**CECS 211 – HW 1 - Solutions**

For each problem, please show your entire work and submit via canvas. These problems are taken from chapters two and three from *J. Nilsson and S. Riedel, Electric Circuits, 10th*.

**1.**

P 2.11 [a] Using the passive sign convention and Ohm's law,

$$v = Ri = (3000)(0.015) = 45 \text{ V}$$

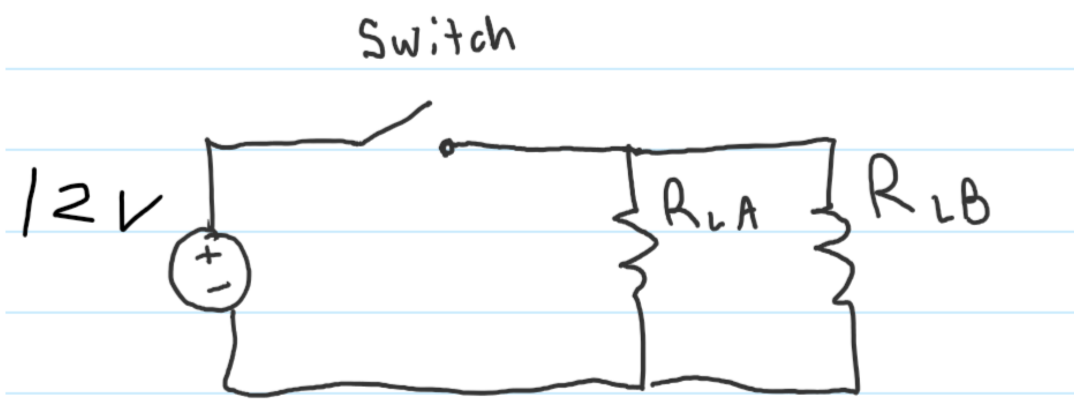
[b] $P_{\text{R}} = \dfrac{v^2}{R} = \dfrac{45^2}{3000} = 0.675 = 675 \text{ mW}$

[c] Using the passive sign convention with the current direction reversed,

$$v = -Ri = -(3000)(0.015) = -45 \text{ V}$$

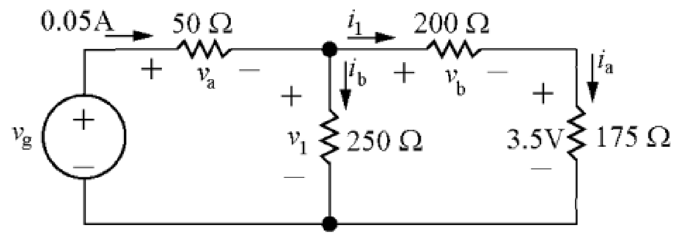
$$P_{\text{R}} = \frac{v^2}{R} = \frac{-45^2}{3000} = 0.675 = 675 \text{ mW}$$

**2.**




**3.**

P 2.20 Label the unknown resistor voltages and currents:




[a] $i_a = \dfrac{3.5}{175} = 0.02\,\text{A}$ (Ohm's law)

$i_1 = i_a = 0.02\,\text{A}$ (KCL)

[b] $v_b = 200i_1 = 200(0.02) = 4\,\text{V}$ (Ohm's law)

$-v_1 + v_b + 3.5 = 0$ so $v_1 = 3.5 + v_b = 3.5 + 4 = 7.5\,\text{V}$ (KVL)

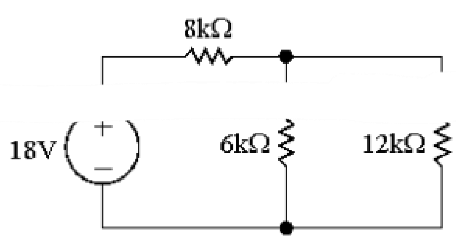
[c] $v_a = 0.05(50) = 2.5\,\text{V}$ (Ohm's law)

$-v_g + v_a + v_1 = 0$ so $v_g = v_a + v_1 = 2.5 + 7.5 = 10\,\text{V}$ (KVL)

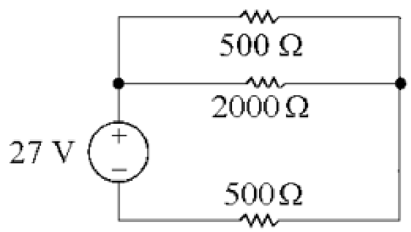
[d] $p_g = v_g(0.05) = 10(0.05) = 0.5\,\text{W}$

**4.**

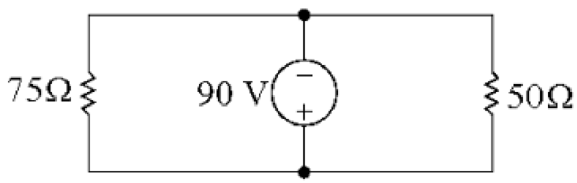
P 3.3 [a] The 5 kΩ and 7 kΩ resistors are in series. The simplified circuit is shown below:



