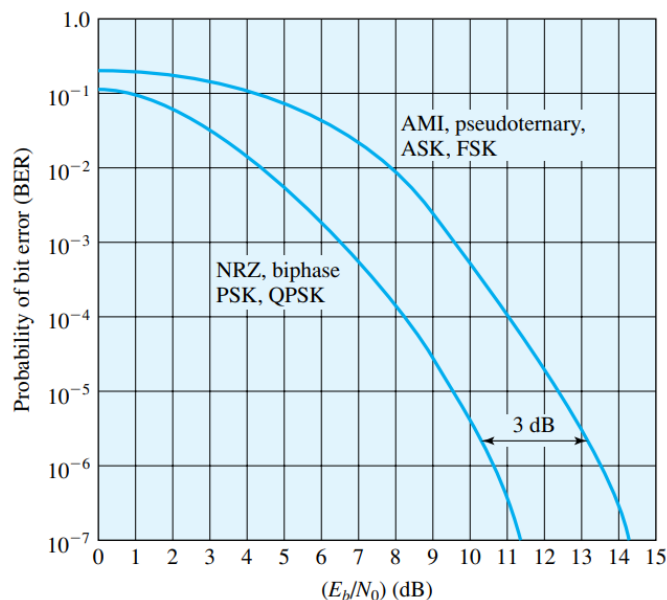


CS425: Computer Networks
Homework-3 (50 points)
Due date: Wednesday 06/03/2022

1. **(10 points)** Assume that your message signal is a sine wave (with any amplitude, frequency and phase). Now update the code provided with this homework to answer the following. Please include the plots and discussion in your report.
 - (a) Update the Matlab code that plots the time domain representation of an AM modulated signal. Assume any modulation index, $f_c=300$ Hz.
 - (b) Next modify the code to plot the frequency domain representation of an AM modulated signal. Assume any modulation index, $f_c=300$ Hz.
 - (c) Now change the modulation index. What characteristics are varying and how with the modulation index?
2. **(10 points)** Now, do the same for FM and PM:
 - (a) Update the Matlab code that plots the time domain representation of a FM and PM modulated signal. Assume $k_f = 80$, $k_p = \pi$, $f_c=300$ Hz.
 - (b) Next modify the code to plot the frequency domain representation of a FM and PM modulated signal. Assume $k_f = 80$, $k_p = \pi$, $f_c=300$ Hz.
 - (c) Now change the modulation index. What characteristics are varying and how with the modulation index?
3. **(10 points)** Given the bit pattern 01100, encode this data using ASK, BFSK, and BPSK.
4. **(10 points)** What SNR ratio is required to achieve a bandwidth efficiency of 1.0 for ASK, FSK, and PSK? Assume that the required bit error rate is 10^{-6} . Use the following figure to answer your question.



5. (10 points) The analog waveform shown in below is to be delta modulated. The sampling period and the step size are indicated by the grid on the figure. The first DM output and the staircase function for this period are also shown. Show the rest of the staircase function and give the DM output. Indicate regions where slope overload distortion exists.

