HW1 Solution

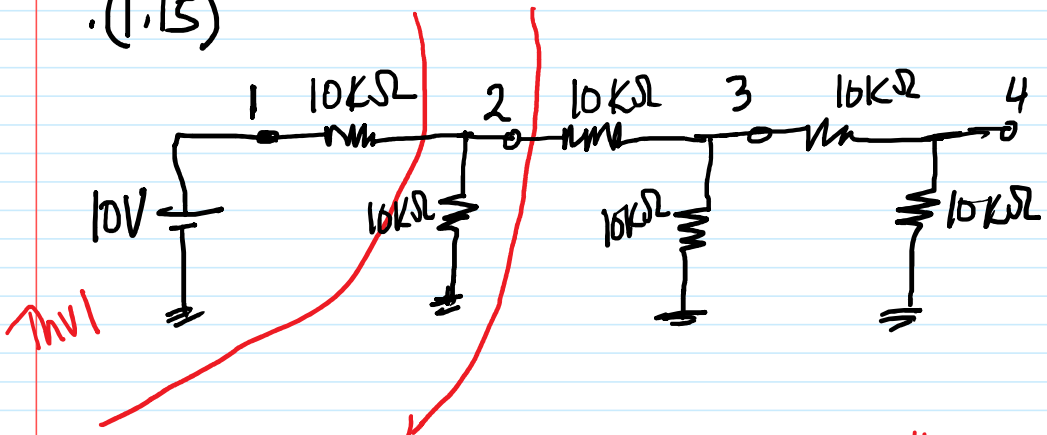
.(1.10)

$$I_1 = \frac{1/R_1}{1/R_1+1/R_2} I = \frac{1/R_1}{1/R_1+1/R_2} * \frac{R_1R_2}{R_1R_2} * I = \frac{R_2}{R_2+R_1} I$$

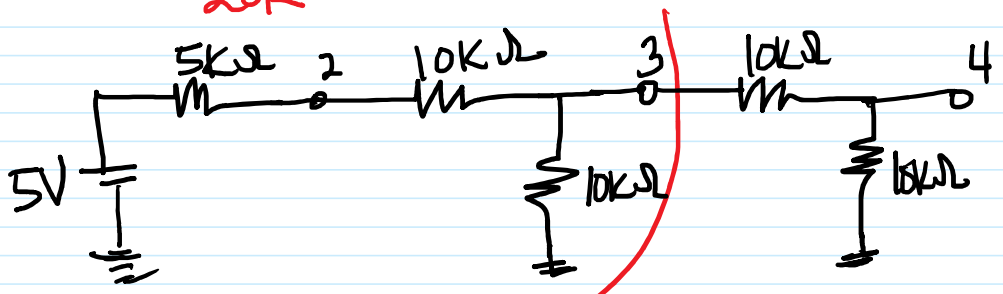
$$I_2 = \frac{1/R_2}{1/R_2+1/R_1} I = \frac{1/R_2}{1/R_1+1/R_1} * \frac{R_1R_2}{R_1R_2} \times I = \frac{R_1}{R_1+R_2} I$$

$$V = I_1R_1 = I_2R_2 = \frac{R_1R_2}{R_1+R_2} I \Rightarrow V=(R_1 /\!/ R_2)I$$

.(1.15)

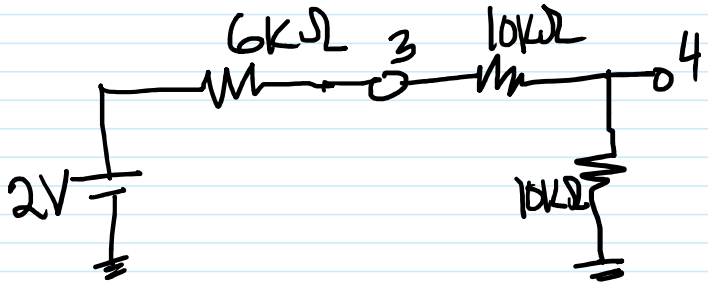


$V_{OC} = \frac{10K}{20K} \times 10V = 5V$, $R_{th} = 10K /\!/ 10K = 5K\Omega$



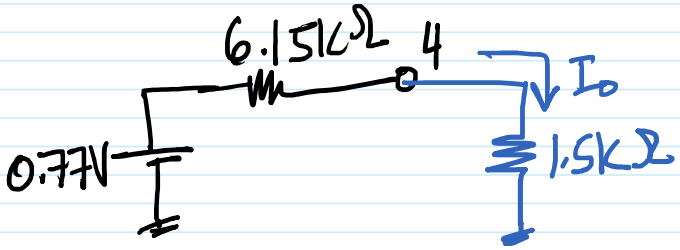
$V_{OC} = \frac{10K}{25K} * 5V = 2V$, $R_{th} = 10K /\!/ 15K = 6K\Omega$

