ECE/EEE F311 Communication Systems (First Semester 2023-2024)
Lab-8 (Tuesday) (07-11-2023)

Objectives

In this task, the objective is to understand digital transmission using Nyquist criteria and random variable simulations.

Task 1

You have five bits 10011 to be transmitted over a band-limited channel with bandwidth B Hz using polar signaling. The bits are line encoded to pulses $\pm m(t)$ where $m(t) = 2sinc(2\pi t)$ transmitted every T_s. Demonstrate the Nyquist signaling criteria for a channel bandwidth $B = 4$ Hz. At what values of T_s, there will be ISI or zero-ISI? Demonstrate by plotting five time-domain signals (corresponding to 10011) in the same figure at the output.

Task 2

Plot the histogram of following random variables:

(a) Uniform random variable $X \sim U(a, b)$. Take any value for a and b. Use function rand and hist. Also find the statistics of the generated numbers. Find the probability $P(X < 0.5b)$.

(b) Gaussian random variable $N(\mu, \sigma^2)$. Use function randn and hist. Also find the statistics of the generated numbers. Find the probability $P(-\sigma < X < \sigma)$.