

ENGG 382

ASSIGNMENT 3

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MATR NO: 17/ENGG06/108

DEPARTMENT: MECHANICAL ENGINEERING

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

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

$$F_1 = 2$$

$$F_2 = 21$$

$$F_3 = 5$$

$$F_4 = -3$$

$$F_5 = 4$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 2-2(1) & -1-2(1) & 1-2(-2) & 2-2(1) & 1-2(3) & -5-2(-1) \\ 1-1(1) & 3-1(1) & -3-1(-2) & -1-1(1) & 2-1(3) & 1-1(-1) \\ 5-5(1) & 2-5(1) & -1+5(-2) & -1-5(1) & 2-5(3) & 1-5(-1) \\ -3+3(1) & -1+3(1) & 2+3(-2) & 3+3(1) & 1+3(3) & 3+3(-1) \\ 4-4(1) & 3-4(1) & 1-4(-2) & -6-4(1) & -3-4(3) & -2-4(-1) \end{bmatrix}$$

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

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

$$\begin{aligned} T_1 &= -2/3 \\ T_2 &= -1 \\ T_3 &= -2/3 \\ T_4 &= 1/3 \end{aligned}$$

$$\begin{bmatrix}
 1 & 2 & -2 & 1 & 3 & -1 \\
 0 & -3 & 5 & 0 & -5 & -1 \\
 0 & 2 + \frac{2}{3}(-3) & -1 + \frac{2}{3}(5) & -2 + \frac{2}{3}(0) & -1 + \frac{2}{3}(-5) & 2 + \frac{2}{3}(-1) \\
 0 & -3 - 1(-3) & 9 - 1(5) & -6 - 1(0) & -3 - 1(-5) & 6 - 1(-1) \\
 0 & 2 + \frac{2}{3}(-3) & 4 + \frac{2}{3}(5) & 6 + \frac{2}{3}(0) & 10 + \frac{2}{3}(-5) & 0 + \frac{2}{3}(-1) \\
 0 & -1 - \frac{1}{3}(-3) & 9 - \frac{1}{3}(5) & -10 - \frac{1}{3}(0) & -15 - \frac{1}{3}(-1) & 2 - \frac{1}{3}(-1)
 \end{bmatrix}
 \begin{matrix}
 T_1 \\
 T_2 \\
 T_3 \\
 T_4 \\
 T_5 \\
 T_6
 \end{matrix}$$

$$\begin{bmatrix}
 2 \\
 4 \\
 12 \\
 -19 + \frac{2}{3}(12) \\
 -23 - 1(12) \\
 -28 + \frac{2}{3}(12) \\
 -43 - \frac{1}{3}(12)
 \end{bmatrix}$$

$$F_1 = 12T_1 \quad F_2 = -2T_3 \quad F_3 = 22T_1$$

$$\begin{bmatrix}
 1 & 1 & -2 & 1 & 3 & -1 \\
 0 & -3 & 5 & 0 & -5 & -1 \\
 0 & 0 & \frac{7}{3} & -2 & -\frac{13}{3} & \frac{4}{3} \\
 0 & 0 & 4 - \frac{12}{7}(\frac{7}{3}) & -6 - 12T_1(-2) & -8 - \frac{12}{7}(-\frac{13}{3}) & 7 - \frac{12}{7}(\frac{4}{3}) \\
 0 & 0 & -2T_3 + 2T_1(\frac{7}{3}) & 6 + 2T_1(-2) & \frac{20}{3} + 2T_1(-\frac{13}{3}) & -\frac{2}{3} + 2T_1(\frac{4}{3}) \\
 0 & 0 & \frac{22}{3} - 22T_1(\frac{7}{3}) & -10 - 22T_1(-2) & -\frac{60}{3} - 22T_1(-\frac{13}{3}) & \frac{7}{3} - 22T_1(\frac{4}{3})
 \end{bmatrix}$$

$$\begin{bmatrix}
 T_1 \\
 T_2 \\
 T_3 \\
 T_4 \\
 T_5 \\
 T_6
 \end{bmatrix}
 =
 \begin{bmatrix}
 4 \\
 12 \\
 -1 \\
 -35 - 12T_1(-1) \\
 -36 + 2T_3(-1) \\
 -47 - 22T_1(-1)
 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & -5 & -1 \\ 0 & 0 & 7/3 & -2 & -14/3 & 4/3 \\ 0 & 0 & 0 & -18/7 & -4/7 & 33/7 \\ 0 & 0 & 0 & 30/7 & 8/7 & -2/7 \\ 0 & 0 & 0 & -18/7 & 2/7 & -13/7 \end{bmatrix} \begin{matrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{matrix} = \begin{bmatrix} 4 \\ 12 \\ -11 \\ -113/7 \\ 230/7 \\ -87/7 \end{bmatrix}$$

$$F_1 = \frac{-19}{9}, \quad F_2 = \frac{13}{9}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & -5 & -1 \\ 0 & 0 & 7/3 & -2 & -13/3 & 4/3 \\ 0 & 0 & 0 & -18/7 & -4/7 & 33/7 \\ 0 & 0 & 0 & 38/7 + 19/9 (-18/7) & 38/7 + 19/9 (-4/7) & -2/7 + 19/9 (33/7) \\ 0 & 0 & 0 & -20/7 - 13/9 (-18/7) & 2/7 - 13/9 (-4/7) & -13/7 + 13/9 (13/7) \end{bmatrix}$$

$$F_1 = \frac{5}{19}$$