

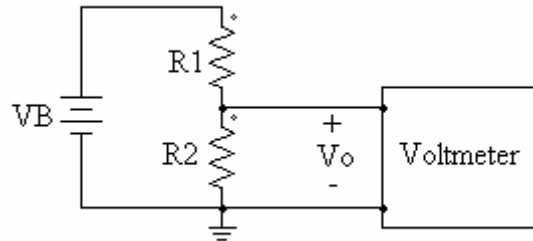
Massachusetts institute of Technology
Department of Nuclear Science and Engineering
Department of Electrical Engineering and Computer Science

22.071, 6.071 - Introduction to Electronics, Signals and Measurement
Spring 2006

Homework 2
Due 2/22/06

Problem 1.

A voltage divider is formed with resistors R1 and R2. A voltmeter is used to measure the voltage across resistor R2. The following table gives the values for the measured voltage V_o as a function of resistors R1 and R2 and the ideal voltage source V_B .

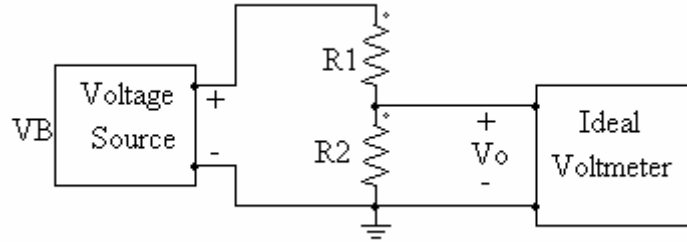


V_B (Volts)	R1 (Ohms)	R2 (Ohms)	V_o (Volts)
5	1000	1000	2.498
5	10000	10000	2.475
5	100000	100000	2.273
5	500000	500000	1.667

1. From these data develop a simple circuit model for the voltage measuring device.
2. Give the parameters for an ideal voltmeter (i.e a device which for the above cases will always measure 2.50 Volts).

Problem 2.

We know have an ideal voltmeter and we measure the voltage across R2 with the following results

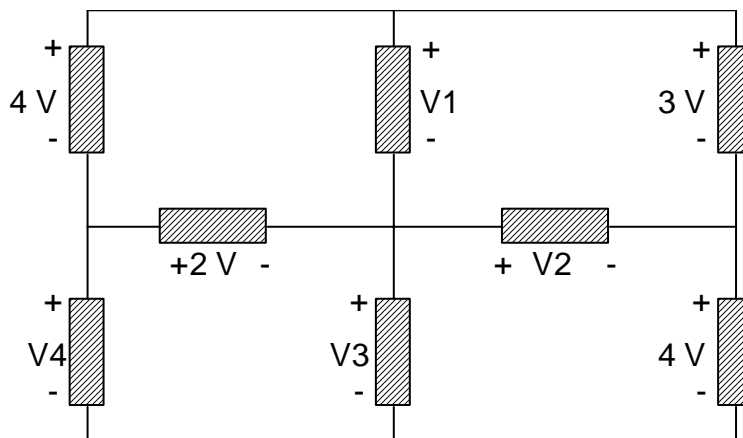


VB (Volts)	R1 (Ohms)	R2 (Ohms)	Vo (Volts)
5	1000	1000	1.667
5	10000	10000	2.381
5	100000	100000	2.488
5	500000	500000	2.498

1. Now develop a simple model for the voltage source
2. How would you design an ideal voltage source?

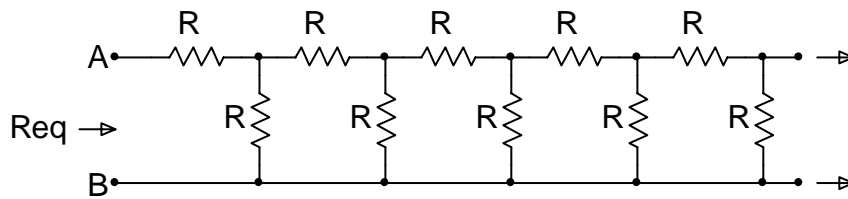
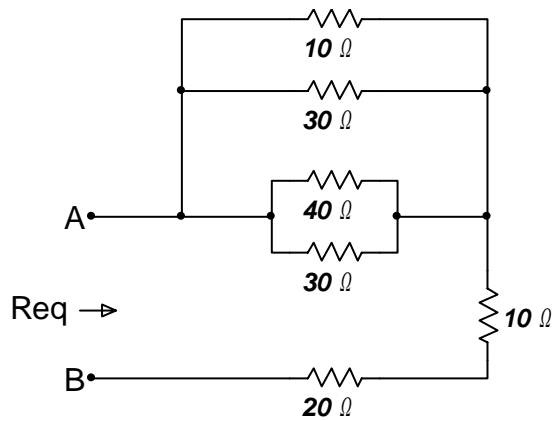
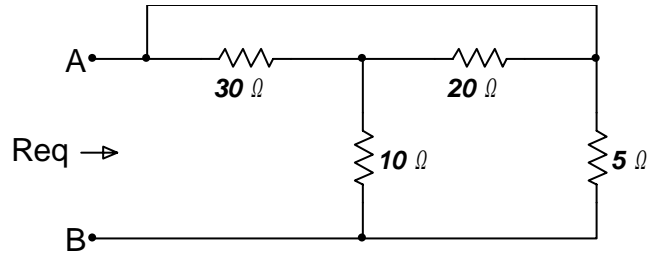
Problem 3.

The hatched rectangles in the circuit below represent general two terminal elements with the polarity and voltage drop across them as indicated. Use Kirchhoff's laws to determine the unknown voltages V1, V2, V3, V4.



Problem 4.

Find the equivalent resistance of the following resistor networks at the terminals A-B



Hint: $\infty + 1 = \infty$