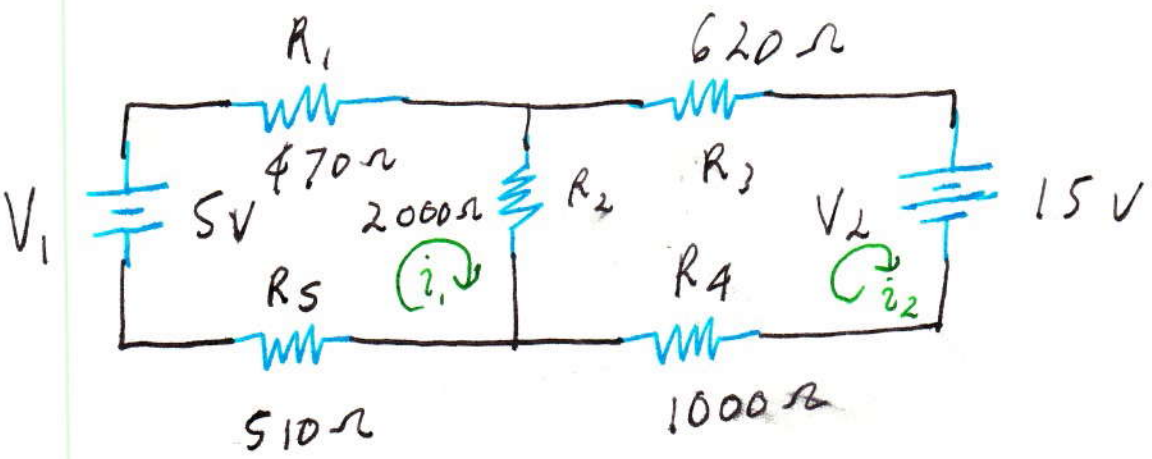
pre lab#7 Cpe 1140 Bruce Liu



$$-5 + 470i_1 + 2000(i_1 - i_2) + 510i_1 = 0$$

$$+15 + 1000i_2 + 2000(i_2 - i_1) + 620i_2 = 0$$

eq1 $-5 + 470i_1 + 2000i_1 - 2000i_2 + 510i_1 = 0$

$$-5 + 2980i_1 - 2000i_2 = 0$$

$$2980i_1 - 2000i_2 = 5$$

eq2 $1000i_2 + 2000i_2 - 2000i_1 + 620i_2 = -15$

$$-2000i_1 + 3620i_2 = -15$$

Simplified equations

$$2980 i_1 - 2000 i_2 = 5$$
$$-2000 i_1 + 3600 i_2 = -15$$

Δ matrix

$$\begin{bmatrix} 2980 & -2000 \\ -2000 & +3600 \end{bmatrix}$$

$$2980 \times 3600 - (-2000 \times -2000)$$

$$(10.728 \times 10^6) - (4 \times 10^6)$$

$$\Delta = 6.278 \times 10^6$$

i_1 matrix

$$\begin{bmatrix} 5 & -2000 \\ -15 & 3600 \end{bmatrix}$$

$$(5 \times 3600) - (-2000 \times -15)$$

$$(1.8 \times 10^4) - (3.0 \times 10^4)$$

$$-1.2 \times 10^4$$

$$\Delta_{i_1} = -12000$$

i_2 matrix

$$\begin{bmatrix} 2980 & 5 \\ -2000 & -15 \end{bmatrix}$$

$$(-15 \times 2980) - (5 \times 2000)$$

$$(-44.7 \times 10^3) - (-10^4) = \Delta i_2 - 34700$$

Δ results

$\Delta = 6.278 \times 10^6$

$\Delta i_1 = -12000$

$\Delta i_2 = -34700$

$$i_1 = \frac{-1.2 \times 10^4}{6.278 \times 10^6} = \frac{1.2}{6.278 \times 10^2}$$

$$i_1 = -1.911 \text{ mA}$$

$$i_2 = \frac{-3.47 \times 10^4}{6.278 \times 10^6} = \frac{3.47}{6.278 \times 10^2}$$

$$i_2 = -5.527 \text{ mA}$$

$$i_{R_2} = i_1 - i_2$$

$$i_{R_2} = -1.911\ mA + 5.527\ mA$$

$$\boxed{i_{R_2} = 3.616\ mA}$$

Voltage calculations

$$V = iR$$

$$V_{R_1} = i_1 R_1$$

currents

$i_1 = -1.911\ mA$

$i_2 = -5.527\ mA$

$i_{R_2} = 3.616\ mA$

$$V_{R_1} = (-1.911 \times 10^{-3})(470)$$

$$\boxed{V_{R_1} = -0.898\ V}$$

$$V_{R_2} = 3.616 \times 10^{-3} \times 2 \times 10^{3}$$

$$\boxed{V_{R_2} = 7.232\ V}$$

$$V_{R_3} = -5.527 \times 10^{-3} \times 620$$

$$\boxed{V_{R_3} = -3.426\ V}$$

$V_{R4} = -5.527 \times 10^{-3} \times 10^{3}$

$\boxed{V_{R4} = -5.527\ V}$

$V_{R5} = -1.911 \times 10^{-5} \times 510$

$\boxed{V_{R5} = -0.974\ V}$