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COURSE:

MATRIC NO: 15/ENGG09/049

SIGNATURE: *[Signature]*

$$i) \quad T_1 + T_2 - 2T_3 + T_4 + 3T_5 - T_6 = 4$$

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

$$T_1 + 3T_2 - 3T_3 - 7T_4 + 2T_5 + T_6 = -15$$

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

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

$$4T_1 + 8T_2 + T_3 - 6T_4 - 3T_5 - 2T_6 = -27$$

The augmented matrix

$$\left[\begin{array}{cccccc|c} 1 & 1 & -2 & 1 & 3 & -1 & T_1 & 4 \\ 2 & -1 & 0 & 2 & 1 & -3 & T_2 & 20 \\ 0 & 0 & -3 & -1 & 2 & 1 & T_3 & -15 \\ 0 & 0 & 2 & -1 & 2 & 1 & T_4 & -3 \\ 5 & 2 & -1 & -1 & 2 & 1 & T_5 & -3 \\ -3 & 1 & 2 & 3 & 1 & 3 & T_6 & 16 \\ 4 & 8 & 1 & -6 & -3 & -2 & & -27 \end{array} \right]$$

$$\left[\begin{array}{cccccc|c} 1 & 1 & -2 & 1 & 3 & -1 & T_1 & 4 \\ 2 & -1 & 0 & 2 & 1 & -3 & T_2 & 20 \\ 0 & 0 & -3 & -1 & 2 & 1 & T_3 & -15 \\ 0 & 0 & 2 & -1 & 2 & 1 & T_4 & -3 \\ 5 & 2 & -1 & -1 & 2 & 1 & T_5 & -3 \\ -3 & 1 & 2 & 3 & 1 & 3 & T_6 & 16 \\ 4 & 8 & 1 & -6 & -3 & -2 & & -27 \end{array} \right]$$

$$\left[\begin{array}{cccccc|c} 1 & 1 & -2 & 1 & 3 & -1 & T_1 & 4 \\ 0 & -3 & 0 & 0 & 8 & -1 & T_2 & 12 \\ 0 & 0 & -1 & 2 & -1 & 2 & T_3 & -19 \\ 0 & 0 & 0 & -6 & -13 & 6 & T_4 & 23 \\ 0 & 0 & 0 & 0 & 10 & 0 & T_5 & 28 \\ 0 & 0 & 0 & -10 & 23 & 2 & T_6 & 43 \end{array} \right]$$

$$\begin{bmatrix}
 1 & 1 & -2 & 1 & 3 & -1 \\
 0 & 3 & 5 & 0 & -5 & -1 \\
 0 & 2 - (-2/3) & -3 - 1(-4/3) & -2(-2/3) & -1(-2/3) & 2(-2/3) \\
 0 & -5 - (-3/3) & -3 - 9(-3/3) & -6 - (-3/3) & -3 - (-1/3) & 6 - (-3/3) \\
 0 & 2 - (2/3) & -3 - 4(-2/3) & 6 - (2/3) & 10 - (2/3) & 50(-2/3) \\
 0 & -1 - (-1/3) & -3 - 9(-1/3) & -10 - (-1/3) & -15 - (-1/3) & 82(-1/3)
 \end{bmatrix}
 \begin{matrix}
 r_1 \\
 r_2 \\
 r_3 \\
 r_4 \\
 r_5 \\
 r_6
 \end{matrix}$$

$$\begin{bmatrix}
 \phi \\
 12 \\
 -19 - (2/3)12 \\
 -23 - (-1/3)12 \\
 28 - (-2/3)12 \\
 -43 - (-1/3)12
 \end{bmatrix}$$

$$\begin{bmatrix}
 1 & 1 & -2 & 1 & 3 & -1 \\
 0 & 3 & 5 & 0 & -5 & -1 \\
 0 & 0 & 2\phi & -2 & -4\phi & 1\phi \\
 0 & 0 & \phi & 6 & -8 & 7 \\
 0 & 0 & -0.7 & 6 & 6.7 & -0.7 \\
 0 & 0 & 7\phi & -10 & 13\phi & 2\phi
 \end{bmatrix}
 \begin{matrix}
 r_1 \\
 r_2 \\
 r_3 \\
 r_4 \\
 r_5 \\
 r_6
 \end{matrix}
 \begin{matrix}
 \phi \\
 12 \\
 -11 \\
 -35 \\
 88 \\
 -49
 \end{matrix}$$

