NAME (please print) ______________________________ SID __________________

UNIVERSITY OF CALIFORNIA, BERKELEY
Electrical Engineering and Computer Sciences Department

EECS 145L Electronic Transducer Lab
MIDTERM #1 (100 points maximum)
October 3, 2007

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

PROBLEM 1 (30 points)

Design a circuit using op-amps for adding two waveform inputs V_1(t) and V_2(t) to produce the output $V_0(\mathrm{t}) = a\ V_1(t) + b\ V_2(t)$, where both a and b are positive, and the two inputs have high impedance.

Sketch your circuit design and describe all circuit elements.

PROBLEM 2 (10 points)

Given an instrumentation amplifier, describe how you would measure the differential and common mode gains at 10 different frequencies.

PROBLEM 3 (20 points)

Design a Butterworth low-pass filter that has gain = 1 at 0 Hz, 0.999 at 20 kHz, and 0.0001 at 60 kHz, and the minimum number of stages. Design means determining the number of stages and the corner frequency

PROBLEM 4 (30 points)

Describe how each of the following works in detail

4a (10 points) Electromagnetic isolation amplifier

4b (10 points) Digital angle encoder

4c (10 points) Stepping motor

PROBLEM 5 (10 points)

You have a large bag of 1kΩ resistors. You measure the collection and find that the resistors have an average resistance of 1050 Ω and a standard deviation of 100 Ω.

If you connect pairs of these resistors to make a set of 2 kΩ resistors, what is the average resistance and standard deviation of the new resistors?