$\left\{ \begin{array}{l} 1 \\ 2-2(1) \\ 1-1(1) \\ 5-5(1) \\ -3-(-3)(1) \\ -4-4(1) \end{array} \right\} \left\{ \begin{array}{l} 1 \\ -1-2(1) \\ 8-1(1) \\ 8-6(1) \\ -1-5(1) \\ 6-4(1) \end{array} \right\} \left\{ \begin{array}{l} 1 \\ 1-2(-2) \\ -3-1(-2) \\ -1-8(1) \\ 2-(-3)(1) \\ 1-4(-2) \end{array} \right\} \left\{ \begin{array}{l} 1 \\ 2-2(1) \\ -1-1(1) \\ -1-8(1) \\ 2-3(1) \\ 3-(-3)(1) \end{array} \right\} \left\{ \begin{array}{l} 1 \\ 1-2(8) \\ 2-1(8) \\ 1-5(1) \\ 1-5(1) \\ 3-(-3)(1) \end{array} \right\} \left\{ \begin{array}{l} 1 \\ 20-2(4) \\ -15-1(4) \\ -3-6(4) \\ 16-(-3)(4) \\ -27-4(4) \end{array} \right\}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 2 & -1 & -2 & -1 & 2 & -11 \\ 0 & -3 & 1 & -6 & -13 & 6 & -23 \\ 0 & 2 & 4 & 6 & 10 & 0 & -28 \\ 0 & 1 & 1 & 24 & -15 & 2 & -43 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & -2 - \left[\frac{-2}{-3} \right] \left[-1 \right] & -1 - \left[\frac{-2}{-3} \right] \left[2 \right] & -2 - \left[\frac{-2}{-3} \right] \left[-2 \right] & -1 - \left[\frac{-2}{-3} \right] \left[-1 \right] & -1 - \left[\frac{-2}{-3} \right] \left[-1 \right] & 4 \\ 0 & -3 - \left[\frac{-3}{-3} \right] \left[1 \right] & 1 - \left[\frac{-3}{-3} \right] \left[6 \right] & -6 - \left[\frac{-3}{-3} \right] \left[-7 \right] & 2 - \left[\frac{-3}{-3} \right] \left[-1 \right] & -19 - \left[\frac{-3}{-3} \right] \left[10 \right] & -23 \\ 0 & -2 - \left[\frac{-2}{-3} \right] \left[-1 \right] & -4 - \left[\frac{-2}{-3} \right] \left[5 \right] & 6 - \left[\frac{-2}{-3} \right] \left[-1 \right] & 0 - \left[\frac{-2}{-3} \right] \left[-1 \right] & 28 - \left[\frac{-2}{-3} \right] \left[12 \right] & -43 \\ 0 & -1 - \left[\frac{-1}{-3} \right] \left[1 \right] & 9 - \left[\frac{-1}{-3} \right] \left[5 \right] & 14 - \left[\frac{-1}{-3} \right] \left[-1 \right] & 2 - \left[\frac{-1}{-3} \right] \left[-1 \right] & -43 - \left[\frac{-1}{-3} \right] \left[12 \right] \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 2.333 & -2 & -4.333 & 1.333 & -11 \\ 0 & 0 & 4 & -6 & -8 & 7 & -35 \\ 0 & 0 & 0.667 & -6 & 16.667 & -0.667 & 36 \\ 0 & 0 & 7.333 & -10 & -13.333 & 2.333 & -47 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 2.333 & -2 & -4.333 & 1.333 & -11 \\ 0 & 0 & 4 - \frac{4}{2.333} & -6 - \left[\frac{4 \times 2}{2.333} \right] & -8 - \left[\frac{4 \times (-4.333)}{2.333} \right] & 7 - \left[\frac{4 \times 1.333}{2.333} \right] & -35 - \left[\frac{4 \times (-11)}{2.333} \right] \\ 0 & 0 & -0.667 - \left[\frac{0.667 \times 2.333}{2.333} \right] & 6 - \left[\frac{0.667 \times (-2)}{2.333} \right] & 6 - \left[\frac{0.667 \times (-4.333)}{2.333} \right] & -0.667 - \left[\frac{0.667 \times 1.333}{2.333} \right] & 36 - \left[\frac{0.667 \times (-11)}{2.333} \right] \\ 0 & 0 & 7.333 - \left[\frac{7.333 \times 2.333}{2.333} \right] & -10 - \left[\frac{7.333 \times (-2)}{2.333} \right] & -13.333 - \left[\frac{7.333 \times (-4.333)}{2.333} \right] & 2.333 - \left[\frac{7.333 \times 1.333}{2.333} \right] & -47 - \left[\frac{7.333 \times (-11)}{2.333} \right] \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 2.333 & -2 & -4.333 & 1.333 & -11 \\ 0 & 0 & 0 & -2.571 & 0.571 & 8.714 & -16.742 \\ 0 & 0 & 0 & 5.428 & -5.428 & -0.281 & 32.857 \\ 0 & 0 & 0 & -3.714 & 0.281 & -1.857 & -12.428 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 2.333 & -2 & -4.333 & 1.333 & -11 \\ 0 & 0 & 0 & 2.571 & -0.571 & 4.714 & -16.142 \\ 0 & 0 & 0 & 5.428 & -\frac{5.428}{2.571} (-0.571) & 5.428 - \frac{5.428}{2.571} (0.571) & -0.765 - \frac{5.428}{2.571} (4.714) \\ 0 & 0 & 0 & 16.714 & -\frac{16.714}{2.571} (-0.571) & 0.765 - \frac{16.714}{2.571} (0.571) & 4.851 - \frac{16.714}{2.571} (4.714) \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 2.333 & -2 & -4.333 & 1.333 & -11 \\ 0 & 0 & 0 & -2.57143 & -0.571 & 4.714 & -16.142 \\ 0 & 0 & 0 & 0 & 4.222 & 9.667 & -1.222 \\ 0 & 0 & 0 & 0 & 1.11 & -5.667 & 11.210 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 2.333 & -2 & -4.333 & 1.333 & -11 \\ 0 & 0 & 0 & -2.671 & -0.571 & 4.714 & -16.142 \\ 0 & 0 & 0 & 0 & 4.222 & 9.667 & -1.222 \\ 0 & 0 & 0 & 0 & \frac{1.111 - (1.111)(4.222)}{2.222} & \frac{-5.667 - 4.111}{4.222} (4.667) & 10.667 - \frac{4.111(1.222)}{4.222} \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 2.333 & -2 & -4.333 & 1.333 & -11 \\ 0 & 0 & 0 & -2.571 & -0.571 & 4.714 & -16.142 \\ 0 & 0 & 0 & 0 & 4.222 & 9.667 & -1.222 \\ 0 & 0 & 0 & 0 & 0 & -11.21 & 11.210 \end{bmatrix} \quad \begin{bmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{bmatrix} \quad \begin{bmatrix} 4 \\ 12 \\ 11 \\ -16.142 \\ -1.222 \\ 11.210 \end{bmatrix}$$

