P2.02

$$i = \frac{5}{100 + 50 /\!/ 150} \times \frac{\frac{1}{50}}{\frac{1}{50} + \frac{1}{150}} + 0.1 \times \frac{\frac{1}{50}}{\frac{1}{50} + \frac{1}{100} + \frac{1}{150}} -$$

$$- \frac{10}{150 + 50 /\!/ 100} \times \frac{\frac{1}{50}}{\frac{1}{50} + \frac{1}{100}} = 0.0273 + 0.0545 - 0.0364$$

$$= 0.0455 \text{ A}$$

P2.03

$$i = 2 \times \frac{\frac{1}{10}}{\frac{1}{10} + \frac{1}{20+40}} - 4 \times \frac{\frac{1}{10+40}}{\frac{1}{10+40} + \frac{1}{20}} + \frac{80}{20+10+40} - \frac{120}{20+10+40}$$

$$= 1.71 - 1.14 - 1.14 - 1.71 = -2.29 \text{ A}$$

P2.38 using cw current

$$i_1(1+5) + 3(i_1 - i_2) = -8 - 10$$
$$i_2(4+2) + 3(i_2 - i_1) = +6 + 10$$

$\Rightarrow$ $i_1 = -1.58$ A, $i_2 = 1.25$ A

$i_2 - i_1 = 2.83$ $\Rightarrow$ out of + on 10V source

$$P_{10} = 10 \times 2.82 = 28.3 \text{ W}$$

P2.40. $-6 + 3i + 10(i + 0.2) + 12 + 15i = 0 \Rightarrow i = -0.286$ A

P2.47. For max power, use parallel

$$3000 = \frac{(230)^2}{R_1} + \frac{(230)^2}{R_2} = (230)^2 \left(\frac{R_1 + R_2}{R_1 R_2} \right)$$

For min power, use series

$$500 = (230)^2 / (R_1 + R_2)$$

(cont)

P2.47, cont. Simultaneous solution yields

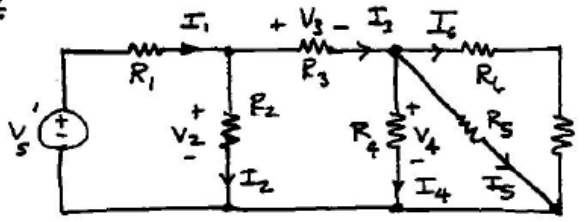
$R_1 = 83.4$ and 22.4

$R_2 = 22.4$ and 83.4

The four settings are

$P_1 = 500\ W$, $P_2 = \frac{(230)^2}{83.4} = 634\ W$, $P_3 = \frac{(230)^2}{22.4} = 2366\ W$, $P_4 = 3000\ W$

4.2



$R_5 = 6k\Omega$

All other R are $3k\Omega$

$V_s = 8V$

$I_6 = V_o'/R_7 = 1/3\ \mu A$ $\quad V_4 = I_6(R_6 + R_7) = 2mV$ $\quad I_5 = V_4/R_5 = 1/3\ \mu A$

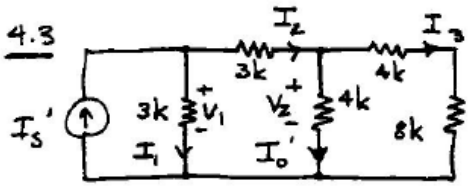
$I_4 = V_4/R_4 = 2/3\ \mu A$ $\quad I_3 = I_4 + I_5 + I_6 = 4/3\ \mu A$ $\quad V_3 = I_3 R_3 = 4mV$

$V_2 = V_3 + V_4 = 6mV$ $\quad I_2 = V_2/R_2 = 2\mu A$ $\quad I_1 = I_2 + I_3 = \frac{10}{3}\ \mu A$

$V_s' = I_1 R_1 + V_2 = 16mV$ $\quad \frac{V_o}{V_o'} = \frac{V_s}{V_s'} \Rightarrow V_o = \left(\frac{8}{16m}\right)(1m) = 0.5V$

