

ROSE-HULMAN INSTITUTE OF TECHNOLOGY
Department of Electrical and Computer Engineering

ECE 380 Discrete-Time Systems

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Homework 2

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1. The following signal:

$$x(t) = 2 \cos(2\pi 400t) + 2 \cos(2\pi 2000t)$$

is sampled at $f_s = 5000$ samples/second. Sketch the magnitude of the spectrum of the output of each of the following samplers. Be sure to label all significant frequencies, amplitudes and areas.

- An ideal sampler. Sketch from $-2\pi 2f_s$ to $2\pi 2f_s$.
 - A sample-with-pulse with duty cycle $\frac{T}{T_s} = \frac{1}{4}$. Sketch from $-2\pi 4f_s$ to $2\pi 4f_s$.
 - A sample-with-pulse with duty cycle $\frac{T}{T_s} = \frac{1}{2}$. Sketch from $-2\pi 4f_s$ to $2\pi 4f_s$.
 - A sample-and-hold with duty cycle $\frac{T}{T_s} = 1$. Sketch from $-2\pi f_s$ to $2\pi f_s$.
- Problem P-5.1 from Signal Processing First.
 - Problem P-5.2.
 - Problem P-5.3.
 - Problem P-5.9.