

Homework I: C1 # 18

C2 # 1, 4, 11, 12, 19, 21, 24, 27

P1.18

Given: $v = 1.5V$
 $w = 40 kJ$
 $i = 10 mA$

Find: $t = ?$

$$\rightarrow P = iv = (10 mA)(1.5V) = 15 mW$$

$$\rightarrow P = \frac{dw}{dt} \sim \frac{\Delta w}{\Delta t} \Rightarrow \Delta t = \frac{\Delta w}{P} = \frac{(40 kJ)}{(15 mW)} \approx 2.67 \times 10^6$$

$$\Rightarrow \Delta t = \boxed{2.67 \times 10^6 s} = 740.74 hr$$

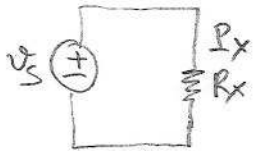
P2.1

Given: $R = 5 k\Omega$
 $i = 12 mA$

Find: $v = ?$

$$\rightarrow v = Ri = (5 k\Omega)(12 mA) = \boxed{60 V}$$

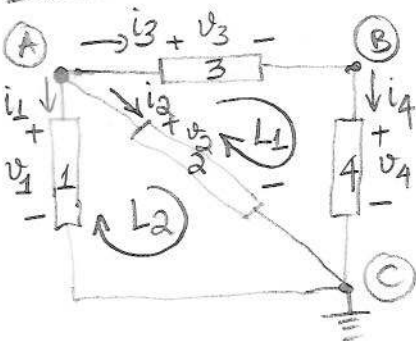
P2.4

Given: $v_s = 15V$, $P_x = 25 mW$ Find: $R_x = ?$

$$\rightarrow P_x = \frac{v_s^2}{R_x} \Rightarrow R_x = \frac{v_s^2}{P_x} = \frac{(15V)^2}{(25 mW)}$$

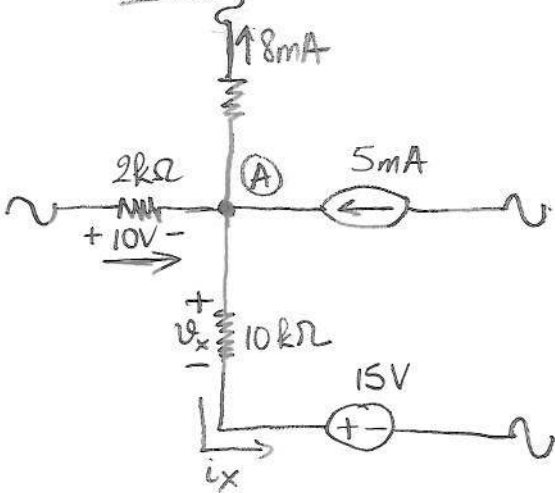
$$\Rightarrow \boxed{R_x = 9 k\Omega}$$

P2.11

a) $\rightarrow$ nodes: A, B, C $\rightarrow$ loops: L_1 : goes through E_3, E_4, E_2 L_2 : goes through E_2, E_1 L_3 : goes through E_3, E_4, E_1 b) $\rightarrow E_3 \& E_4$ in series $\rightarrow E_1 \& E_2$ in parallel $\rightarrow$ combination of $E_3 \& E_4$ parallel to both E_1 and E_2 c) KCL: node A: $-i_1 - i_2 - i_3 = 0$ node B: $i_3 - i_4 = 0$ node C: $i_1 + i_2 + i_4 = 0$ KVL: L_1 : $v_3 + v_4 - v_2 = 0$ L_2 : $v_2 - v_1 = 0$ L_3 : $v_3 + v_4 - v_1 = 0$

