ELEN 458 (ESS) **Due: September 22, 1999**

HOMEWORK ASSIGNMENT #2

Problem 1. Design a first-order low pass with a voltage gain of 0dB and a variable cut-off frequency from 50 KHz to 500KHz. Use commercial OTAs, R's and C's.

a) Derive your design procedure.
b) Provide your frequency response simulations with ideal and real (commercial) OTAs. Use DC sweep to vary the cut-off frequency.
c) Simulate an impulse response. What is the analytical expression for the impulse response?

Discuss your theoretical and simulated results. Make sure the input signal to the OTAs does not exceed 40mV.

Problem 2. Design an all-pass filter (first-order) to operate from a few hertz to the maximum possible frequency. The phase and group delay are free for you to select. You can use Op Amp and/or OTA R's and C's in your circuit. Provide:

a) Design procedure.
b) Simulated results using real amps.
c) A discussion between simulated and theoretical results.
d) Indicate a practical application of this "delay".

Problem 3. Repeat problem 2 for a fully differential balanced architecture. How does the mismatch of components affect the A_{cm} voltage gain?

Extra Credit

Implement your design equations in an Excel file, such that you can easily change design specs.

HINT: Use OTA model CA3080 or LM13600 from the manufacturer via the internet.