

## EE 42 Introduction to Electronics for **Computer Science**

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## Problem Set #1 Due:1 PM Sep 3rd, 2003 in box outside 275 Cory

## **Announcements:**

Go to a discussion section this week and get acquainted with your TA, the course schedule and a basic circuit. (M 11, M 3, W 11, Th 1, F 1 in 293 Cory Hall) Professor Neureuther will hold Office Hours in 100 GPB on Tu and Th from 10:30-11 and then go to 510 Cory for the 11-11:30 part of the Office Hour.

Reading: Chapter 0 and 1 Schwarz and Oldham.

Fall 2003.

- 1.1 Digital Samples: Problem 0.5 in Schwarz and Oldham but approximate by a sample and hold process in which each sample is a bar in a bar graph with the height of the analog signal and centered at the sample time.
- **1.2 Charge and Current:** A sample of a material is 1 mm x 1 cm x 1 cm and has a density of  $10^{22}$ atoms per cm<sup>3</sup>. Suppose that 0.001 % of the atoms have an extra electron.
  - a) Find the number of atoms in the sample.
  - b) Find the net charge of the sample.
  - c) Find the current flowing in at a constant rate required to neutralize the sample in 1 second.
  - d) Find the current flowing out at a constant rate required to neutralize the sample in 1 ps  $(10^{-12} \text{ seconds}).$

## 1.3 Kirchhof's Laws and Power: Circuit P1.3 is shown below.

- a) Use KCL at node C to find  $I_{R2}$  and then  $V_{C}$ .
- b) Use KCL at B to find  $I_{R1}$  and then  $V_{B}$ .
- c) Use KVL to find the voltage on the current source  $V_{s2}$ .
- d) Find the power into the voltage source (circle with  $V_{s1}$  and  $I_{s1}$ ).
- e) Find the power into the current source (diamond with  $V_{s2}$  and  $I_{s2}$ ).
- f) Show that the sum of the power for all elements in the circuit is zero.

