Assignment 3

$$I_1 + I_2 - 2I_3 + I_4 + 3I_5 - I_6 = 4 \quad \text{---(1)}$$
$$2I_1 - I_2 + I_3 + 2I_4 + I_5 - 3I_6 = 20 \quad \text{---(2)}$$
$$I_1 + 3I_2 - 3I_3 - I_4 + 2I_5 + I_6 = -15 \quad \text{---(3)}$$
$$-3I_1 + 2I_2 + 2I_3 + 3I_4 + I_5 + 3I_6 = 16 \quad \text{---(4)}$$
$$4I_1 + 3I_2 + I_3 - 6I_4 - 3I_5 - 2I_6 = -27 \quad \text{---(5)}$$

∴ Equation (1) becomes the pivot equation

$$2[I_1 + I_2 - 2I_3 + I_4 + 3I_5 - I_6 = 4] = 2I_1 + 2I_2 - 4I_3 + 2I_4 + 6I_5 - 2I_6 = 8$$

$$1[I_1 + I_2 - 2I_3 + I_4 + 3I_5 - I_6 = 4] = I_1 + I_2 - 2I_3 + I_4 + 3I_5 - I_6 =$$
$$5[I_1 + I_2 - 2I_3 + I_4 + 3I_5 - I_6 = 4] = 5I_1 + 5I_2 - 10I_3 + 5I_4 + 15I_5 - 5I_6 = 20$$
$$-3[I_1 + I_2 - 2I_3 + I_4 + 3I_5 - I_6 = 4] = -3I_1 + 3I_2 + 6I_3 - 3I_4 - 9I_5 + 3I_6 =$$
$$4[I_1 + I_2 - 2I_3 + I_4 + 3I_5 - I_6 = 4] = 4I_1 + 4I_2 - 8I_3 + 4I_4 + 12I_5 - 4I_6 = 16$$

Subtracting equations,

$$2I_1 + 2I_2 - 4I_3 + 2I_4 + 6I_5 - 2I_6 = 8$$
$$-2I_1 - I_2 + I_3 + 2I_4 + I_5 - 3I_6 = 20$$
$$\Rightarrow \quad 0 - 3I_2 + 5I_3 + 0 - 5I_5 - I_6 = 12 \quad \text{---(2)'}$$

$$I_1 + 3I_2 - 3I_3 - I_4 + 2I_5 + I_6 = -15$$
$$-I_1 + I_2 - 2I_3 + I_4 + 3I_5 - I_6 = 4$$
$$\Rightarrow \quad 0 + 2I_2 - I_3 - 2I_4 - I_5 + 2I_6 = -19 \quad \text{---(3)'}$$

$$5\bar{I}_1 + 2\bar{I}_2 - \bar{I}_3 - \bar{I}_4 + 2\bar{I}_5 + \bar{I}_6 = -3$$
$$-5\bar{I}_1 + 5\bar{I}_2 + 10\bar{I}_3 + 5\bar{I}_4 + 15\bar{I}_5 - 5\bar{I}_6 = 20$$
$$0 - 3\bar{I}_2 + 9\bar{I}_3 - 6\bar{I}_4 - 13\bar{I}_5 + 6\bar{I}_6 = -23 \quad \text{--- (4)}$$

$$-3\bar{I}_1 - \bar{I}_2 + 2\bar{I}_3 + 3\bar{I}_4 + \bar{I}_5 + 3\bar{I}_6 = 16$$
$$-3\bar{I}_1 - 5\bar{I}_2 + 6\bar{I}_3 - 3\bar{I}_4 - 9\bar{I}_5 + 3\bar{I}_6 = -12$$
$$0 + 2\bar{I}_2 - 4\bar{I}_3 + 6\bar{I}_4 + 10\bar{I}_5 - 0\bar{I}_6 = 28 \quad \text{--- (5)'}$$

$$4\bar{I}_1 + 3\bar{I}_2 + \bar{I}_3 - 6\bar{I}_4 - 3\bar{I}_5 - 2\bar{I}_6 = -27$$
$$-4\bar{I}_1 + 4\bar{I}_2 - 8\bar{I}_3 + 4\bar{I}_4 + 12\bar{I}_5 - 4\bar{I}_6 = 16$$
$$0 - \bar{I}_2 + 7\bar{I}_3 - 10\bar{I}_4 - 15\bar{I}_5 + 2\bar{I}_6 = -43 \quad \text{--- (6)'}$$