6KΩ 3 10KΩ 4



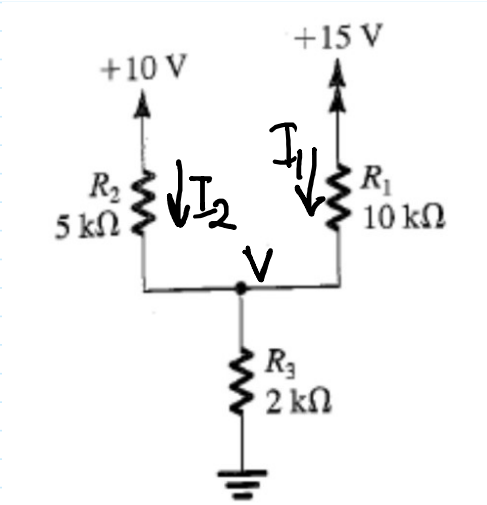
$V_{OC} = \frac{10K}{26K} \times 2V = 0.77V$

$R_{th} = 10K // 16K = 6.15K\Omega$

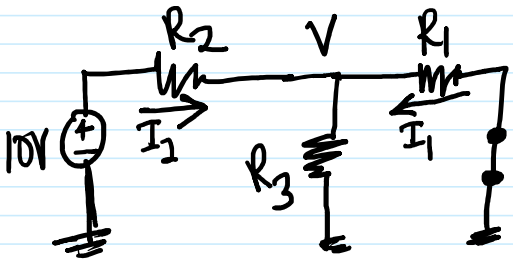


$I_o = \frac{0.77}{1.5K + 6.15K} = 0.10mA$

(1.16)



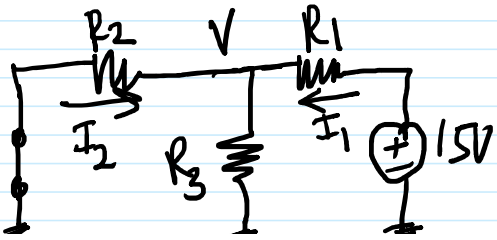
(a) Use superposition and current division



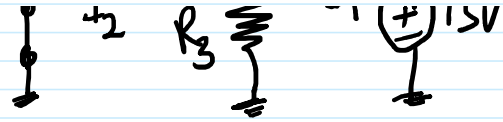
$I_2 = \frac{10V}{R_2 + R_1 // R_3} = \frac{10V}{5K + \frac{20K}{12}} = \frac{120}{80K}$

$I_2 = \frac{12}{8} mA.$

$I_1 = -I_2 * \frac{R_3}{R_1 + R_3} = -\frac{12}{8}m * \frac{2}{12} = -\frac{1}{4}mA$



$I_1 = \frac{15V}{R_1 + R_2 // R_3} = \frac{15V}{10K + \frac{10K}{7}} = \frac{15V \times 7}{80K}$



$$I_1 = \frac{-20}{80} + \frac{105}{80} = \frac{85}{80}\,mA$$

$$= \frac{17}{16}\,mA = 1.0625\,mA$$

$$I_2 = \frac{120}{80} - \frac{30}{80} = \frac{90}{80}\,mA$$

$$= \frac{9}{8}\,mA = 1.125\,mA$$

$$R_1 + R_2 /\!/ R_3 \quad 10K + \frac{10K}{7} \quad \frac{80K}{}$$

$$I_1 = \frac{105}{80}\,mA$$

$$I_2 = -I_1 * \frac{R_3}{R_3 + R_2} = -\frac{105}{80} \times \frac{2}{7}\,mA$$

$$I_2 = -\frac{30}{80}\,mA$$

$$V = (I_1 + I_2) R_3 = \frac{175}{80}\,m * 2K = 4.375V$$

(8) Use superposition & Voltage division

$$V = 10V * \frac{R_1 /\!/ R_3}{R_1 /\!/ R_3 + R_2} = \frac{20/12}{\frac{20}{12} + 5} \times 10 = \frac{200}{80} = \frac{20}{8}\,V.$$

$$I_1 = -V/R_1 = -20/8 \times \frac{1}{10K} = \frac{-2}{8}\,mA = -1/4\,mA$$

$$I_2 = \frac{(10 - V)}{R_2} = \frac{80 - 20}{8} \times \frac{1}{5K} = \frac{12}{8}\,mA = \frac{6}{4}\,mA$$

$$V = 15V * \frac{R_2 /\!/ R_3}{R_2 /\!/ R_3 + R_4} = 15 * \frac{10/7}{10/7 + 10} = \frac{150}{80} = \frac{15}{8}\,V$$

$$I_2 = -V/R_2 = -\frac{15}{8} \times \frac{1}{5K} = -\frac{3}{8}\,mA$$

$$I_1 = \frac{(15 - V)}{R_1} = \frac{15 \times 8 - 15}{8} \cdot \frac{1}{10K} = \frac{15 \times 7}{80}\,mA$$

$$V = \frac{20}{8} + \frac{15}{8} = \frac{35}{8} = 4.375\,V$$

$$I_1 = \frac{85}{8}\,mA\,,\quad I_2 = 9/8\,mA.$$

2.

$$I_L = \frac{R_S}{R_S + R_L} I_S$$