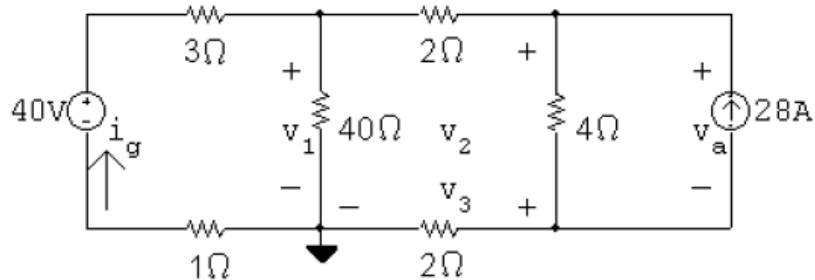


EENG 281 Homework #3 Solutions  
Fall 2013

P 4.15 [a]



$$\frac{v_1}{40} + \frac{v_1 - 40}{4} + \frac{v_1 - v_2}{2} = 0 \quad \text{so} \quad 31v_1 - 20v_2 + 0v_3 = 400$$

$$\frac{v_2 - v_1}{2} + \frac{v_2 - v_3}{4} - 28 = 0 \quad \text{so} \quad -2v_1 + 3v_2 - v_3 = 112$$

$$\frac{v_3}{2} + \frac{v_3 - v_2}{4} + 28 = 0 \quad \text{so} \quad 0v_1 - v_2 + 3v_3 = -112$$

Solving,  $v_1 = 60$  V;  $v_2 = 73$  V;  $v_3 = -13$  V,

$$[\text{b}] \quad i_g = \frac{40 - 60}{4} = -5 \text{ A}$$

$$p_g = (40)(-5) = -200 \text{ W}$$

Thus the 40 V source delivers 200 W of power.

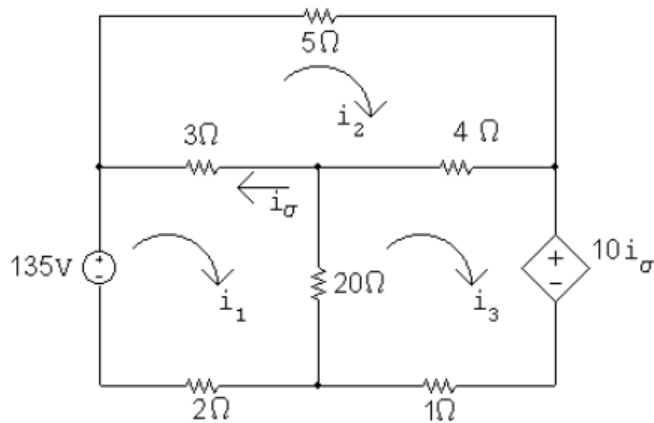
P 4.27 Place  $5v_\Delta$  inside a supernode and use the lower node as a reference. Then

$$\frac{v_\Delta - 15}{10} + \frac{v_\Delta}{2} + \frac{v_\Delta - 5v_\Delta}{20} + \frac{v_\Delta - 5v_\Delta}{40} = 0$$

$$12v_\Delta = 60; \quad v_\Delta = 5 \text{ V}$$

$$v_o = v_\Delta - 5v_\Delta = -4(5) = -20 \text{ V}$$

P 4.38



$$-135 + 25i_1 - 3i_2 - 20i_3 + 0i_\sigma = 0$$

$$-3i_1 + 12i_2 - 4i_3 + 0i_\sigma = 0$$

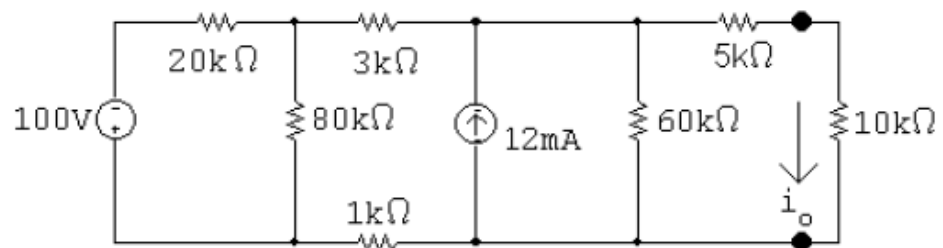
$$-20i_1 - 4i_2 + 25i_3 + 10i_\sigma = 0$$

