This

ECE/EEE F311 Communication Systems (First Semester 2023-2024)
Lab-8 (Saturday) (04-11-2023)

Objectives

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

Task 1

You have three bits 101 to be transmitted over a band-limited channel with bandwidth $B = 1$ Hz. The bits are line encoded to pulses $\pm m(t)$ and are transmitted every T_s seconds where $m(t) = 2sinc(2\pi t)$ denotes a bit 1 and $m(t) = -2sinc(2\pi t)$ denotes a 0. Thus $x(t) = m(t - nT_s)$ is the sequence of transmission of symbols and $R_s = 1/T_s$ denotes the rate of transmission.

(a) Plot three time-domain signals (corresponding to 1, 0, 1) in the same figure (figure 1) at the output of channel when $T_s = 1$.

(b) Plot three time-domain signals (corresponding to 1, 0, 1) in the same figure (figure 2) at the output of channel when $T_s = 1/4$.

(c) Plot three time-domain signals (corresponding to 1, 0, 1) in the same figure (figure 3) at the output of channel by taking optimum T_s.

(d) From above figures, write your observations about the impact of rate of transmission over a band-limited channel.

Task 2

Plot the histogram of following random variables:

(a) Uniform random variable $U(a, b)$. Take any value for a and b. Use function rand and hist. Also find the statistics of the generated numbers.

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