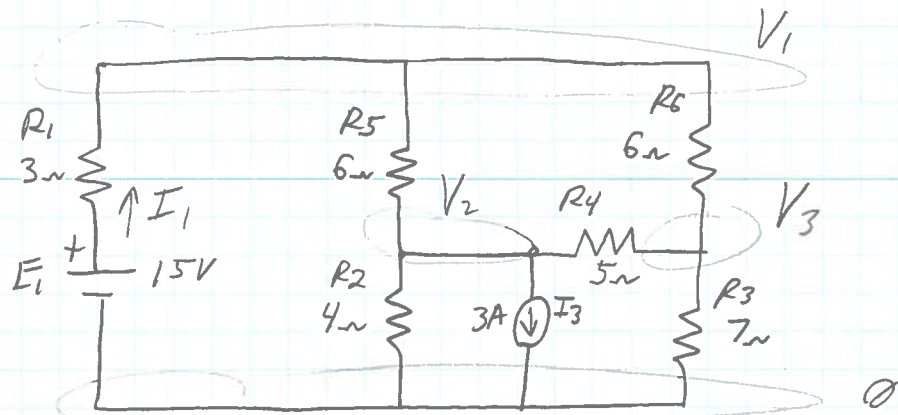


PREVIOUS ICP USING MODIFIED SUPERNODE :



$$\sum I_{IN} = \sum I_{OUT}$$

STEPS

- IDENTIFY NODES 1, 2, 3, 0
- ASSIGN CURRENT I_1
- KCL AT NODES 1, 2 & 3 ✓ 3 EQS BUT 4 UNKNOWN
- RELATE E_1 TO THE NODE VOLTAGES ✓ 4TH EQ
- SOLVE

$$V1) \quad I_1 = \frac{V_1 - V_2}{R_5} + \frac{V_1 - V_3}{R_6}$$

$$\text{OR} \quad \left(\frac{1}{R_5} + \frac{1}{R_6} \right) V_1 - \frac{1}{R_5} V_2 - \frac{1}{R_6} V_3 - I_1 = 0$$

$$0.333 V_1 - 0.166 V_2 - 0.166 V_3 - I_1 = 0 \quad (1)$$

$$V2) \quad 0 = \frac{V_2 - V_1}{R_5} + \frac{V_2}{R_2} + \frac{V_2 - V_3}{R_4} + I_3$$

$$\text{OR} \quad -\frac{1}{R_5} V_1 + \left(\frac{1}{R_5} + \frac{1}{R_2} + \frac{1}{R_4} \right) V_2 - \frac{1}{R_4} V_3 = -I_3$$

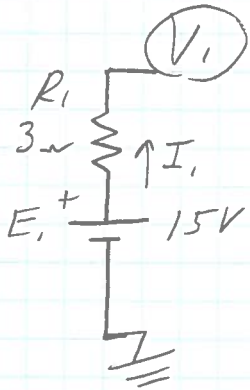
$$-0.166 V_1 + 0.615 V_2 - 0.200 V_3 = -3 \quad (2)$$

$$V_3) \quad 0 = \frac{V_3 - V_1}{R_6} + \frac{V_3 - V_2}{R_4} + \frac{V_3}{R_3}$$

$$\text{OR } -\frac{1}{R_6} V_1 - \frac{1}{R_4} V_2 + \left(\frac{1}{R_6} + \frac{1}{R_4} + \frac{1}{R_3}\right) V_3 = 0$$

$$-0.166 V_1 - 0.200 V_2 + 0.5095 V_3 = 0 \quad (3)$$

RELATING E_1 TO THE NODE VOLTAGES:



$$\text{KVL: } 15 - I_1 R_1 - V_1 = 0$$

$$\text{OR } -V_1 - I_1 R_1 = -E_1$$

$$\left(\text{OR } V_1 = E_1 - I_1 R_1 \text{ BY INSPECTION} \right)$$

$$-1.00 V_1 - 3.00 I_1 = -15 \quad (4)$$

SO, WE HAVE:

$$0.333 V_1 - 0.167 V_2 - 0.167 V_3 - 1.00 I_1 = 0 \quad (1)$$

$$-0.167 V_1 + 0.6167 V_2 - 0.200 V_3 + 0.00 I_1 = -3.00 \quad (2)$$

$$-0.167 V_1 - 0.200 V_2 + 0.5095 V_3 + 0.00 I_1 = 0 \quad (3)$$

$$-1.00 V_1 + 0.00 V_2 + 0.00 V_3 - 3.00 I_1 = -15.00 \quad (4)$$

SOLVING YIELDS:

$(M_1^{-1} * M_2) = \text{ANS}$
4x1

$$V_1 = 7.25 V$$

$$V_2 = -2.44 V$$

$$V_3 = 1.42 V$$

$$I_1 = 2.58 A$$

$M_1 (4 \times 4)$

$M_2 (4 \times 1)$