

Name: Pepple Ihim Obiedima.

Matri no: 161ENGE088

Department: Mechanical

Date: 2nd March, 2018

Assignment

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

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

$$\left[\begin{array}{cccccc|c} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 2-2(1) & -1-2(1) & 1-2(-2) & 2-2(1) & 1-2(3) & -1-2(-1) & 20-2(4) \\ 1-1(1) & 3-1(1) & -3-1(-2) & -1-1(1) & 2-1(3) & 1-1(-1) & -15-1(4) \\ 5-5(1) & 2-5(1) & -1-5(-2) & -1-5(1) & 2-5(3) & 1-5(-1) & -3-5(4) \\ -3-(-3)(1) & -1-(-3)(1) & 2-(-3)(-2) & 3-(-3)(1) & 1-(-3)(3) & 3-(-3)(-1) & 16-(-3)(4) \\ 4-4(1) & 3-4(1) & 1-4(-2) & -6-4(1) & -3-4(3) & -2-4(-1) & -27-4(4) \end{array} \right]$$

$$= \begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 2 & -1 & -2 & -1 & 2 & -19 \\ 0 & -3 & 9 & -6 & -13 & 6 & -23 \\ 0 & 2 & -4 & 6 & 10 & 0 & 28 \\ 0 & -1 & 9 & -16 & -15 & 0 & 43 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 1 & 2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 2 - \frac{2(-3)}{3} & -1 - \frac{2(5)}{3} & -2 - \frac{2(0)}{3} & -1 - \frac{2(-5)}{3} & 2 - \frac{2(-1)}{3} & -19 - \frac{2(12)}{3} \\ 0 & -3 - \frac{(-3)(-3)}{3} & 9 - \frac{(-3)(5)}{3} & -6 - \frac{(-3)(0)}{3} & -13 - \frac{(-3)(-5)}{3} & 6 - \frac{(-3)(-1)}{3} & -23 - \frac{(-3)(12)}{3} \\ 0 & 2 - \frac{2(-3)}{3} & -4 - \frac{2(5)}{3} & 6 - \frac{2(0)}{3} & 10 - \frac{2(-5)}{3} & 0 - \frac{2(-1)}{3} & 28 - \frac{2(12)}{3} \\ 0 & -1 - \frac{(-1)(-3)}{3} & 9 - \frac{(-1)(5)}{3} & -10 - \frac{(-1)(0)}{3} & -15 - \frac{(-1)(-5)}{3} & 2 - \frac{(-1)(-1)}{3} & 43 - \frac{(-1)(12)}{3} \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 2.333 & -2 & -4.333 & 1.333 & -11 \\ 0 & 0 & 4 & -6 & -8 & 7 & -35 \\ 0 & 0 & -0.667 & 6 & 6.667 & -0.667 & 36 \\ 0 & 0 & 7.33 & -10 & -13.333 & 2.333 & -47 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 2.333 & -2 & -4.333 & 1.333 & -11 \\ 0 & 0 & 4 - \frac{4(2.333)}{2.333} & -6 - \frac{4(-2)}{2.333} & -8 - \frac{4(-4.333)}{2.333} & 7 - \frac{4(1.333)}{2.333} & -35 - \frac{4(-11)}{2.333} \\ 0 & 0 & -0.667 - \frac{(-0.667)(2.333)}{2.333} & 6 - \frac{(-0.667)(-2)}{2.333} & 6.667 - \frac{(-0.667)(-4.333)}{2.333} & -0.667 - \frac{(-0.667)(1.333)}{2.333} & 36 - \frac{(-0.667)(-11)}{2.333} \\ 0 & 0 & 7.33 - \frac{7.33(2.333)}{2.333} & -10 - \frac{7.33(-2)}{2.333} & -13.333 - \frac{7.33(-4.333)}{2.333} & 2.333 - \frac{7.33(1.333)}{2.333} & -47 - \frac{7.33(-11)}{2.333} \end{bmatrix}$$

$$\begin{bmatrix}
 1 & 1 & -2 & 1 & 3 & -1 & 4 \\
 0 & -3 & 5 & 0 & -5 & -1 & -12 \\
 0 & 0 & 2.333 & -2 & -4.333 & 1.333 & -11 \\
 0 & 0 & 0 & -2.571 & -0.571 & 4.714 & -16.142 \\
 0 & 0 & 0 & 5.428 - 5.228(-2.571) & 5.428 - 5.428(-0.571) & -0.285 - 5.428(4.714) & 32.857 - 5.428(-16.142) \\
 0 & 0 & 0 & -3.714 - (-3.714)(-2.571) & 0.285 - (-3.714)(-0.571) & -1.857 - 3.714(4.714) & -6.428 - 3.714(-16.142) \\
 & & & -2.571 & -2.571 & -2.571 & -2.571
 \end{bmatrix}$$

$$\begin{bmatrix}
 1 & 1 & -2 & 1 & 3 & -1 & 4 \\
 0 & -3 & 5 & 0 & -5 & -1 & -12 \\
 0 & 0 & 2.333 & -2 & -4.333 & 1.333 & -11 \\
 0 & 0 & 0 & -2.571/43 & -0.571 & 4.714 & -16.142 \\
 0 & 0 & 0 & 0 & 4.222 & 9.667 & -1.222 \\
 0 & 0 & 0 & 0 & 1.111 & -8.667 & 10.889
 \end{bmatrix}$$

$$\begin{bmatrix}
 1 & 1 & -2 & 1 & 3 & -1 & 4 \\
 0 & -3 & 5 & 0 & -5 & -1 & -12 \\
 0 & 0 & 2.333 & -2 & -4.333 & 1.333 & -11 \\
 0 & 0 & 0 & -2.571 & -0.571 & 4.714 & -16.142 \\
 0 & 0 & 0 & 0 & 4.222 & 9.667 & -1.222 \\
 0 & 0 & 0 & 0 & 1.111 - 1.111(4.222) & -8.667 - 1.111(9.667) & 10.889 - 1.111(-1.222) \\
 & & & & 4.222 & 4.222 & 4.222
 \end{bmatrix}$$

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

$$T_6 = \frac{11.210}{-11.210} = -1$$

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

$$T_A = \frac{(-16.42 + 0.57143 \times T_5 + 4.714 \times T_6)}{-2.571} = \frac{-16.42 + 0.571 \times 2 + 4.714 \times -1}{-2.571}$$

= 4

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

= 3

$$T_2 = \frac{12 - 5 \times T_3 - 0 \times T_A + 5 \times T_5 + 1 \times T_6}{-3} = \frac{12 - 5 \times 3 - 0 \times 4 + 5 \times 2 + 1 \times -1}{-3}$$

= -2

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

$$T_1 = -1$$