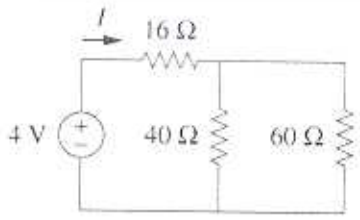
EE331 PS 4 | P2.68, 2.69, 2.74

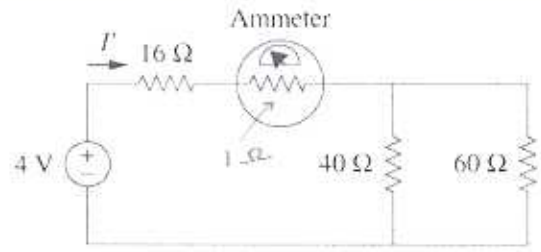
P2.68



(a)

(a) $40 \| 60 = 24\ \Omega$

$$I = \frac{4}{(16+24)} = \boxed{0.1\ A}$$



(b)

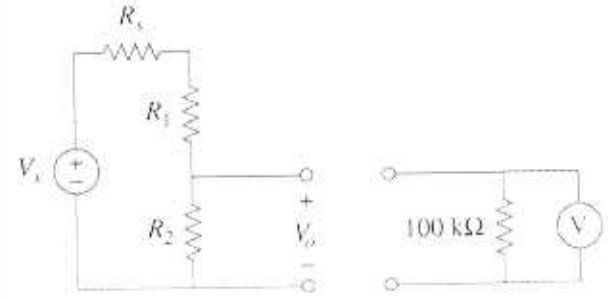
(b) $$I' = \frac{4}{16+1+24} = \frac{4}{41} = \boxed{0.0976\ A}$$

(c)

$$\%\ error = \frac{0.1 - 0.0976}{0.1} \times 100\ \%$$

$$= \boxed{2.44\ \%}$$

P2.69



$v_s = 40\ V$, $R_s = 10\ k\Omega$, $R_1 = 20k$

(a) $R_2 = 1k\Omega$

w/o voltmeter

$$V_o = \frac{R_2}{R_1 + R_2 + R_s} \cdot 40\ V$$

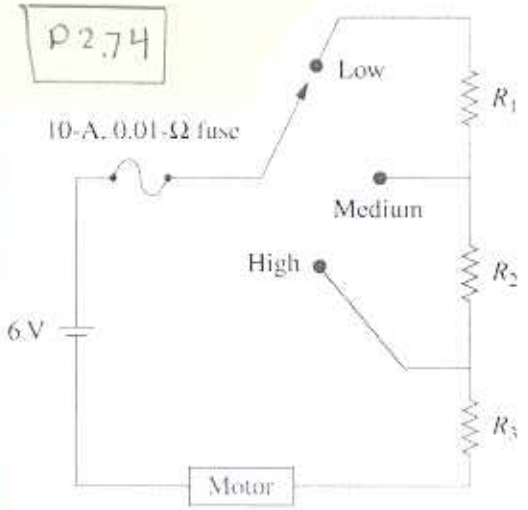
$$= \frac{R_2}{30k + R_2} \cdot 40\ V$$

w/ voltmeter

$$V_o = \frac{R_2 \| 100k}{R_2 \| 100k + 30k} \cdot 40\ V$$

R_2	$R_2 \| 100k$	w/o meter	w/ meter
1 kΩ	0.9901k	1.290 V	1.278 V
10 kΩ	9.09k	10.00 V	9.302 V
100 kΩ	50 k	30.77 V	25 V

P2.74



high 5 A, med 3 A, low 1 A

$R_{motor} = 0.020\ \Omega$

high

$$5\text{ A} = \frac{6\text{ V}}{R_3 + 0.020\ \Omega + 0.010\ \Omega}$$

$$\rightarrow \boxed{R_3 = 1.17\ \Omega}$$

med

$$3\text{ A} = \frac{6\text{ V}}{R_2 + R_3 + 0.02\ \Omega + 0.01}$$

$$\rightarrow R_2 = 2 - 1.17 - 0.02 - 0.01$$

$$\boxed{R_2 = 0.8\ \Omega}$$

low

$$1\text{ A} = \frac{6\text{ V}}{R_1 + R_2 + R_3 + 0.02 + 0.01}$$

$$R_3 = 6 - 1.17 - 0.8 - 0.02 + 0.01$$

$$\boxed{R_3 = 4\ \Omega}$$