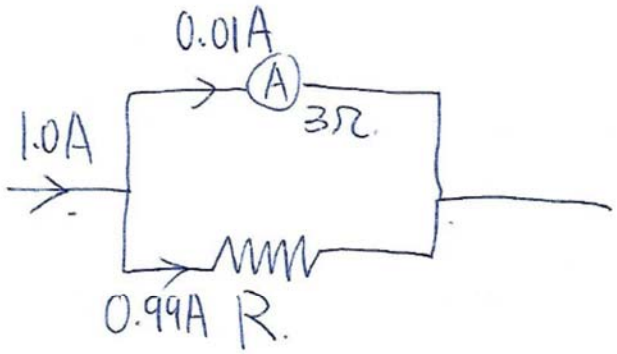
Problem 1



$$0.01 \times 3 = (1.0 - 0.01) R$$

$$R = 0.03\ \Omega$$

Problem 2

$$R_L = \frac{1}{\frac{1}{5} + \frac{1}{7} + \frac{1}{8}} = 2.14\ \Omega$$

$$V_L = 10 \cdot \frac{2.14}{2.14 + 1} = 6.8\ V$$

Problem 3

$$\frac{10 \times 30}{10+30} = 7.5\,\Omega.$$

$$7.5 + 10 = 17.5\,\Omega.$$

$$\frac{17.5 \times 10}{17.5+10} = 6.36\,\Omega.$$

$$6.36 + 5 = 11.36\,\Omega.$$

$$\frac{20}{11.36} = 1.76\ A$$

$$I = 1.76 \times \frac{\frac{1}{10}}{\frac{1}{10}+\frac{1}{17.5}} = 1.12\ (A)$$

Problem 4

$10 // 10 = 5\,\Omega$

$5 + 5 = 10\,\Omega$

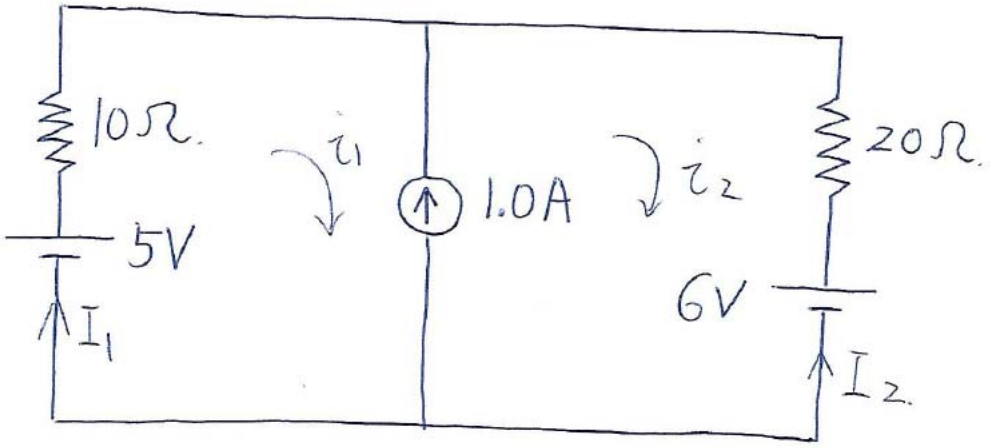
$10 // 10 = 5\,\Omega$

$5 + 10 = 15\,\Omega$

$15 // 15 = 7.5\,\Omega$

$$i = \frac{15}{7.5} = 2.0\,(A)$$

Problem 5



Solution 1:

Define branch currents I_1 and I_2 (shown above)

$$I_1 + I_2 + 1.0 = 0 \quad \text{(kCL)}$$

Outer loop $5 - 10I_1 + 20I_2 - 6 = 0$ (kVL)

$\therefore$ $I_1 = -0.7\,A \Rightarrow$ current through 10 Ω is 0.7 A (downward).

$I_2 = -0.3\,A$

Solution 2:

Define clockwise mesh currents i_1, i_2.

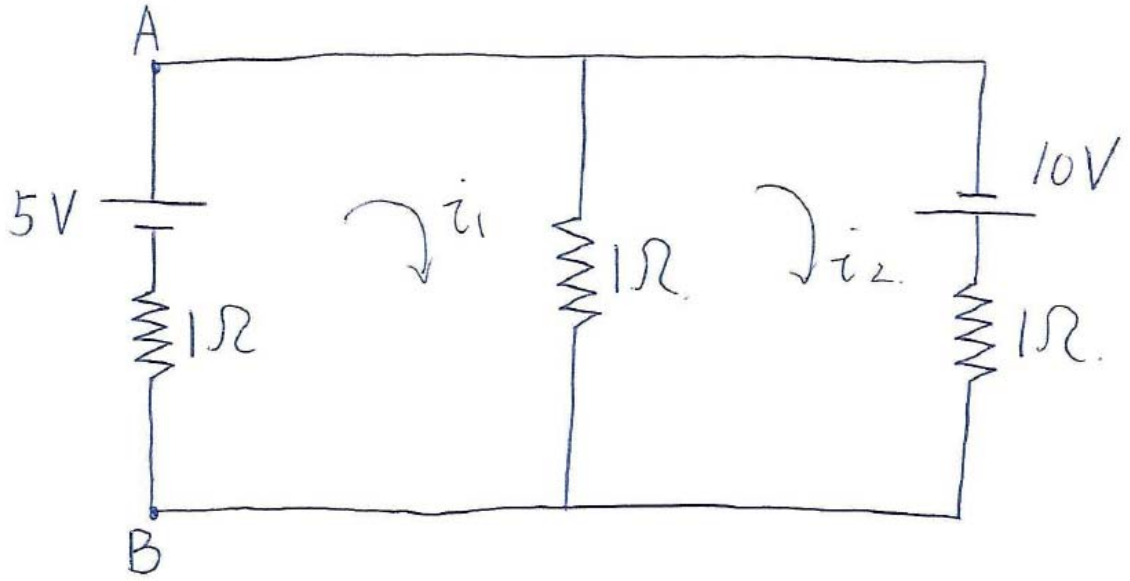
$$i_2 - i_1 = 1$$

Outer loop: $5 - 10i_1 - 20i_2 - 6 = 0$

$\therefore$ $i_1 = -0.7\,(A) \Rightarrow$ Current through 10 Ω is 0.7A, downward.

$i_2 = 0.3\,(A)$

Problem 6



$$\begin{cases} 2i_1 - i_2 = 5 \\ 2i_2 - i_1 = 10 \end{cases}$$

$\therefore i_1 = 6.67\,A$

$i_2 = 8.33\,A$

$$V_{AB} = V_A - V_B = -6.67 \times 1 + 5 = -1.67\,V$$