Equation (2)' then becomes the pivot equation

$$2/-3\left[-\bar{I}_2 + 5\bar{I}_3 - 0\bar{I}_4 - 5\bar{I}_5 - \bar{I}_6 = 12\right]$$
$$= 2\bar{I}_2 - 10/3\bar{I}_3 + 10/3\bar{I}_5 + 2/3\bar{I}_6 = -8$$

$$-3/-3\left[-3\bar{I}_2 + 5\bar{I}_3 - 5\bar{I}_5 - \bar{I}_6 = 12\right] = -3\bar{I}_2 + 5\bar{I}_3 - 5\bar{I}_5 - \bar{I}_6 = 12$$

$$2/-3\left[-3\bar{I}_2 + 5\bar{I}_3 - 5\bar{I}_5 - \bar{I}_6 = 12\right] = \bar{I}_2 - 10/3\bar{I}_3 + 10/3\bar{I}_5 + 2/3\bar{I}_6 = -8$$

$$-1/-3\left[-3\bar{I}_2 + 5\bar{I}_3 - 5\bar{I}_5 - \bar{I}_6 = 12\right] = -\bar{I}_2 + 5/3\bar{I}_3 - 5/3\bar{I}_5 - 4/3\bar{I}_6 = 4$$

Subtracting equations

$$2\bar{I}_2 - \bar{I}_3 - 2\bar{I}_4 - \bar{I}_5 + 2\bar{I}_6 = -19$$
$$-2\bar{I}_2 - 10/3\bar{I}_3 + 0 + 10/3\bar{I}_5 + 2/3\bar{I}_6 = -8$$
$$0 + 7/3\bar{I}_3 - 2\bar{I}_4 - 13/3\bar{I}_5 + 4/3\bar{I}_6 = -8 \quad \text{--- (3)''}$$

$$-3\bar{I}_2 + 9\bar{I}_3 - 6\bar{I}_4 - 13\bar{I}_5 + 6\bar{I}_6 = 23$$
$$-3\bar{I}_2 + 5\bar{I}_3 - 5\bar{I}_5 - \bar{I}_6 = 12$$
$$4\bar{I}_3 - 6\bar{I}_4 - 8\bar{I}_5 + 7\bar{I}_6 = -35 \quad \text{--- (4)''}$$

