ECE 642 - Assignment 10

Recall that problems should be solved by using only the concepts discussed during the lectures. *When plotting either by hand or with MATLAB, please label all the axes with specific numerical value and units of measure.* MATLAB may be used only when explicitly stated. Include your MATLAB code and plots.

Consider a digital communication system based on the following waveforms

$$x_{z,i}(t) = A\text{sinc}(t) \exp(j\theta_i)$$

with $\theta_i = (2i + 1)\pi/4$ for $i = 0, 1, 2, 3$.

    a. Compute A as a function of E_b.

    b. Is it a linear modulation scheme? If so, draw the constellation.

    c. Evaluate the conditional distance spectrum for all messages.

    d. Compute the union bound on the probability of error.

    e. Evaluate the union bound approximation.

    f. Using MATLAB, plot the union bound and the union bound approximation versus E_b/N_0. Use the logarithmic scale for probabilities and consider the range of E_b/N_0 between -10 and 5 dB. Comment on your result.

    g. Using the union bound approximation, compare the peformance of this scheme with 4-PAM. Evaluate the loss of the worse of the two schemes with respec to the other in dB.

    h. Add to your plot at point f. the union bound approximation for 4-PAM. To observe the loss computed at point g., you can extend the plot up to E_b/N_0 equal to 15 dB.