

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

Homework 5

EECS 247

B.E. Boser

Due Thursday, November 18, 2003

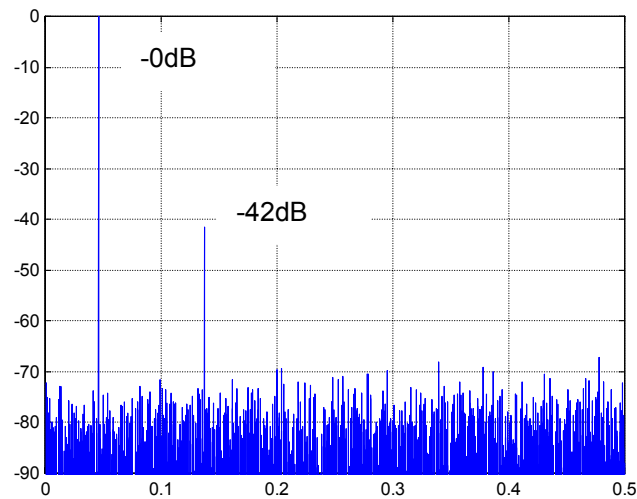
Fall 2003

B. Murmann

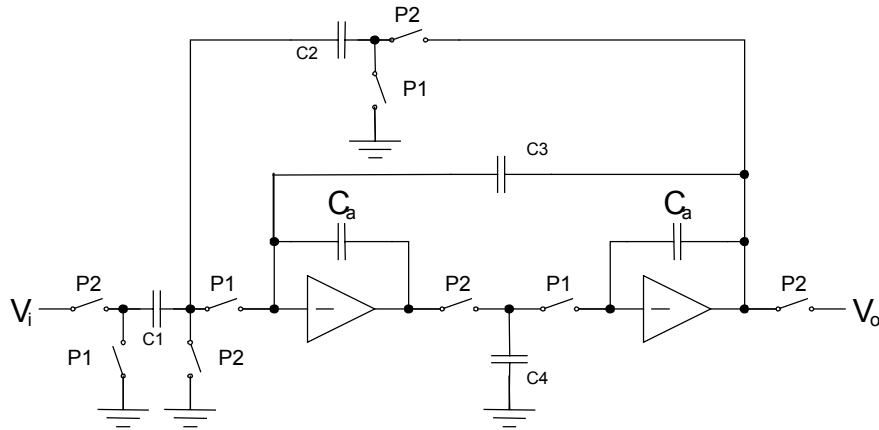
1. [25 points] Shown below is a 4096 point FFT of the output of an A/D converter for full scale sinusoidal input. Estimate the INL of the converter in LSBs.

Note 1: the definition of INL requires that the offset and gain of the ADC are adjusted for zero error at the end points (full scale).

Note 2: $\sin^3 \alpha = \frac{3}{4} \sin \alpha - \frac{1}{4} \sin 3\alpha$



2. [25 points] Compute the z-transform $V_o(z)/V_i(z)$ realized by the SC filter shown below. Ignore parasitic capacitances. Note: P_1, P_2 are non-overlapping 2-phase clocks. Set $C_a=1$.



3. A full-scale sine wave with frequency $f_x=7\text{MHz}$ is input to a 12-Bit DAC clocked at $f_s=20\text{MHz}$. Calculate the frequency, amplitude (relative to full-scale input) and delay (relative to the input) of all tones in the DAC output up to $f=50\text{MHz}$. Assume the DAC output for each sample is held at the DAC output voltage for 30ns and returned to zero for 20ns . Ignore quantization noise and other nonidealities.