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$$\begin{bmatrix}
 1 & 1 & -2 & 1 & 3 & -1 \\
 0 & 3 & 5 & 0 & -5 & -1 \\
 0 & 0 & 2\phi & -2 & -4\phi & 1\phi \\
 0 & 0 & 4 - (4/2\phi)2\phi & -6 - (4/2\phi)2\phi & -8 - (4/2\phi)2\phi & 2 - (4/2\phi)2\phi \\
 0 & 0 & -0.7 - (-0.7/2\phi)2\phi & 6 - (-0.7/2\phi)2\phi & 6.7 - (-0.7/2\phi)2\phi & -0.7 - (-0.7/2\phi)2\phi \\
 0 & 0 & 7\phi - (7\phi/2\phi)2\phi & -10 - (7\phi/2\phi)2\phi & 13\phi - (7\phi/2\phi)2\phi & 2\phi - (7\phi/2\phi)2\phi
 \end{bmatrix}$$

$$\begin{bmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{bmatrix} = \begin{bmatrix} 4 \\ 72 \\ -11 \\ -3 - (4/2.4)(-11) \\ 36 - (0.9/2.4)(-11) \\ -47 - (7.4/2.4)(11) \end{bmatrix}$$

↓

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & 3 & 5 & 0 & -5 & -1 \\ 0 & 0 & 2.4 & -2 & 4.4 & 1.4 \\ 0 & 0 & 0 & -2.7 & -0.7 & 4.2 \\ 0 & 0 & 0 & 5.42 & 5.42 & -0.29 \\ 0 & 0 & 0 & 3.84 & 0.19 & -1.91 \end{bmatrix} \begin{bmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{bmatrix} = \begin{bmatrix} 4 \\ 12 \\ -11 \\ -16.4 \\ 32.79 \\ -13.08 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & 3 & 5 & 0 & -5 & -1 \\ 0 & 0 & 2.4 & -2 & 4.4 & 1.4 \\ 0 & 0 & 0 & -2.7 & -0.7 & 4.2 \\ 0 & 0 & 0 & 5.42 & 5.42 & -0.29 \\ 0 & 0 & 0 & 3.84 & 0.19 & -1.91 \end{bmatrix} \begin{bmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{bmatrix} = \begin{bmatrix} 4 \\ 12 \\ -11 \\ -16.4 \\ 32.79 \\ -13.08 \end{bmatrix}$$

$(5.42 - (5.42) \cdot 2.7) \cdot 5.42 - (5.42) \cdot 0.7 - 0.29 - (5.42) \cdot 4.2$
 $(3.84 - (3.84) \cdot 2.7) \cdot 0.19 - (3.84) \cdot (-1.91) - (3.84) \cdot 4.2$

0.4/0.4

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$$\begin{bmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{bmatrix} = \begin{bmatrix} 4 \\ 12 \\ -11 \\ -16.4 \\ 32.79 - (5.42/-2.7)(-16.4) \\ -13.08 - (3.84/-2.7)(-16.4) \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & 3 & 5 & 0 & -5 & -1 \\ 0 & 0 & 2\phi & -2 & -4\phi & 1\phi \\ 0 & 0 & 0 & -2\tau & -0.7 & 4\tau \\ 0 & 0 & 0 & 0 & \phi.01 & 9.2 \\ 0 & 0 & 0 & 0 & 1.16 & 8.59 \end{bmatrix} \begin{bmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{bmatrix} = \begin{bmatrix} \phi \\ 12 \\ -11 \\ -16.7 \\ 0.7\phi \\ 10.7 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & 3 & 5 & 0 & -5 & -1 \\ 0 & 0 & 2\phi & -2 & -4\phi & 1\phi \\ 0 & 0 & 0 & -2\tau & -0.7 & 4\tau \\ 0 & 0 & 0 & 0 & \phi.01 & 9.2 \\ 0 & 0 & 0 & 0 & 1.16 - \left(\frac{1.16}{\phi.01}\right)4.01 - 8.59 - \left(\frac{1.16}{\phi.01}\right)(9.2) \end{bmatrix} \begin{bmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{bmatrix}$$

