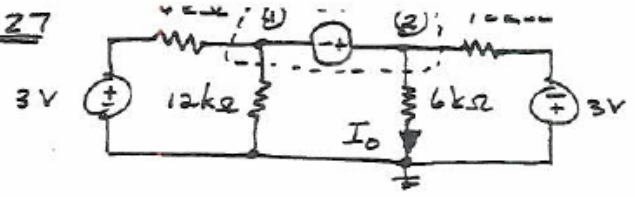
3.27



Use the supernode encircled by the dotted line!

At supernode: $\frac{V_1-3}{6000}+\frac{V_1}{12{,}000}+\frac{V_2}{6{,}000}+\frac{V_2+3}{12{,}000}=0$

$$2V_1-6+V_1+2V_2+V_2+3=0$$

$$3V_1+3V_2=3 \Rightarrow V_1+V_2=1 \quad (1)$$

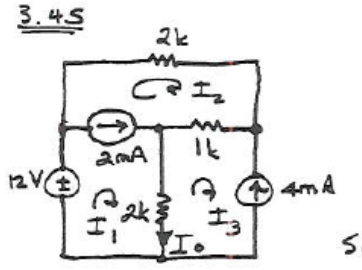
Constraint: $V_2-V_1=6 \Rightarrow V_1=V_2-6 \quad (2)$

Substitute (2) into (1) & find V_2,

$$V_2-6+V_2=1 \Rightarrow 2V_2=7 \Rightarrow V_2=3.5V$$

$I_o = V_2/6{,}000 \Rightarrow$ **$I_o = 0.58\,mA$**

3.45



$$12=(2k)I_2+1k(I_2-I_3)+2k(I_1-I_3)$$

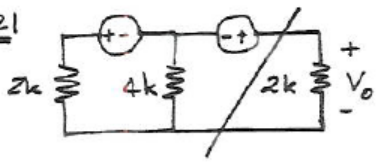
$$12=(3k)I_2+2kI_1-3kI_3 \quad (1)$$

$I_2=I_1-\frac{2}{1000}$; $I_3=-\frac{4}{1000}$ (2) & (3)

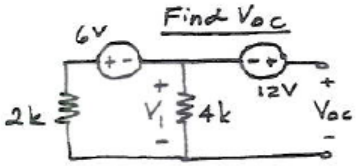
Substitute (2) & (3) into (1): $12=(5k)I_1+6$

$I_1=\frac{6}{5}\,mA \Rightarrow I_o=I_1-I_3=\frac{6}{5}+4\,mA$ **$I_o = 5.2\,mA$**

4.21



Find V_{oc}



$$V_1 = -6\left[\frac{4k}{4k+2k}\right]$$

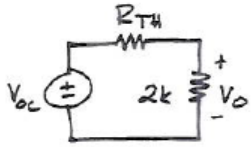
$$V_1 = -4V$$

$$V_{oc} = 12 + V_1 = 8V$$

Find R_{TH}

$\Leftarrow R_{TH} = 2k \,//\, 4k$

$R_{TH} = 1.33k\Omega$



$$V_o = V_{oc}\left(\frac{2k}{2k+R_{TH}}\right)$$

$$\boxed{V_o = 4.8V}$$