$\boxed{V_o = 0.5V}$

4.3



$I_s = 2mA$ $\quad I_o' = 1mA$

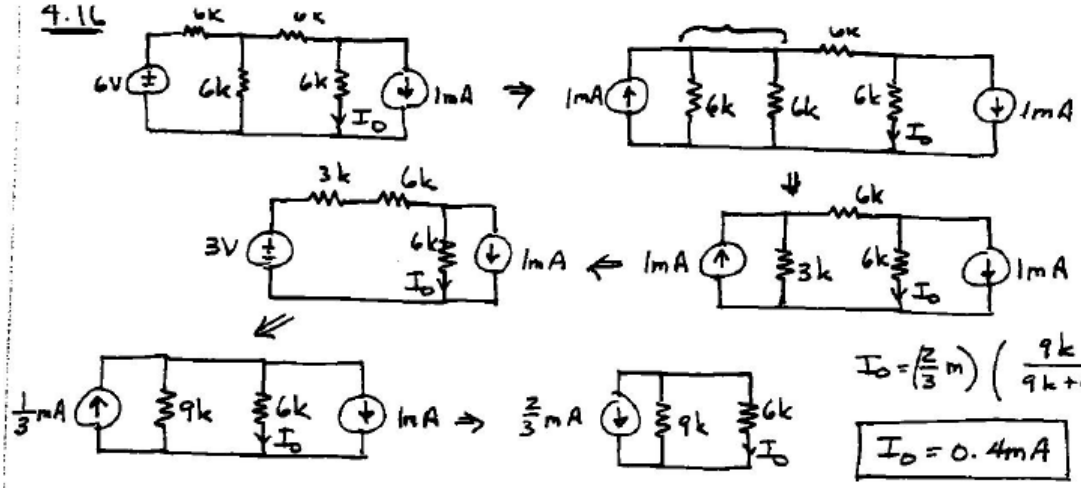
$V_2 = I_o'(4k) = 4V$ $\quad I_3 = V_2/12k = \frac{1}{3}\ mA$

$I_2 = I_o' + I_3 = 4/3\ mA$

$V_1 = I_2(3k) + V_2 = 8V$ $\quad I_1 = V_1/8k = 8/3\ mA$ $\quad I_s' = I_1 + I_2 = 4mA$

$\frac{I_o}{I_o'} = \frac{I_s}{I_s'} \Rightarrow I_o = \left(\frac{2m}{4m}\right)(1m) = 0.5mA$ $\quad \boxed{I_o = 0.5mA}$

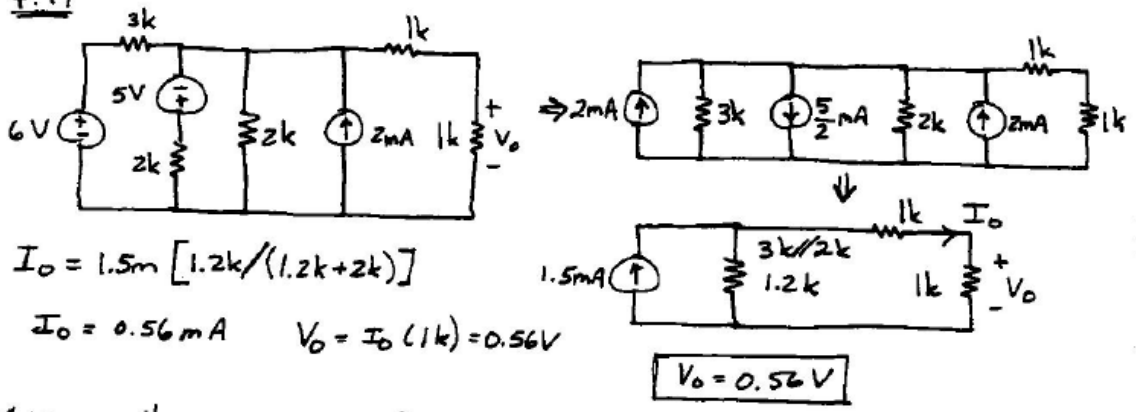
4.16



$$I_o = \left(\frac{2}{3}m\right)\left(\frac{9k}{9k+6k}\right)$$

$$\boxed{I_o = 0.4mA}$$

4.17



$$I_o = 1.5m\left[1.2k/(1.2k+2k)\right]$$

$$I_o = 0.56mA \qquad V_o = I_o(1k) = 0.56V$$

$$\boxed{V_o = 0.56V}$$