$$\begin{bmatrix} \phi \\ 12 \\ -11 \\ 76.7 \\ 0.7\phi \\ 10.7 - \left(\frac{1.16}{\phi.01}\right)(0.7\phi) \end{bmatrix}$$

Continuation

The final matrix will be:

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & 5 & -1 \\ 0 & 0 & 2.7 & -2 & -4.7 & 1.7 \\ 0 & 0 & 0 & -2.2 & -0.7 & 4.7 \\ 0 & 0 & 0 & 0 & 4.01 & 9.2 \\ 0 & 0 & 0 & 0 & 0 & 11.3 \end{bmatrix} \begin{bmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{bmatrix} = \begin{bmatrix} 4 \\ 12 \\ -4 \\ -16.7 \\ -0.74 \\ 10.92 \end{bmatrix}$$

From the above equation we can solve for the temperatures T_1, T_2, T_3, T_4, T_5 and T_6 respectively.

$$-11.3 T_6 = 10.92$$

$$T_6 = \frac{-10.92}{11.3}$$

$$T_6 = -0.966 \quad \text{--- (1)}$$

$$4.01 T_5 + 9.2 T_6 = 0.74$$

$$T_5 = \frac{0.74 - 9.2(-0.966)}{4.01}$$

$$T_5 = \frac{8.1472}{4.01} = 2.031 \quad \text{--- (2)}$$

$$-2.7 T_4 - 0.7 T_5 + 4.7 T_6 = 16.7$$

$$-2.7 T_4 - 0.7(2.031) + 4.7(-0.966) = 16.7$$

$$-2.7 T_4 - 1.4217 - 4.5002 = 16.7$$

$$-2.7 T_4 = 16.7 + 1.4217 + 4.5002$$

$$-2.7 T_4 = -10.7381$$

$$T_4 = \frac{10.7381}{2.7} = 3.947 \quad \text{--- (3)}$$

$$2\phi T_3 - 2.7\phi - 4.475 + 1.456 = -11$$

$$2\phi T_3 - 2(3.977) - 4.4(2.031) + 1.4(-0.966) = -11$$

$$2\phi T_3 - 7.954 - 8.9364 - 1.3524 = -11$$

$$2\phi T_3 = -11 + 18.2428$$

$$T_3 = 7.2428$$

$$\frac{7.2428}{2\phi}$$

$$T_3 = 3.6214 \rightarrow (\phi)$$

$$-3T_2 + 5T_3 + 0.5T_4 - 5T_5 - 1.5T_6 = 12$$

$$-3T_2 + 5(3.6214) + 0.5(2.031) - 1(-0.966) = 12$$

$$-3T_2 + 15.107 + 1.0155 + 0.966 = 12$$

$$-3T_2 = 6.104$$

$$T_2 = 6.104/3$$

$$T_2 = 2.034 \rightarrow (\psi)$$

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

$$T_1 + (2.034) - 2(3.6214) + 3.977 + 3(2.031) + 0.966 = 4$$

$$T_1 - 2.034 - 6.034 + 3.977 + 6.093 + 0.966 = 4$$

$$T_1 = 1.032 \rightarrow (\theta)$$

= From eq (1) to eq (6) respectively

$$T_1 = 1.032^\circ\text{C}$$

$$T_2 = 2.034^\circ\text{C}$$

$$T_3 = 3.6214^\circ\text{C}$$

$$T_4 = 3.977^\circ\text{C}$$

$$T_5 = 2.031^\circ\text{C}$$

$$T_6 = -0.966^\circ\text{C}$$