$2T_2 - 4T_3 + 6T_4 + 10T_5 - 0T_6 = 28$

$-2T_2 - 10/3\,T_3 + 10/3\,T_5 + 2/3\,T_6 = -8$

$-2/3\,T_3 + 6T_4 + 20/3\,T_5 - 2/3\,T_6 = 36 \quad \text{---(5)}''$

$-T_2 + 9/3\,T_3 - 10T_4 - 15/3\,T_5 + 2T_6 = -43$

$-T_2 + 5/3\,T_3 + 0T_4 - 5/3\,T_5 - 1/3\,T_6 = 4$

$0 + 22/3\,T_3 - 10T_4 - 40/3\,T_5 + 7/3\,T_6 = -47 \quad \text{---(6)}''$

Equation (3)'' then becomes the pivot equation

$12/7\,[7/3\,T_3 - 2T_4 - 13/3\,T_5 + 4/3\,T_6 = -11]$

$= 4T_3 - 24/7\,T_4 - 52/7\,T_5 + 16/7\,T_6 = -132/7$

$-2/7\,[7/3\,T_3 - 2T_4 - 13/3\,T_5 + 4/3\,T_6 = -11]$

$= -2/3\,T_3 + 4/7\,T_4 + 26/21\,T_5 - 8/21\,T_6 = 22/7$

$22/7\,[7/3\,T_3 - 2T_4 - 13/3\,T_5 + 4/3\,T_6 = 11]$

$= 22/3\,T_3 - 44/7\,T_4 - 286/21\,T_5 + 88/21\,T_6 = -242/7$

Subtracting equations,

$4T_3 - 6T_4 - 8T_5 + 7T_6 = -35$

$-\,4T_3 - 24/7\,T_4 - 52/7\,T_5 + 16/7\,T_6 = -132/7$

$0 - 2.5714\,T_4 - 0.5714\,T_5 + 4.7142\,T_6 = -16.1429$

$\text{---(4)}'''$

$2/3\,T_3 + 6T_4 + 20/3\,T_5 - 2/3\,T_6 = 36$

$-\,2/3\,T_3 + 4/7\,T_4 + 26/21\,T_5 - 8/21\,T_6 = 22/7$

$0 + 5.4285\,T_4 + 5.4285\,T_5 - 0.2857\,T_6 = 82.8571 \quad \text{---(5)}''$

$22/3\,T_3 - 10T_4 - 40/3\,T_5 + 7/3\,T_6 = -47$

$-\,22/3\,T_3 - 44/7\,T_4 - 286/21\,T_5 + 88/21\,T_6 = -242/7$

$0 - 3.7143\,T_4 + 0.2857\,T_5 - 1.8571\,T_6 = -12.4286 \quad \text{---(6)}''$

Equation (4)''' is then the pivot equation

$-2.1111[-2.5714T_4 - 0.5714T_5 + 4.7142T_6 = -16.1429]$

$= 5.42857T_4 + 1.2063T_5 - 9.9521T_6 = 34.0793$

$1.4444[-2.5714T_4 - 0.5714T_5 + 4.7142T_5 = 16.1429]$

$= -3.71429T_4 - 0.82536T_5 + 6.809474T_6 = 23.31777$

Subtracting equation ii

$5.42857T_4 + 5.42857T_5 - 0.2857T_6 = 32.8571$

$-[5.42857T_4 + 1.2063T_5 - 9.932T_6 = 34.0793$

$0T_4 + 4.2223T_5 + 9.66639T_6 = -1.2222$ ---(5)'''

$-3.71429T_4 + 0.283714T_5 - 1.85714T_6 = -12.4286$

$-[3.71429T_4 - 0.82536T_5 + 6.809474T_6 = 23.31777$

$0T_4 + 1.1111T_5 - 8.6667T_6 = 10.8889$ ---(6)''''

Equation 5''' then becomes the pivot equation

$0.2632[4.2223T_5 + 9.66639T_6 = -1.2222]$

$= 1.1111T_5 + 2.5442T_6 = -0.32168$

$\Rightarrow 1.1111T_5 - 8.6667T_6 = 10.889$

$-1.1111T_5 + 2.5442T_6 = -0.32168$

$= 0 - 11.2109T_6 = 11.2106$

$T_6 = \frac{11.2106}{-11.2109} = -0.99997 \approx -1.0$

$T_6 = -1.0$

$1.1111\,\bar{I}_5 = 8.6667(-1) - 10.889$

$\bar{I}_5 = \dfrac{10.889 - 8.667}{1.1111}$

$\bar{I}_5 = 2$

$-3.71429\,\bar{I}_4 + 0.285714(2) - 1.85714(-1) = -12.4286$

$\bar{I}_4 = \dfrac{-12.4286 - 0.571428 - 1.85724}{-3.71429}$

$= 4$

$4\bar{I}_3 - 6\bar{I}_4 - 8\bar{I}_5 + 7\bar{I}_6 = -35$

$4\bar{I}_3 - 6(4) - 8(2) + 7(-1) = -35$

$4\bar{I}_3 - 24 - 16 - 7 = -35$

$\bar{I}_3 = \dfrac{-35 + 47}{4} = 3$

$\bar{I}_3 = 3$

$2\bar{I}_2 - \bar{I}_3 - 2\bar{I}_4 - \bar{I}_5 + 2\bar{I}_6 = -19$

$2\bar{I}_2 - (3) - 2(4) - (2) + 2(-1) = -19$

$\bar{I}_2 = \dfrac{-19 + 15}{2} = \dfrac{-4}{2} = -2$

$\bar{I}_1 + \bar{I}_2 - 2\bar{I}_3 + \bar{I}_4 + 3\bar{I}_5 - \bar{I}_6 = 4$

$(\bar{I}_1) + (-2) - 2(3) + (4) + 3(2) - (-1) = 4$

$\bar{I}_1 - 2 - 6 + 4 + 6 + 1 = 4$

$\bar{I}_1 = 4 - 3 = 1$

$\bar{I}_1 = 1,\ \bar{I}_2 = -2,\ \bar{I}_3 = 3,\ \bar{I}_4 = 4,\ \bar{I}_5 = 2,$
$\bar{I}_6 = -1$