

**EECS 1 Homework 3**  
**Due in class Monday Feb. 16, 2004**

Read Ch. 3 (Engineering Ethics) and Secs. 19.7-19.11.

Problem 1. Suppose you had been a NASA engineer working on the disastrous shuttle Columbia flight last year. Given the facts about the Challenger shuttle disaster in 1986, what might you have done to get the managers at NASA to take more seriously and investigate (via photos, possible examination by an astronaut on a spacewalk, etc.) the possible damage done by the piece of foam that struck the spacecraft on liftoff?

Prob. 2 Prob. 20.1 in text (energy stored in capacitors).

Prob. 3. In class I charged a 30,000  $\mu\text{F}$  electrolytic capacitor to 60 volts, and then discharged it by putting a screwdriver across the terminals.

- a. How many joules of energy were stored in the capacitor?
- b. If done more carefully, the discharge can actually weld the screwdriver onto the terminals (the metal of the screwdriver melts where it contacts the terminals and then it solidifies, attaching the screwdriver to the terminals). We once measured the time it takes to discharge – that is, to dissipate all the stored energy in the form of heat; we found it took about one ms. If the energy was dissipated at a constant rate, what was the power in watts being dissipated during the discharge?

Prob. 4 Prob. 19.22 in text The point of this problem is to be able to find the Thevenin equivalent circuit for this useful circuit that we've discussed, the voltage divider.

Prob. 5. Find the Thevenin equivalent circuit for the voltage divider of Fig. 19.15. Specifically, find the Thevenin equivalent for the circuit consisting of the voltage source  $V_1$  (let it be 9 volts),  $R_1$  (let it be 330  $\Omega$ ) and  $R_2$  (let it be 470  $\Omega$ ). (If you are unsure about the answer you got in Prob. 4 for the short-circuit current, you may assume it is 15 mA flowing downward between the two terminals at the right in Fig. 19.15.)