NAME (please print) _____

UNIVERSITY OF CALIFORNIA
Electrical Engineering and Computer Sciences

EECS 145L Electronic Transducer Lab
MIDTERM #2 (100 points maximum)

(closed book, equation sheet provided, calculators OK)
(You will not receive full credit if you do not show your work)

PROBLEM 1 (20 points)

In 50 words or less, describe the essential differences between the following two items:

1a (10 points) [Sensor] and [Actuator]

1b (10 points) [Thermocouple] and [Thermistor]

NAME (please print) _____

PROBLEM 2 (16 points)

2a (8 points) What are the technical requirements of the ground fault interrupter circuit? (Hint: the maximum safe current through the human body is 5 mA.)

2b (8 points) Describe how the ground fault interrupter circuit functions to meet those requirements.

NAME (please print) _____

PROBLEM 3 (16 points)

3a (8 points) What are the technical requirements of the electronic ice point circuit for a thermocouple?

3b (8 points) Describe how the electronic ice point circuit functions to meet those requirements.

PROBLEM 4 (48 points)

Design a system that converts sound into light for transmission down an optical fiber and then converts the optical signal back into sound.

Assume the following

1 You have a microphone that produces a maximum differential signal of 100 mV p-p (peak-to-peak) at the maximum sound intensity that you need to consider.

2. The microphone wires have 60 Hz electromagnetic pickup of 10 mV common mode (assume perfect common mode rejection and zero differential 60 Hz pickup).

3. You have an light emitting diode (on one end of the optical fiber) that should produce 100 mA p-p when the microphone signal is at maximum.

4. You have a photodiode (on the other end of the optical fiber) that produces 1 mA p-p when the light emitting diode is producing its maximum signal (100 mA p-p input).

5. The loudspeaker should be driven at 10 V p-p when the microphone signal is at maximum. The speaker has an input impedance of 10 Ω.

6. Each element in the system should be operated in a linear mode (output proportional to input).

In your design you should provide enough detail so that a skilled technician could be able to build it and understand how it works. Include all necessary components and label all signals with their maximum (p-p) amplitude. You may use any circuit components used in the laboratory exercises or discussed in lecture, but keep it simple.