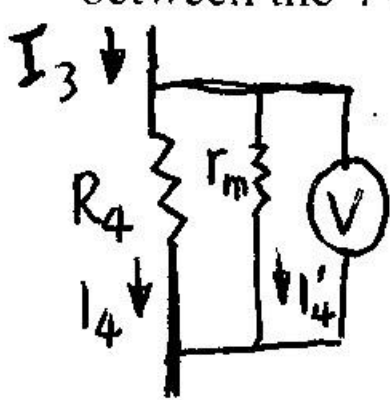
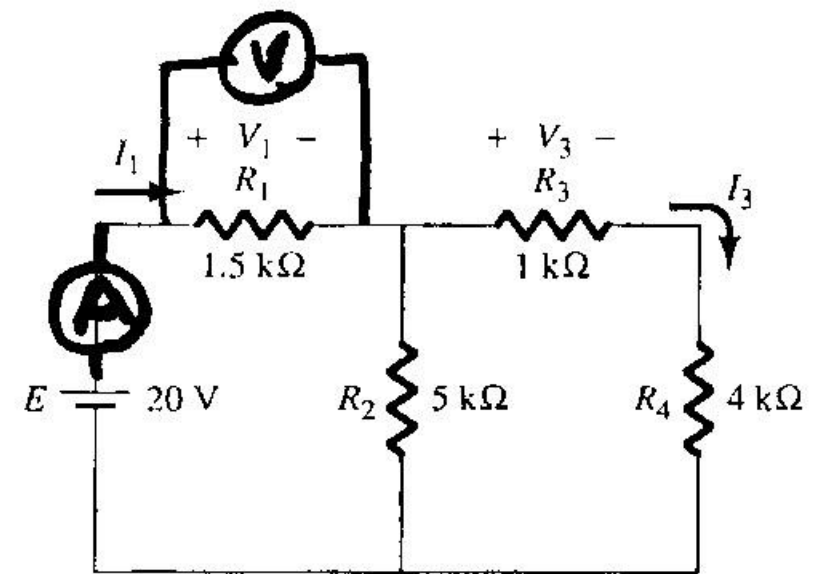


生機系電工學第三次隨堂練習 2011/03/09

學號：_____

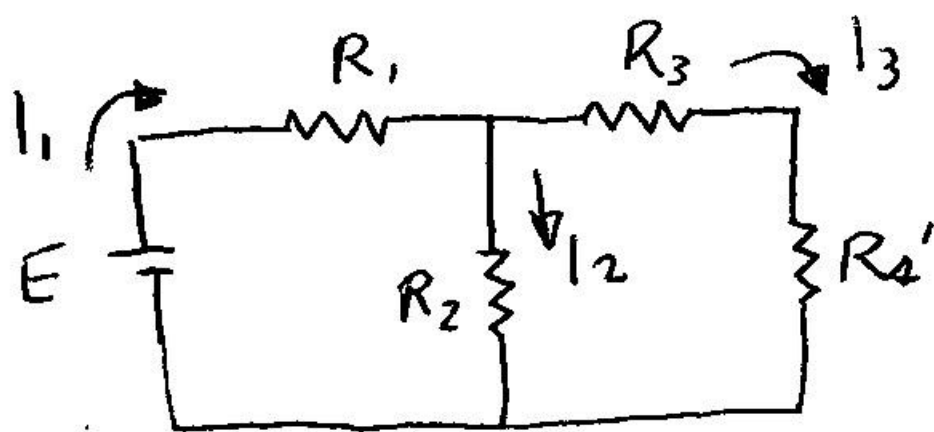
姓名：_____

1. Sketching the location and connection of ammeters and voltmeters need to measure the current I_1 and voltage V_1 .
2. Using a voltmeter with an ohm-per-volt rating of 1000, determine the indication of the meter when it is placed across the 4-k Ω resistor if the 50-V scale is used.
3. Using an ammeter with internal resistance of 200 Ω , determine the indication of the meter when it is inserted between the 4-k Ω resistor and 1-k Ω resistor.