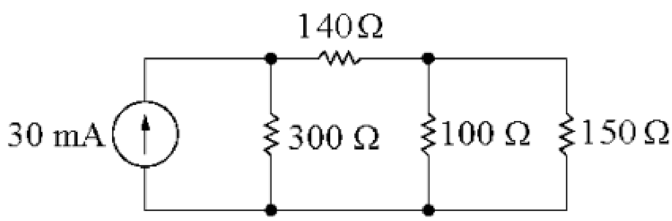

[b] The 800 Ω and 1200 Ω resistors are in series, as are the 300 Ω and 200 Ω resistors. The simplified circuit is shown below:



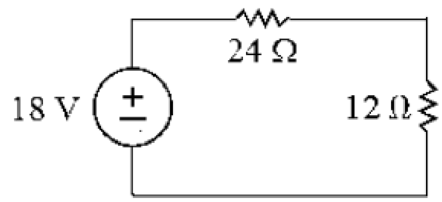

[c] The 35 Ω, 15 Ω, and 25 Ω resistors are in series. as are the 10 Ω and 40 Ω resistors. The simplified circuit is shown below:



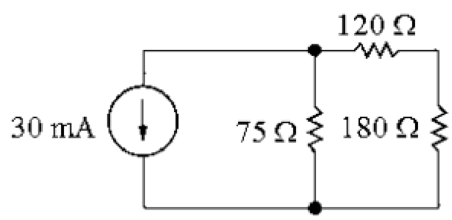

[d] The 50 Ω and 90 Ω resistors are in series, as are the 80 Ω and 70 Ω resistors. The simplified circuit is shown below:



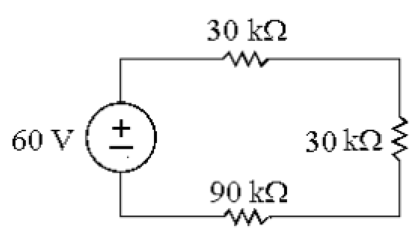
P 3.4 [a] The $36\,\Omega$ and $18\,\Omega$ resistors are in parallel. The simplified circuit is shown below:



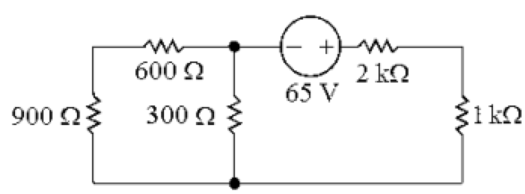

[b] The $200\,\Omega$ and $120\,\Omega$ resistors are in parallel, as are the $210\,\Omega$ and $280\,\Omega$ resistors. The simplified circuit is shown below:




[c] The 100 kΩ, 150 kΩ, and 60 kΩ resistors are in parallel, as are the 75 kΩ and 50 kΩ resistors. The simplified circuit is shown below:




[d] The $750\,\Omega$ and $500\,\Omega$ resistors are in parallel, as are the 1.5 kΩ and 3 kΩ resistors. The simplified circuit is shown below:



P 3.5 Always work from the side of the circuit furthest from the source. Remember that the current in all series-connected circuits is the same, and that the voltage drop across all parallel-connected resistors is the same.

**[a]** Circuit in Fig. P3.3(a):

$$R_{\text{eq}} = [(7000 + 5000)\|6000] + 8000 = 12{,}000\|6000 + 8000$$

$$= 4000 + 8000 = 12 \text{ k}\Omega$$

Circuit in Fig. P3.3(b):

$$R_{\text{eq}} = [500\|(800 + 1200)] + 300 + 200 = (500\|2000) + 300 + 200$$

$$= 400 + 300 + 200 = 900\,\Omega$$

Circuit in Fig. P3.3(c):

$$R_{\text{eq}} = (35 + 15 + 25)\|(10 + 40) = 75\|50 = 30\,\Omega$$

Circuit in Fig. P3.3(d):

$$R_{\text{eq}} = ([(70 + 80)\|100] + 50 + 90)\|300 = [(150\|100) + 50 + 90]\|300$$

$$= (60 + 50 + 90)\|300 = 200\|300 = 120\,\Omega$$

**[b]** Note that in every case, the power delivered by the source must equal the power absorbed by the equivalent resistance in the circuit. For the circuit in Fig. P3.3(a):

$$P = \frac{V_s^2}{R_{\text{eq}}} = \frac{18^2}{12{,}000} = 0.027 = 27 \text{ mW}$$

For the circuit in Fig. P3.3(b):

$$P = \frac{V_s^2}{R_{\text{eq}}} = \frac{27^2}{900} = 0.81 = 810 \text{ mW}$$

For the circuit in Fig. P3.3(c):

$$P = \frac{V_s^2}{R_{\text{eq}}} = \frac{90^2}{30} = 270 \text{ W}$$

For the circuit in Fig. P3.3(d):

$$P = I_s^2(R_{\text{eq}}) = (0.03)^2(120) = 0.108 = 108 \text{ mW}$$