NAME (please print) _____ SID_____

UNIVERSITY OF CALIFORNIA, BERKELEY
Electrical Engineering and Computer Sciences Department

EECS 145L Electronic Transducer Lab
MIDTERM #2 Fall 2000 (100 points maximum)

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

PROBLEM 1 (36 points)

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

1a (12 points) [Stress] and [Strain]

1b (12 points) [Thompson emf] and [Peltier emf]

1c (12 points) [Platinum resistance thermometer] and [Thermistor]

PROBLEM 2 (32 points)

2a (20 points) Describe the operation of the isolation amplifier in words or by sketching the internal block elements

2b (12 points) Describe how the isolation amplifier can convert small signals at its input to larger signals at its output while preventing dangerous 60 Hz currents going from its output to its input.

PROBLEM 3 (32 points)

Design a circuit for powering an incandescent lamp (lightbulb) in a photographic exposure system that requires a constant light source. Over time, some of the lamp filament evaporates and coats the inside of the glass envelope with a metal film that absorbs light. As the filament becomes thinner, variations in its diameter become more important, and cooler and hotter sections develop. Consequently, the relationship between voltage and light output over the life of the lamp is complicated and difficult to predict.

Technical requirements:

1 Constant light output over the lifetime of the lamp and during minor changes in the wall outlet voltage.

2 The ability to adjust the light output

3 Sufficient power for a 100 watt lamp with a maximum voltage of 10 volts.

3a (20 points) Sketch your design below. Provide enough detail so that a skilled technician would be able to build it and understand how it works. Include and label all necessary components. Label all signals with typical voltage and current values. You may use any circuit components from the laboratory exercises, textbook, or lectures, but keep it simple.

(Hint: Use an op-amp with negative feedback)

3b (12 points) Describe how the circuit responds to the gradual development of a metal film on the inside of the glass envelope.