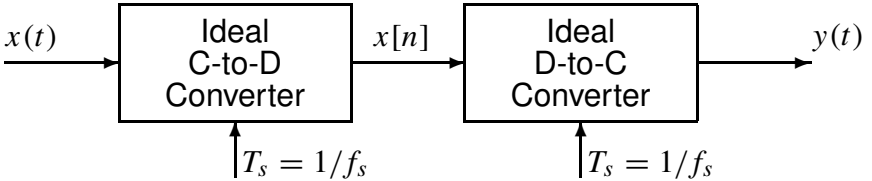
PROBLEM:



In all parts below, the sampling rates of the C/D and D/C converters are **equal,** and the input to the Ideal C/D converter is

$$x(t) = 2\cos(2\pi(50)t + \pi/2) + \cos(2\pi(150)t).$$

(a) If the output of the ideal D-to-C Converter is

$$y(t) = x(t) = 2\cos(2\pi(50)t + \pi/2) + \cos(2\pi(150)t),$$

what general statement can you make about the sampling frequency f_s in this case?

(b) If the sampling rate is $f_s = 250$ samples/sec., determine the discrete-time signal $x[n]$, and give an expression for $x[n]$ as a sum of cosines. *Make sure that all frequencies in your answer are positive and less than π radians.* Plot the spectrum of this signal over the range of frequencies $-\pi \leq \hat{\omega} \leq \pi$. Make a plot for your answer, but label the frequency, amplitude and phase of each spectral component.

(c) If the output of the ideal D-to-C Converter is

$$y(t) = 2\cos(2\pi(50)t + \pi/2) + 1,$$

determine the value of the sampling frequency f_s. (Remember that the input $x(t)$ is as defined above.)