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Chemical Engineering

Assignment 3

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

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

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

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

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

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

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

$$T_1 = 2/1 = 2$$

$$T_3 = 5/1 = 5$$

$$T_5 = 4/1 = 4$$

$$T_2 = 1/1 = 1$$

$$T_4 = -3/1 = -3$$

1	1	-2	1	3	-1	T_1	4
2-2(1)	-1-2(1)	1-2(-2)	2-2(1)	1-2(3)	4-3-2(-1)	T_2	20-2(4)
1-1(1)	3-1(1)	-3-(-2)	-1-1(1)	2-1(3)	-1-1(-1)	T_3	-15-1(4)
5-5(1)	2-5(1)	-1-5(-2)	-1-5(-2)	2-5(3)	1-5(-1)	T_4	-3-5(4)
-3+3(1)	-1+3(1)	2+3(-2)	2+3(-2)	1+3(3)	3+3(-1)	T_5	16+3(4)
4-4(1)	3-4(1)	1-4(-2)	1-4(-2)	-3+4(3)	-2+4(-1)	T_6	-27-4(4)

1	1	-2	1	3	-1	T_1	4
0	-3	5	0	-5	-1	T_2	12
0	2	-1	-2	-1	2	T_3	-19
0	-3	9	-6	-13	6	T_4	-23
0	2	-4	6	10	0	T_5	28
0	-1	9	10	-15	2	T_6	-43

$$f_1 = -2/3, f_2 = -3/3 = 1, f_3 = -2/3, f_4 = -1/3 = 1/3$$

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

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & -5 & -1 \\ 0 & 0 & 7/3 & -2 & -13/3 & 4/3 \\ 0 & 0 & 4 & -6 & -8 & 7 \\ 0 & 0 & -2/3 & 6 & 20/3 & -2/3 \\ 0 & 0 & 2/3 & -10 & -40/3 & 7/3 \end{bmatrix} \begin{matrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{matrix} = \begin{matrix} 4 \\ 12 \\ -11 \\ -35 \\ 36 \\ -47 \end{matrix}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & -5 & -1 \\ 0 & 0 & 7/3 & -2 & -13/3 & 4/3 \\ 0 & 0 & 0 & -6 - 12/7(-2) & -8 - 12/7(13/3) & 7 - 12/7(4/3) \\ 0 & 0 & 0 & 6 + 2/7(-2) & 20/3 + 2/7(-13/3) & -2/3 + 2/7(4/3) \\ 0 & 0 & 0 & -6 - 22/7(-2) & -40/3 - 22/7(-13/3) & 7/3 - 22/7(4/3) \end{bmatrix} \begin{matrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{matrix} = \begin{matrix} 4 \\ 12 \\ -4 \\ -38 \\ 36 + 2/7(-11) \\ -47 - 22/7(-11) \end{matrix}$$

$$\begin{bmatrix} 1 & 0 & 1 & 2 & 3 & -1 \\ 0 & -3 & 5 & 0 & -5 & -1 \\ 0 & 0 & 7/3 & -2 & -13/3 & 4/3 \\ 0 & 0 & 0 & 38/7 & 38/7 & -2/7 \\ 0 & 0 & 0 & 2/7 & 2/7 & -13/7 \end{bmatrix} \begin{matrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{matrix} = \begin{matrix} 4 \\ -12 \\ -4 \\ -38 \\ 230/7 \\ -87/7 \end{matrix}$$

$$\frac{-38 \times 7}{7 \times 18} = \frac{19}{9} \quad f = \frac{26 \times 7}{7 \times 18} = \frac{13}{9}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & -5 & -1 \\ 0 & 0 & 7/3 & -2 & -13/3 & 4/3 \\ 0 & 0 & 0 & -18/7 & -4/8 & 33/7 \\ 0 & 0 & 0 & 0 & 38/9 & 29/3 \\ 0 & 0 & 0 & 0 & 10/9 & -26/3 \end{bmatrix} \begin{bmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{bmatrix} = \begin{bmatrix} 4 \\ 12 \\ -11 \\ -113/7 \\ -11/9 \\ 98/9 \end{bmatrix}$$

$$f_1 = \frac{10 \times 9}{9 \times 38} = \frac{5}{19}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & 5 & -1 \\ 0 & 0 & 7/3 & -2 & -13/3 & 4/3 \\ 0 & 0 & 0 & -18/7 & -4/7 & 33/7 \\ 0 & 0 & 0 & 0 & 38/9 & 29/3 \\ 0 & 0 & 0 & 0 & 10/9 - 5/17(29/3) & -26/3 - 5/17(29/3) \end{bmatrix} \begin{bmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{bmatrix} = \begin{bmatrix} 4 \\ 12 \\ -11 \\ -113/7 \\ -4/9 \\ 98/9 - 5/17(29/3) \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & -5 & -1 \\ 0 & 0 & 7/3 & -2 & -13/3 & 4/3 \\ 0 & 0 & 0 & -18/7 & -4/7 & 33/7 \\ 0 & 0 & 0 & 0 & 38/9 & 29/3 \\ 0 & 0 & 0 & 0 & 0 & -213/19 \end{bmatrix} \begin{bmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{bmatrix} = \begin{bmatrix} 4 \\ 12 \\ -11 \\ -113/7 \\ -11/9 \\ 213/19 \end{bmatrix}$$

$$-213/19 T_6 = 213/19$$

$$T_6 = \frac{213}{19} \times \frac{-19}{213} = -1$$

$$38/9 T_5 + 29/3 T_6 = -11/9$$

$$38/9 T_5 + 29/3 (-1) = -11/9$$

$$T_5 = \left[-11/9 + 29/3 \right] \times 9/38 = 2$$

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

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

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

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

$$\begin{bmatrix} T_1 = 1 \\ T_2 = -2 \\ T_3 = 3 \\ T_4 = 4 \\ T_5 = 2 \\ T_6 = -1 \end{bmatrix}$$