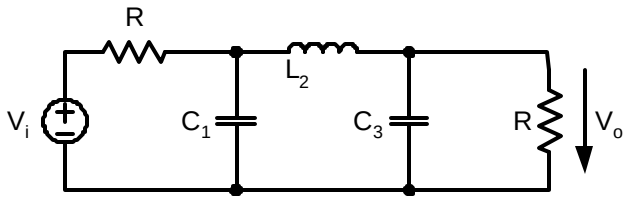
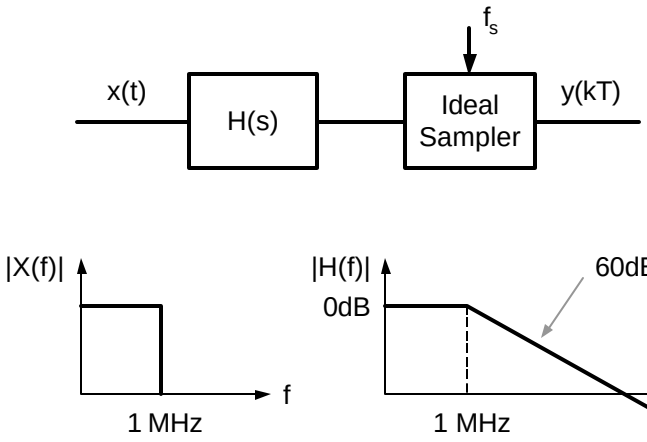
UNIVERSITY OF CALIFORNIA
College of Engineering
Department of Electrical Engineering
and Computer Sciences

	Midterm Exam	**EECS 247 (NTU)**
B. Murmann	**October 20-24, 2003**	**FALL 2003**

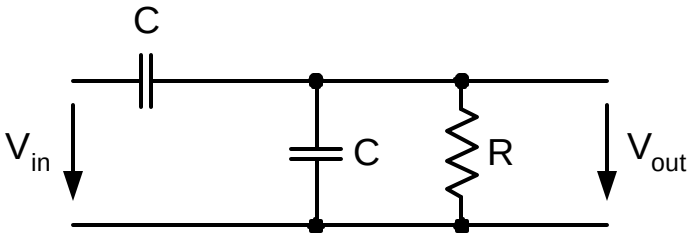
1. (15 points) Synthesize the passive LC ladder filter shown below with active RC differentiators with H(s)=sRC.
   a) Draw the circuit diagram of the active filter. Specify all capacitors as a function of the parameters of the ladder prototype (use negative capacitors as needed). Choose all resistors equal R.
   b) Scale the filter to double the gain to $V_o(s)/V_i(s)$.



2. (10 points) For the system shown below, what is the minimum sampling frequency f_s that guarantees > 60 dB attenuation of aliasing components in the discrete time signal y(kT), where $T=1/f_s$?. (Assume that unwanted tones can be present in x(t) at any arbitrary frequency outside the desired signal band of 1MHz)



3. (10 points) The output V_{out} of the filter shown below is processed by an ideal sampler operating at the sampling frequency f_s. (e.g. an ideal A/D converter). V_{in} is a sinusoid with amplitude A and frequency f_x=1.25fs. Derive an expression for the amplitude and frequency of the sampled output.



4. (5 points) A 10-bit ADC has DNL(j)= $(-1)^j$, where j is the j^{th} code of the converter. Assuming that there are no other error sources (e.g. thermal noise), what is the SNR of this ADC?

5. (10 points) Derive an expression for the output $V_o(z)$ of the switched capacitor circuit below as a function of its inputs $V_1(z)$ and $V_2(z)$.