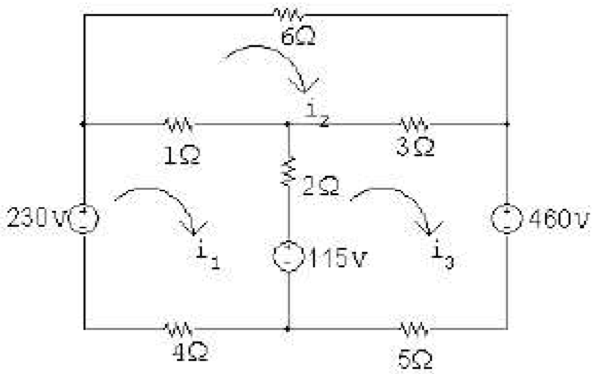
P 4.34 [a]



$$230 - 115 = 7i_1 - 1i_2 - 2i_3$$

$$0 = -1i_1 + 10i_2 - 3i_3$$

$$115 - 460 = -2i_1 - 3i_2 + 10i_3$$

Solving, $i_1 = 4.4$ A; $i_2 = -10.6$ A; $i_3 = -36.8$ A

$$p_{230} = -230i_1 = -1012 \text{ W(del)}$$

$$p_{115} = 115(i_1 - i_3) = 4738 \text{ W(abs)}$$

$$p_{460} = 460i_3 = -16{,}928 \text{ W(del)}$$

$$\therefore \sum p_{\text{dev}} = 17{,}940 \text{ W}$$

[b] $p_{6\Omega} = (10.6)^2(6) = 674.16$ W

$$p_{1\Omega} = (15)^2(1) = 225 \text{ W}$$

$$p_{3\Omega} = (26.2)^2(3) = 2059.32 \text{ W}$$

$$p_{2\Omega} = (41.2)^2(2) = 3394.88 \text{ W}$$

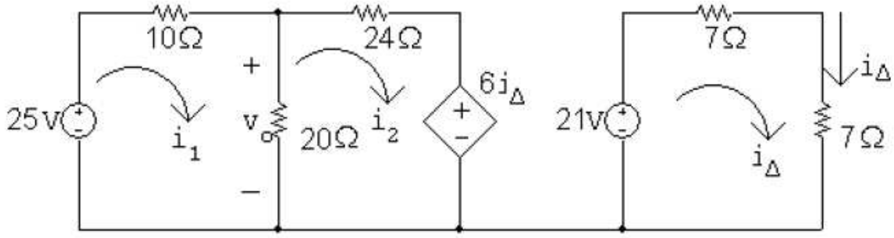
$$p_{4\Omega} = (4.4)^2(4) = 77.44 \text{ W}$$

$$p_{5\Omega} = (36.8)^2(5) = 6771.2 \text{ W}$$

$$\therefore \sum p_{\text{abs}} = 4738 + 674.16 + 225 + 2059.32 + 3394.88$$

$$+77.44 + 6771.2 = 17{,}940 \text{ W}$$

P 4.37 **[a]**



$$25 = 30i_1 - 20i_2 + 0i_\Delta$$

$$0 = -20i_1 + 44i_2 + 6i_\Delta$$

$$21 = 0i_1 + 0i_2 + 14i_\Delta$$

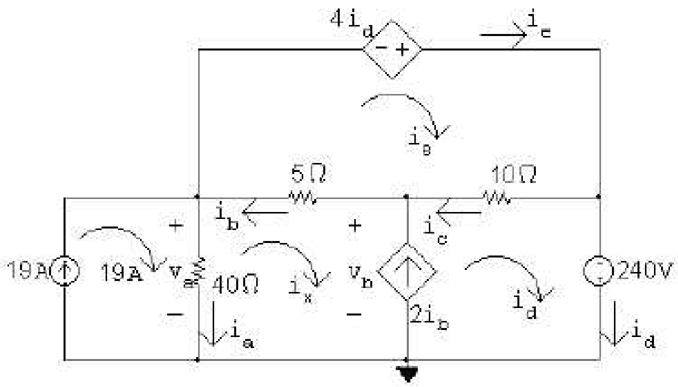
Solving, $i_1 = 1$ A; $\qquad i_2 = 0.25$ A; $\qquad i_\Delta = 1.5$ A

$v_o = 20(i_1 - i_2) = 20(0.75) = 15$ V

[b] $p_{6i_\Delta} = 6i_\Delta i_2 = (6)(1.5)(0.25) = 2.25$ W (abs)

$\therefore\ p_{6i_\Delta}$ (deliver) $= -2.25$ W

P 4.50 [a]



$$-4i_d + 10(i_e - i_d) + 5(i_e - i_x) = 0$$

$$5(i_x - i_e) + 10(i_d - i_e) - 240 + 40(i_x - 19) = 0$$

$$i_d - i_x = 2i_b = 2(i_e - i_x)$$

Solving, $i_d = 10$ A; $\quad i_e = 18$ A; $\quad i_x = 26$ A

$i_a = 19 - i_x = -7$ A; $\quad i_b = i_e - i_x = -8$ A; $\quad i_c = i_e - i_d = 8$ A;

