Lab7: Probability of error computation for Polar Signalling:

Problem 1: Consider bit stream of 0 and 1 with equal probability. These are available at the receiver input as p(t) and –p(t) pulses with duration of T_b . Let the amplitudes of the received pulses at the time of decision making be Ap and –Ap. The received signal is modelled as signal + noise, where the noise is Gaussian and with variance σ_n^2, added independently to each bit. (Refer to notes in Lecture folder on Prob-Of-Error-no-Filter) . Note that this refers to matched filter output noise power when we use a matched filter prior to taking decision.

Generate the received values by adding Ap (10000 in number) considering equiprobable bit stream and the noise values with variance σ_n^2. Using a threshold of 0, compute the Pe using the simulated data as well as analytically by using Q function. Plot the SNR Vs Pe by considering different values of variances and repeating the above experiment. You may use Ap=+1 or Ap=-1 (they are equiprobable).

Problem 2: Repeat the above experiment where the bit stream of 1 and 0 is not equiprobable.

You may use Pm(0)=0.2 and Pm(1)=0.8 (as opposed to 0.5 in the previous case)

Note that Pe will be minimum for a suitably chosen threshold (will be covered in tutorial). To verify the same you may conduct the experiments by choosing 0 and the derived optimum as thresholds and compute the probability of error for these two thresholds.