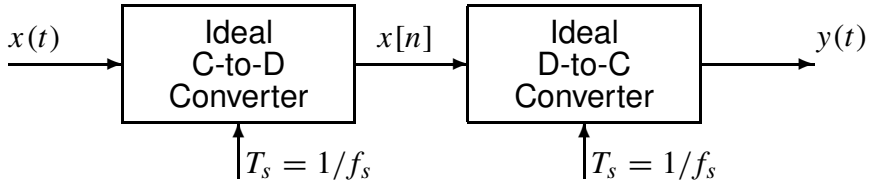
PROBLEM:

Consider the following system.



(a) Suppose that the discrete-time signal $x[n]$ is given by the formula

$$x[n] = 10\cos(0.18\pi n + \pi/4)$$

If the sampling rate is $f_s = 2500$ samples/second, determine two *different* continuous-time signals $x(t) = x_1(t)$ and $x(t) = x_2(t)$ that could have been inputs to the above system; i.e., find $x_1(t)$ and $x_2(t)$ such that $x[n] = x_1(nT_s) = x_2(nT_s)$ if $T_s = 1/2500$. Both of these input signals should have a frequency less than 2500 Hz. Give a formula for each signal.

(b) For $x[n]$ given in part (a), what is the frequency of the analog signal $y(t)$ that will be reconstructed by the ideal D-to-C converter operating at sampling rate 2500 samples/second?

(c) If the input $x(t)$ is given by the two-sided spectrum representation shown below, determine a simple formula for $y(t)$ when $f_s = 2500$ samples/sec. (for both the C/D and D/C converters).