UNIVERSITY OF CALIFORNIA

College of Engineering

NTU 776CA (EECS 247)

Midterm (120 minutes)

October 15-19, 2001

Exam is open-book, open-notes. Clearly mark results with box around. No credit for ambiguous solutions. Show derivations. Return this cover page. Good luck!

Name:________________________________

PROBLEM	**SCORE**
1	
2	
Total	

1. [40] Consider the following Z-domain filter transfer function.

$$H(z) = \frac{1 - z^{-1}}{2 + z^{-1}}$$

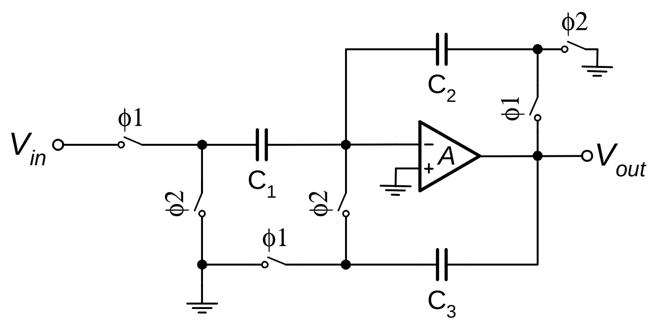
a) Find the poles and zeros of *H(z)*. [10]

b) Sketch the frequency response of the filter between $-\pi$ and π. Is it highpass, lowpass, or bandpass? [10]

c) Draw a fully differential circuit that realizes this transfer function using LDI integrators and switched capacitors. Assume you have non-overlapping two-phase clocks available. Your answer will be graded on the number of components used in your circuit. [20]

   Hint: you may realize negative numbers with fully differential circuits.

2. [60] Performance of switched-capacitor circuits often suffers from nonidealities of op amps, i.e., finite bandwidth, finite gain, offset etc. The following predictive SC amplifier is claimed to be able to compensate the finite-gain effect of the op amp. Assume the op amp gain is A (frequency independent). $\phi1$ and $\phi2$ are non-overlapping two-phase clocks. V_{in} and V_{out} updates when $\phi1=1$.



a) Derive the Z-domain voltage transfer function $V_{out}(z)/V_{in}(z)$ with finite A. [20]

b) Explain why the predictive SC amplifier works. What is the limitation of this compensation scheme? You may explain intuitively and justify your answer with the result you obtain in a). [20]

   Hint: think about when the frequency of V_{in} approaches f_{clk}, the clock frequency.

c) Someone also claims this compensation scheme can remove the input offset of the op amp. Can you prove that? [20]