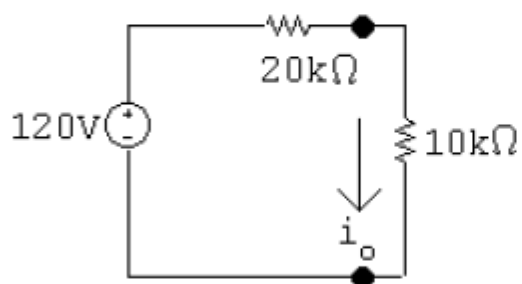
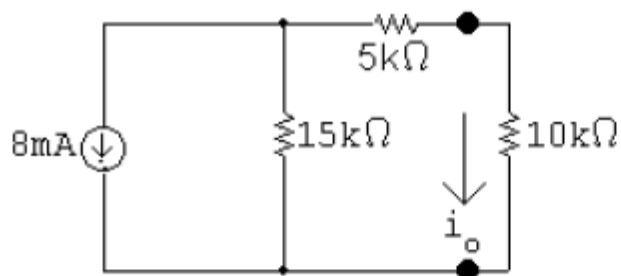
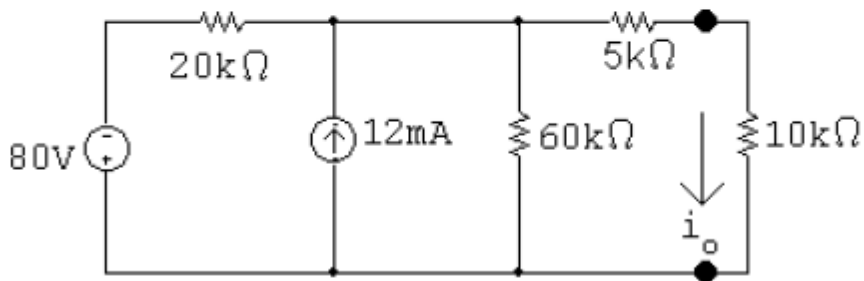
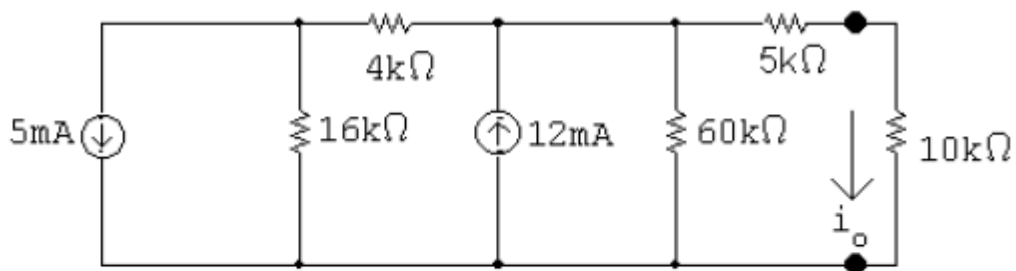
$$1i_1 - 1i_2 + 0i_3 + 1i_\sigma = 0$$

$$\text{Solving, } i_1 = 64.8 \text{ A} \quad i_2 = 39 \text{ A} \quad i_3 = 68.4 \text{ A} \quad i_\sigma = -25.8 \text{ A}$$

$$p_{20\Omega} = (68.4 - 64.8)^2(20) = 259.2 \text{ W}$$

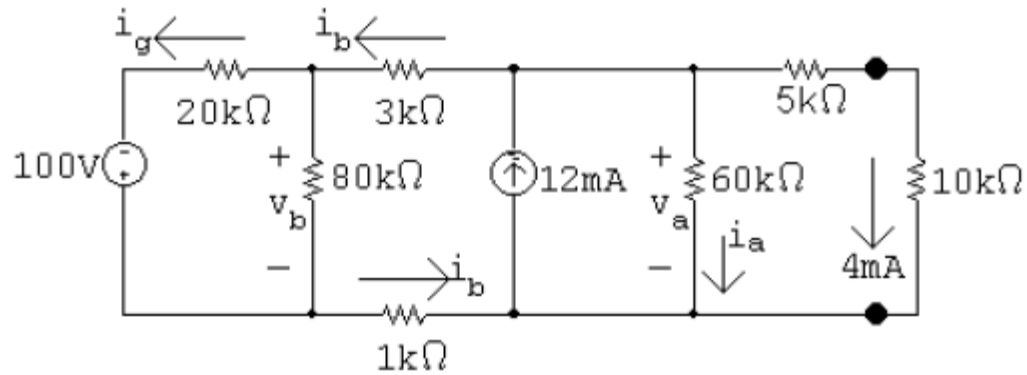
P 4.61 [a]





$$i_o = \frac{120}{30,000} = 4 \text{ mA}$$

[b]



$$v_a = (15,000)(0.004) = 60 \text{ V}$$

$$i_a = \frac{v_a}{60,000} = 1 \text{ mA}$$

$$i_b = 12 - 1 - 4 = 7 \text{ mA}$$

$$v_b = 60 - (0.007)(4000) = 32 \text{ V}$$

$$i_g = 0.007 - \frac{32}{80,000} = 6.6 \text{ mA}$$

$$p_{100V} = -(100)(6.6 \times 10^{-3}) = -660 \text{ mW}$$