

ECE 3041

Homework Assignment No. 2

Spring 2012 First Homework Problem Set for Experiment No 4

Due Week of January 30

For each step in these problems, determine the Thévenin equivalent circuit with respect to the meter. SPICE may be used to check the solutions but the problems must be solved using classical techniques.

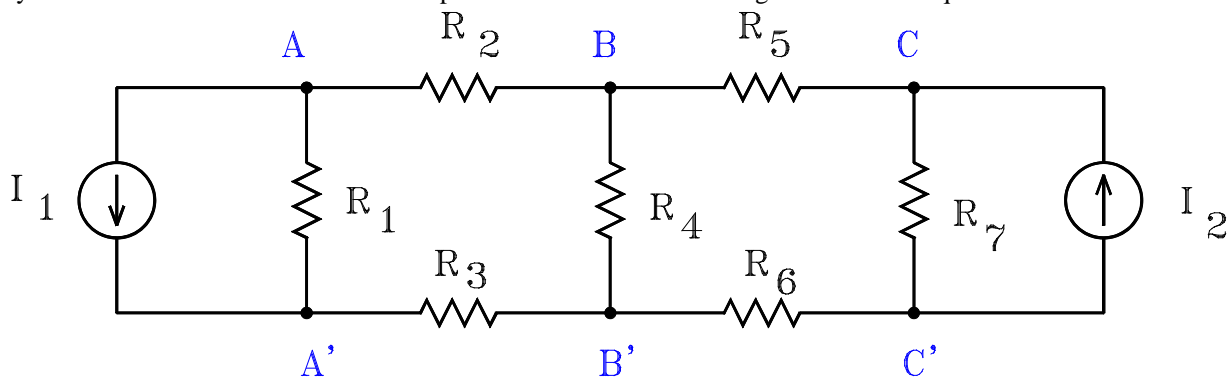


Figure 1

Problem 1

For the circuit shown in Fig. 1 the component values are: $R_1 = 22 \text{ k}\Omega$, $R_2 = 11 \text{ k}\Omega$, $R_3 = 13 \text{ k}\Omega$, $R_4 = 3 \text{ k}\Omega$, $R_5 = 12 \text{ k}\Omega$, $R_6 = 15 \text{ k}\Omega$, and $R_7 = 18 \text{ k}\Omega$. The sources are: $I_1 = 3 \text{ mA}$ and $I_2 = 4 \text{ mA}$.

(a) Determine the percentage error due to dc voltmeter loading in the measurement of the dc voltage $V_{AA'}$ in the circuit shown in Fig. 1. The voltmeter leads are connected to nodes A and A' in the circuit. The dc voltmeter (which isn't shown) is a Simpson Meter Model 260-7. The voltmeter is set to the range that is the smallest that exceeds the Thévenin voltage with respect to the voltmeter. The available ranges for the Simpson meter when used as a dc voltmeter are: 1 V, 2.5 V, 10 V, 50 V, 250 V, 500 V, and 1,000 V.

(b) Determine the percentage error if the voltmeter is used to measure the voltage $V_{BB'}$.

(c) Determine the percentage error if the voltmeter is used to measure the voltage $V_{CC'}$.

Problem 2

Repeat Problem 1 if the voltmeter is changed to a Fluke 73 HHDMM.

Problem 3

Determine the percentage error due to dc ammeter loading in the measurement of the dc current I_x in the circuit shown in Fig. 3. The internal resistance of the ammeter is 7.3Ω . The component values are: $R_1 = 12 \Omega$, $R_2 = 18 \Omega$, $R_3 = 22 \Omega$, and $R_4 = 15 \Omega$. The sources are: $E_1 = 12 \text{ V}$ and $E_2 = 5 \text{ V}$.

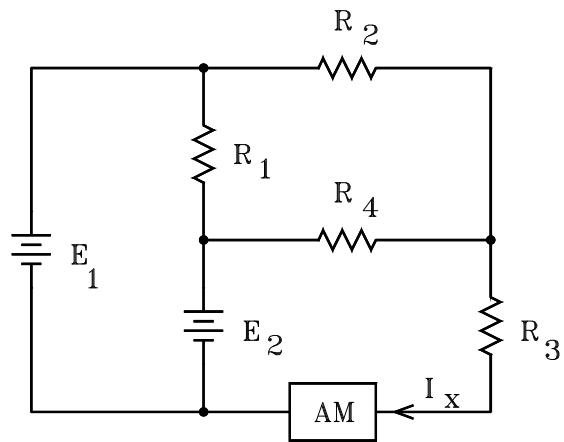


Figure 2