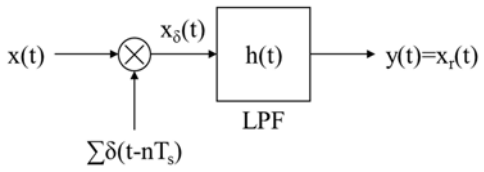
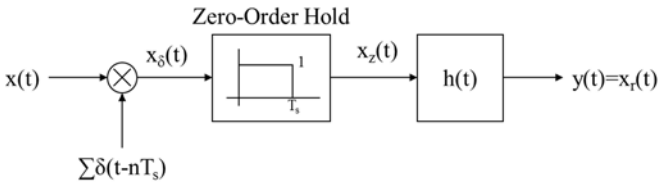
Discussion 9: Sampling and Laplace Transform Practice

1. Sampling with Zero-order-hold

Sinc-interpolation block diagram:



Zero-order-hold block diagram:



Consider $x(t) = \cos(2\pi 60t)$, $f_{sampling} = 360Hz$.

a) Sample the signal using Dirac deltas, show that we can recover the original signal using an ideal LPF (following sinc-interpolation block diagram).
b) Sample the signal using zero-order-hold, find h(t) such that we can recover the original signal.

2. Laplace Transform Practice

Analysis Equation

$$X(s) = \int_{-\infty}^{\infty} x(t)e^{-st}dt$$

Synthesis Equation

$$x(t) = \frac{1}{2\pi j}\int_{\sigma-j\infty}^{\sigma+j\infty} X(s)e^{st}ds$$

a) Find $X(s) = \mathcal{L}\{e^{-\alpha t}u(t)\}$ using the analysis equation.
b) Find $X(s) = \mathcal{L}\{-e^{-\alpha t}u(-t)\}$ using the analysis equation.

c) Find $x(t)$ if $X(s) = \frac{1}{(s+1)(s+2)}$, with region of convergence, $Re\{s\} > -1$.
d) Find $x(t)$ if $X(s) = \frac{1}{(s+1)(s+2)}$, with region of convergence, $-2 < Re\{s\} < -1$.