P2.24

Given:



$$a) v_x = ? ; i_x = ?$$

$$\rightarrow \text{KCL, node A: } 5\text{mA} - 8\text{mA} + \frac{(10\text{V})}{(2\text{k}\Omega)} - i_x = 0$$

$$\Rightarrow i_x = 2\text{mA}$$

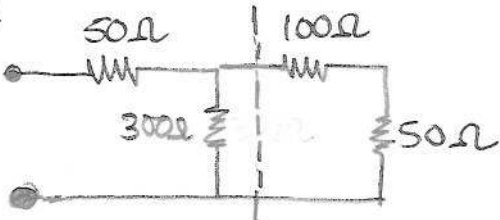
$$\rightarrow v_x = (10\text{k}\Omega) i_x = (10\text{k}\Omega) (2\text{mA}) = \boxed{20\text{V}}$$

$$b) \sum i = ?$$

$$\rightarrow \sum i = -8\text{mA} + 5\text{mA} + 5\text{mA} - 2\text{mA} = 0\text{A}$$

P2.27

Given:



Find: equivalent R:

$$\Rightarrow$$

$$100\Omega + 50\Omega = 150\Omega$$

$$\Rightarrow$$

$$\frac{(300\Omega)(150\Omega)}{(300\Omega + 150\Omega)} = 100\Omega$$

$$\Rightarrow$$

$$50\Omega + 100\Omega \Rightarrow \boxed{R_{eq} = 150\Omega}$$

P2.12

Given: circuit in P2.11

$$\rightarrow i_2 = 10 \text{ mA}$$

$$\rightarrow i_4 = 20 \text{ mA}$$

Find: $\rightarrow i_1 = ?$

$$\rightarrow i_3 = ?$$

$$\rightarrow \text{KCL, node B} \Rightarrow i_3 = i_4 = \boxed{20 \text{ mA}}$$

$$\rightarrow \text{KCL, node C} \Rightarrow i_1 + i_2 = -20 \text{ mA}$$

$$\Rightarrow i_1 = -20 \text{ mA} - 10 \text{ mA}$$

$$\Rightarrow \boxed{i_1 = -30 \text{ mA}}$$

P2.19

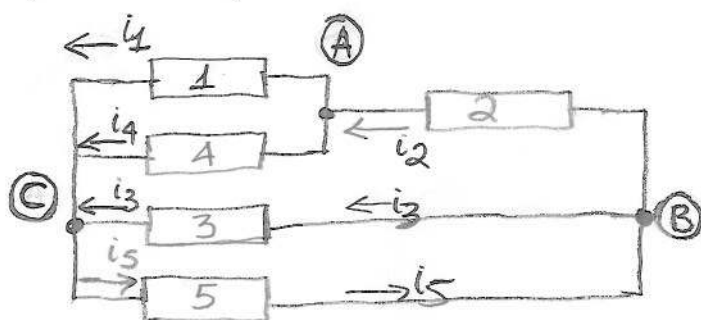
Given: KCL: node A: $-i_1 + i_2 - i_4 = 0$

node B: $-i_2 - i_3 + i_5 = 0$

node C: $i_1 + i_3 + i_4 - i_5 = 0$

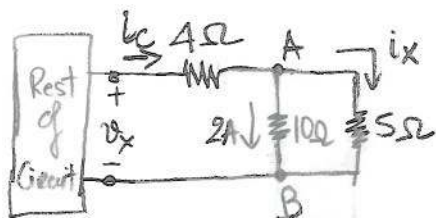
Find: circuit?

$\rightarrow$ 3 nodes, 5 elements



P2.21

Given:



Find: $v_x = ?$; $i_x = ?$

$$\rightarrow v_{AB} = (2\text{ A})(10\Omega) = 20\text{ V}$$

$$\rightarrow i_x = \frac{v_{AB}}{5\Omega} = \frac{20\text{ V}}{5\Omega} = \boxed{4\text{ A}}$$

$$\rightarrow i_c = 2\text{ A} + i_x = 2\text{ A} + 4\text{ A} = 6\text{ A}$$

$$\rightarrow v_x = v_{AB} + v_{4\Omega} = (20\text{ V}) + (4\Omega)(6\text{ A})$$

$$\Rightarrow \boxed{v_x = 44\text{ V}}$$