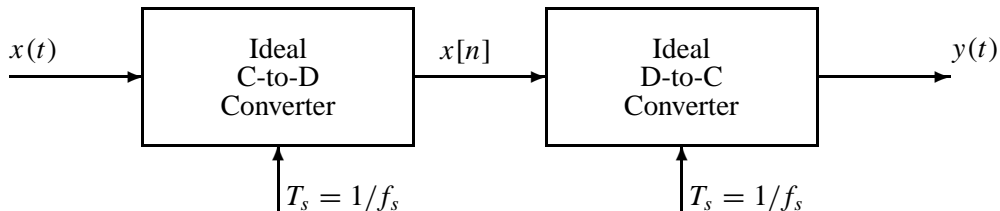




PROBLEM:

Consider the following sampling and reconstruction system.



where $x[n] = x(nT_s)$. If $x(t)$ is given by the formula

$$x(t) = 10 \cos(20\pi t - \pi/4) - 5 \cos(50\pi t),$$

- What condition must be satisfied by the sampling rate, $f_s = 1/T_s$, such that $y(t) = x(t)$?
- How should f_s be chosen so that $y(t) = A + 10 \cos(20\pi t - \pi/4)$?
- Determine the constant A in part (b).



- Sampling & aliasing

(a) Highest frequency is 25 Hz i.o.

$f_s > 50$ avoids aliasing & output = input

(b) Clearly, we want the 25 Hz term to alias to zero. $\Rightarrow f_s = 25 \text{ Hz}$. (Note $25 > 2(10)$)

$$(c) x[n] = 10 \cos\left(\frac{20\pi n}{25} - \frac{\pi}{4}\right) - 5 \cos\left(\frac{50\pi n}{25}\right)$$

$$= 10 \cos\left(\frac{20\pi n}{25} - \frac{\pi}{4}\right) - 5$$

$$\Rightarrow y(t) = \underbrace{-5} + 10 \cos(20\pi t - \pi/4)$$