$$\therefore T_6 = \frac{11.210}{-11.210} = -1 \quad T_5 = \frac{(1.222 - 9.667 \times T_6)}{4.222} = \frac{(1.222 - 9.667 \times -1)}{4.222} = 2$$

$$T_4 = \frac{(-16.142 + 0.57193 \times T_5 + 4.714 \times T_6)}{-2.571} = \frac{-16.142 + 0.571 \times 2 + 4.714 \times -1}{-2.571} = 4$$

$$T_3 = \frac{(-11 + 2 \times T_4 + 4.333 \times T_5 - 1.333 \times T_6)}{-2.333} = \frac{-11 + 2 \times 4 + 4.333 \times 2 - 1.333 \times -1}{-2.333} = 7$$

$$T_2 = \frac{12 - 5 \times T_3 - 0 \times T_4 + 5 \times T_5 + 1 \times T_6}{-3} = \frac{12 - 5 \times 7 - 0 + 5 \times 2 - 1 \times -1}{-3} = -2$$

$$T_1 = \frac{4 - 1 \times T_2 + 2 \times T_3 - 1 \times T_4 - 3 \times T_5 - 1 \times T_6}{7} = \frac{4 - 1 \times -2 + 2 \times 7 - 1 \times 4 - 3 \times 2 - 1 \times -1}{7} = 1$$