[b] $v_\text{a} = 40i_\text{a} = -280$ V; $\qquad v_\text{b} = 5i_b + 40i_a = -320$ V

$$p_{19\text{A}} = -19v_a = 5320 \text{ W}$$

$$p_{4i_d} = -4i_d i_e = -720 \text{ W}$$

$$p_{2i_a} = -2i_b v_b = -5120 \text{ W}$$

$$p_{240\text{V}} = -240i_d = -2400 \text{ W}$$

$$p_{40\Omega} = (7)^2(40) = 1960 \text{ W} =$$

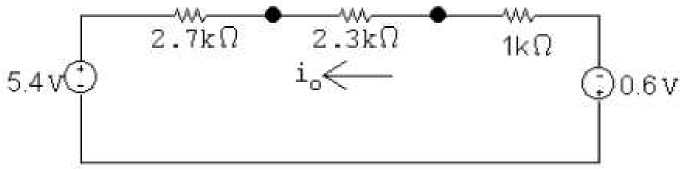
$$p_{5\Omega} = (8)^2(5) = 320 \text{ W}$$

$$p_{10\Omega} = (8)^2(10) = 640 \text{ W}$$

$$\sum P_\text{gen} = 720 + 5120 + 2400 = 8240 \text{ W}$$

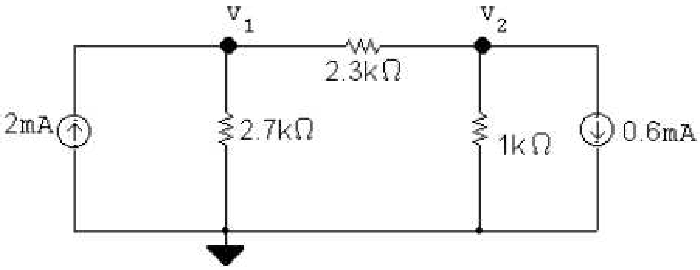
$$\sum P_\text{diss} = 5320 + 1960 + 320 + 640 = 8240 \text{ W}$$

P 4.59 [a] Apply source transformations to both current sources to get



$$i_o = \frac{-(5.4 + 0.6)}{2700 + 2300 + 1000} = -1 \text{ mA}$$

[b]



The node voltage equations:

$$-2 \times 10^{-3} + \frac{v_1}{2700} + \frac{v_1 - v_2}{2300} = 0$$

$$\frac{v_2}{1000} + \frac{v_2 - v_1}{2300} + 0.6 \times 10^{-3} = 0$$

Place these equations in standard form:

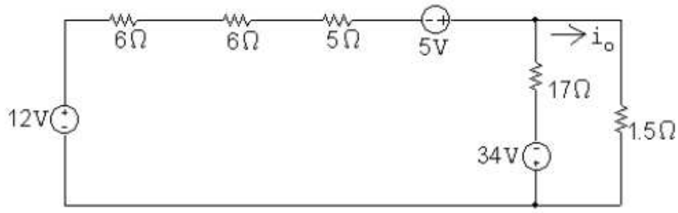
$$v_1\left(\frac{1}{2700} + \frac{1}{2300}\right) + v_2\left(-\frac{1}{2300}\right) = 2 \times 10^{-3}$$

$$v_1\left(-\frac{1}{2300}\right) + v_2\left(\frac{1}{1000} + \frac{1}{2300}\right) = -0.6 \times 10^{-3}$$

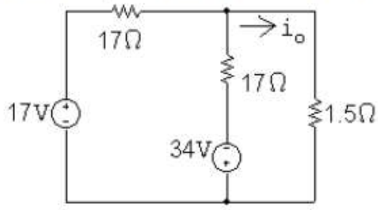
Solving, $v_1 = 2.7$ V; $\quad v_2 = 0.4$ V

$$\therefore \quad i_o = \frac{v_2 - v_1}{2300} = -1 \text{ mA}$$

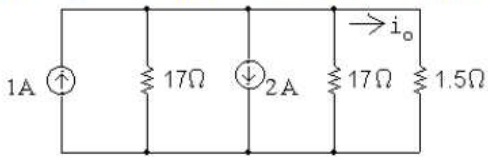
P 4.60 [a] Applying a source transformation to each current source yields



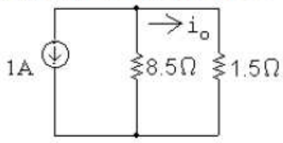
Now combine the 12 V and 5 V sources into a single voltage source and the 6 Ω, 6 Ω and 5 Ω resistors into a single resistor to get



Now use a source transformation on each voltage source, thus

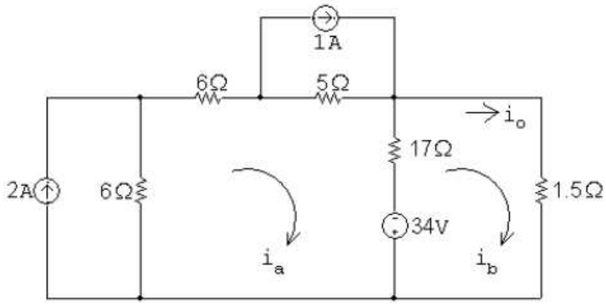


which can be reduced to



$$\therefore \quad i_o = -\frac{8.5}{10}(1) = -0.85 \text{ A}$$

[b]



$$34i_a - 17i_b = 12 + 5 + 34 = 51$$

$$-17i_a + 18.5i_b = -34$$

Solving, $i_b = -0.85 \text{ A} = i_o$