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INSTRAL NO: 16/01/023

DEPARTMENT: Chemical Engineering.

Question.

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

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

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

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

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

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

Solution.

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

$$\begin{array}{l} \begin{array}{cccccc|c} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 2-(2/1) \times 1 & -1-(2/1) \times 1 & 1-(2/1) \times -2 & 2-(2/1) \times 1 & 1-(2/1) \times 3 & -3-(2/1) \times -1 & 20-(2/1) \times 4 \\ 1-(1/1) \times 1 & 3-(3/1) \times 1 & -3-(3/1) \times -2 & -1-(3/1) \times 1 & 2-(3/1) \times 3 & 1-(3/1) \times -1 & -15-(3/1) \times 4 \\ 5-(5/1) \times 1 & 2-(5/1) \times 1 & -1-(5/1) \times -2 & -1-(5/1) \times 1 & 2-(5/1) \times 3 & 1-(5/1) \times -1 & -3-(5/1) \times 4 \\ -3-(3/1) \times 1 & -1-(3/1) \times 1 & 2-(3/1) \times -2 & 3-(3/1) \times 1 & 1-(3/1) \times 3 & 3-(3/1) \times -1 & 16-(3/1) \times 4 \\ 4-(4/1) \times 1 & 3-(4/1) \times 1 & 1-(4/1) \times -2 & -6-(4/1) \times 1 & -3-(4/1) \times 3 & -2-(4/1) \times -1 & -27-(4/1) \times 4 \end{array} \\ \downarrow \end{array}$$

$$\left[ \begin{array}{cccccc|c} 1 & 1 & 2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 2 & -1 & -2 & -1 & 2 & -19 \\ 0 & -3 & 9 & -6 & -13 & 4 & -28 \\ 0 & 2 & -4 & 6 & 10 & 0 & 28 \\ 0 & -1 & 9 & -10 & -15 & 2 & -43 \end{array} \right]$$

$$\begin{array}{ccccccc|c} 1 & 1 & -2 & 1 & 3 & -1 & 1 & 4 \\ 0 & -3 & 3 & 0 & -5 & -1 & 1 & 12 \\ 0 & 0 & 2+33 & -2 & -4+33 & 1+33 & 1 & -11 \\ 0 & 0 & 1 & -6 & -8 & 7 & 1 & -35 \\ 0 & 0 & -0+7 & 6 & 6+7 & -0+7 & 1 & 26 \\ 0 & 0 & 9+33 & -10 & -13+33 & 2+33 & 1 & -17 \end{array}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 9 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 20/33 & 2 & -40/33 & 10/33 & -11 \\ 0 & 0 & 0 & -20/57 & -006 & 40/27 & -1601 \\ 0 & 0 & 0 & 504 & 504 & -003 & 3209 \\ 0 & 0 & 0 & -307 & 003 & -109 & -1204 \end{bmatrix}$$

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$$\left[ \begin{array}{cccccc|c} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 2.33 & -2 & -4.33 & 1.33 & -11 \\ 0 & 0 & 0 & -2.57 & -0.6 & 4.71 & -16.14 \\ 0 & 0 & 0 & 0 & 4.22 & 9.67 & -10.22 \\ 0 & 0 & 0 & 0 & 0 & -11.21 & 11.21 \end{array} \right]$$

$$\left[ \begin{array}{cccccc|c} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 2.33 & -2 & -4.33 & 1.33 & -11 \\ 0 & 0 & 0 & -2.57 & -0.6 & 4.71 & -16.14 \\ 0 & 0 & 0 & 0 & 4.22 & 9.67 & -10.22 \\ 0 & 0 & 0 & 0 & 1.11 - (1.4/4.22) \times 4.22 & -8.67 - (1.11/4.22) \times 9.67 & -10.22 - (1.11/4.22) \times (-10.22) \end{array} \right]$$

Final Answer:

$$\left[ \begin{array}{cccccc|c} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 2.33 & -2 & -4.33 & 1.33 & -11 \\ 0 & 0 & 0 & -2.57 & -0.6 & 4.71 & -16.14 \\ 0 & 0 & 0 & 0 & 4.22 & 9.67 & -10.22 \\ 0 & 0 & 0 & 0 & 0 & -11.21 & 11.21 \end{array} \right]$$

$$\left[ \begin{array}{cccccc|c} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 0 & 3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 2.33 & -2 & -4.33 & 1.33 & -11 \\ 0 & 0 & 0 & -2.57 & -0.6 & 4.71 & -16.14 \\ 0 & 0 & 0 & 0 & 4.22 & 9.67 & -10.22 \\ 0 & 0 & 0 & 0 & 0 & -11.21 & 11.21 \end{array} \right] \times \begin{bmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{bmatrix}$$

$$-11.21 T_6 = 11.21$$

$$T_6 = \frac{-11.21}{11.21}$$

$$= -1^\circ$$



$$4.22T_5 + 9.67(-T_6) = -1022$$

$$T_5 = \frac{-1022 - 9.67(-1)}{4.22}$$

$$= 2^\circ\text{C}$$

$$-2.57(T_4) - 0.6(T_5) + 4.71(T_6) = -16.14$$

$$T_4 = \frac{-16.14 + 0.6(2) + 4.71(-1)}{-2.57}$$

$$= 4^\circ\text{C}$$

$$2.33T_3 - 2T_4 - 4.33T_5 + 1.33T_6 = -11$$

$$T_3 = \frac{-11 + 2(4) + 4.33(2) + 1.33(1)}{2.33}$$

$$= 3^\circ\text{C}$$

$$3T_2 + 5T_3 - 5T_5 - 1T_6 = 12$$

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

$$= -2^\circ\text{C}$$

$$T_1 + T_2 - 2T_3 + T_4 + 5T_5 - T_6 = 4$$

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

$$= 1^\circ\text{C}$$

$$\text{So } T_1 = 1$$

$$T_2 = -2$$

$$T_3 = 3$$

$$T_4 = 4$$

$$T_5 = 2$$

$$T_6 = -1$$