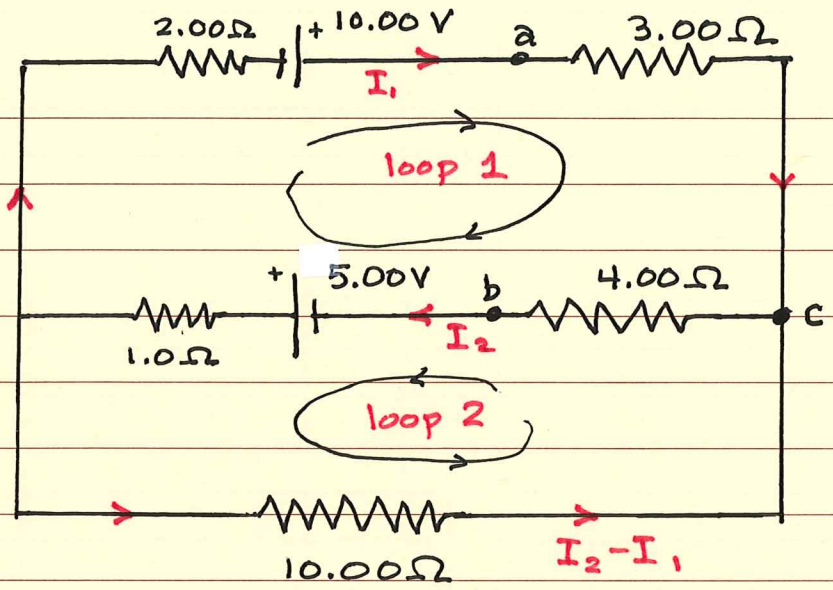
DATE | TOPIC

PS250 Homework Problem 26.29



Loop 1: $\Sigma V_i = 0 \quad -I_1(2\Omega) + 10\,V - I_1(3\Omega) - I_2(4\Omega) + 5.0\,V - I_2(1\Omega) = 0$

$$-(5\Omega)I_1 - (5\Omega)I_2 + 15\,V = 0$$

$$\text{①} \quad \boxed{(5\Omega)I_1 + (5\Omega)I_2 = 15\,V}$$

Loop 2: $\Sigma V_i = 0 \quad -I_2(4\Omega) + 5.0\,V - I_2(1\Omega) - (I_2 - I_1)(10\Omega) = 0$

$$(10\Omega)I_1 - (15\Omega)I_2 + 5V = 0$$

$$\text{②} \quad \boxed{-(10\Omega)I_1 + (15\Omega)I_2 = 5\,V}$$

$2\times$ ① → $(10\Omega)I_1 + (10\Omega)I_2 = 30\,V$

② → $-(10\Omega)I_1 + (15\Omega)I_2 = 5\,V$

Sum → $0\,I_1 + (25\Omega)I_2 = 35\,V$

$$\boxed{I_2 = \frac{7}{5}\,A}$$

① → $(5\Omega)I_1 + (5\Omega)\left(\frac{7}{5}\,A\right) = 15\,V$

$(5\Omega)I_1 = 15\,V - 7\,V = 8\,V$

$$\boxed{I_1 = \frac{8}{5}\,A} \qquad \boxed{I_2 - I_1 = -\frac{1}{5}\,A}$$

b.) $V_{ab} = V_{ac} + V_{cb} = I_1(3\Omega) + I_2(4\Omega) = \left(\frac{8}{5}\,A\right)3\Omega + \left(\frac{7}{5}\,A\right)4\Omega$

$V_{ab} = \left(\frac{24}{5} + \frac{28}{5}\right)$ volts $\qquad V_{ab} = \frac{52}{5}\,V \qquad \boxed{V_{ab} = 10.4 \text{ volts}}$