理想的 voltmeter 內部電阻 r_m 越大越好，當 $r_m \rightarrow \infty$ 測得 R_4 的理想值；當 r_m 非無限大， I_3 一部分流向 R_4 ，一部分流向 r_m ，測得跨越 R_4 的電壓降，當然比 $r_m \rightarrow \infty$ 時，小了一些。

2. $r_m = 50V \times 1000 \Omega/V = 50k\Omega$



$$R_4' = r_m \parallel R_4 = \dots = 3.704k\Omega$$

$$R_T = R_1 + (R_2 \parallel (R_3 + R_4'))$$

$$= \dots \text{ (列出數字)}$$

$$= 3.924k\Omega$$

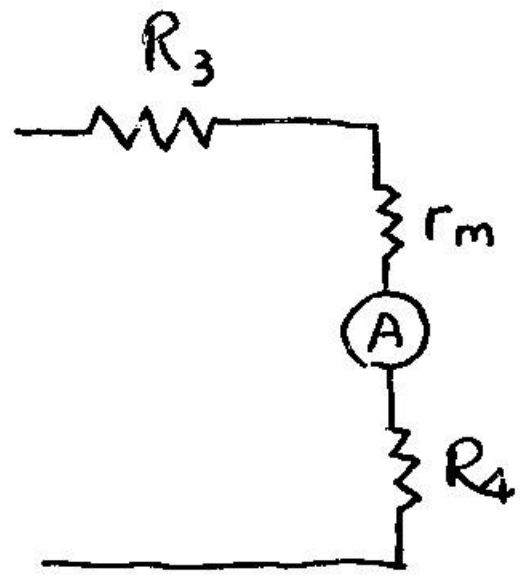
由 E 流出的電流 $I_1 = \frac{E}{R_T} = \frac{20V}{3.924k\Omega} = 5.047mA$

利用 Current-divider rule $I_3 = I_1 \times \frac{R_2}{R_2 + R_3 + R_4'} = 2.626mA$

利用 Current-divider rule $I_4 = I_3 \times \frac{r_m}{R_4 + r_m} = 2.431mA$

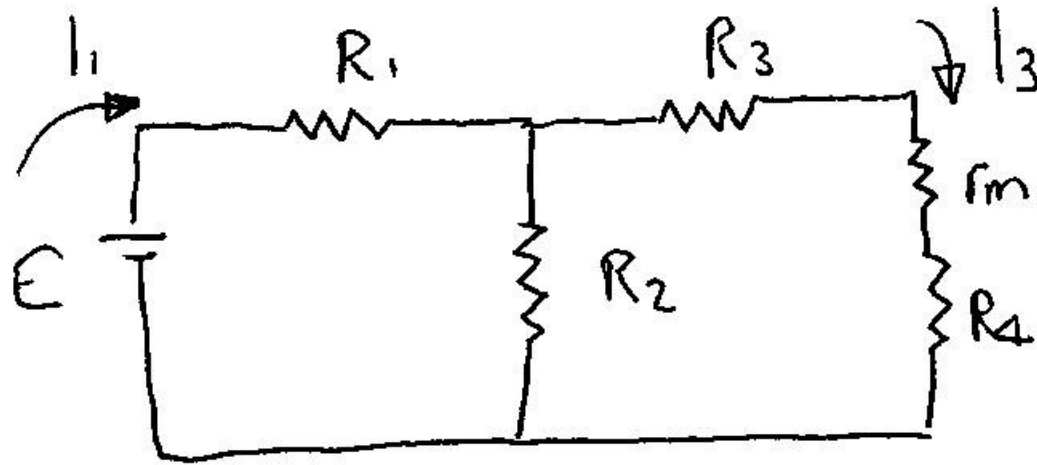
跨越 R_4 的電壓降 $V_4 = I_4 \times R_4 = 9.726V$

3.



理想的 ammeter 内部电阻

$$r_m = 200 \Omega$$



$$R_T = ((R_3 + r_m + R_4) \parallel R_2) + R_1$$

$$= \dots$$

$$= 5.2 \text{ k}\Omega$$

E 流出的电流 $I_1 = \frac{E}{R_T} = \frac{20 \text{ V}}{5.2 \text{ k}\Omega} = 4.939 \text{ mA}$

利用 (7) Current-divider rule $I_3 = I_1 \times \frac{R_2}{R_2 + R_3 + r_m + R_4}$

$$= 2.421 \text{ mA}$$

4. 理想 Ammeter, Voltmeter?

$$R_T = R_1 + (R_2 \parallel (R_3 + R_4)) = 4 \text{ k}\Omega$$

E 流出的电流 $I_1 = \frac{E}{R_T} = \frac{20 \text{ V}}{4 \text{ k}\Omega} = 5 \text{ mA}$

利用 current-divider rule $I_3 = I_1 \times \frac{R_2}{R_3 + R_4} = 2.5 \text{ mA}$

跨 R_4 的电压略 $V_4 = I_3 \times R_4 = 10 \text{ V}$