

**EECS 1 Homework 2**  
**Due in class Monday Feb. 9, 2004**

Read Ch. 2 (Design) and Secs. 19.7 – 19.11 in text. Also read Sec. 20.3 (capacitance) in preparation for next week's lab (Parallel and Series Elements).

Problem 2.1 (considerations in designing a lab security system). Notes: Tying every piece of equipment down might keep them from being stolen but would it hamper users? Note that the anti-theft systems used at the exits of stores have problems (they can be very expensive, and we discovered in Cory Hall that some of them emit electromagnetic noise that interferes with measurements!); have you heard of more recent technology that you think might be used instead?

Prob. 19.6 (sign conventions)

Prob. 19.9 (lifetime of a chemical battery) Note: Battery lifetimes are limited because a chemical reaction inside produces the electrical energy, and there's only a finite volume of chemicals contained inside.

Prob. 19.21 (voltage divider)

Light-emitting diode problem: When we discuss light-emitting diodes (LEDs) later in the course you'll find that as long as there's a current flowing through the LED, the voltage drop across the LED is approximately 2 volts. Suppose you connect an LED in series with a 5 V voltage source and a resistor  $R$  chosen to limit the current through the LED to 20 mA. Draw the circuit and find the value of this current-limiting resistance. (The symbol for a diode appears in Fig. 25.3; current flows in the direction of the arrowhead.)

Loudspeaker problem. A loudspeaker converts electrical energy into sound. A loudspeaker is modeled electrically as a resistor (called the internal resistance) whose value is typically 8 ohms. The power rating of a speaker is the maximum power that it can handle without damage. Find the maximum safe current that can be delivered to a stereo speaker that has an internal resistance of 8 ohms and a power rating of 200 watts.