

Massachusetts Institute of Technology
6.101 Analog Electronics Lab
Spring 2007
Problem Set 1
Due Wednesday, February 21, 2007

Refer to Chapters 1 and 2 of *Circuit Analysis and Design, 3rd Edition*
by Donald Neamen for text that supports this problem set.
Remember to use 5% standard resistor values. Assume $V_T=26\text{mV}$

Problem 1. Neamen 1.27 (2nd ed: 1.20)

Problem 2. Neamen 1.30 (2nd ed: 1.24)

Problem 3. Neamen 1.43 (2nd ed: 1.31)

Problem 4. Neamen 2.16 (2nd ed: 2.12)
Change R_i to 15Ω

Problem 5.

You measure the open circuit voltage of an unknown battery and find it to be 9Volts. You then put a 510Ω resistor across the terminals of the battery and measure the voltage to be 8.7 Volts. What is the internal resistance of the battery?

Last Problem on the back...

Problem 6.

After buying a new car, you decide to install aftermarket audio equipment to complement the stock equipment. You choose to start with a 12" subwoofer that will stow away nicely in your trunk. In order to drive the speaker, you will need a good amplifier to meet the power demands of the low end bass signal. A fellow 6.101 student suggests that you look into a class-D amplifier.

You begin by looking at the output stage of the class-D amplifier in lab. The output stage you build is made up of 4 N-Channel MOSFETs arranged in an H-bridge configuration. You begin probing your setup and quickly notice that MOSFETs keep blowing up when you power the circuit. Your setup is shown below. What is causing the problem?

Optional: How would you fix this problem? Knowing this will help you out later in the course.

