Tutorial 8 – Baseband transmission of digital signal

1. Encode the data 101101 using
   (a) Polar NRZ
   (b) Manchester coding
   (c) Unipolar RZ

2. A binary source transmits 1's using unit impulses and 0's using no pulses as shown in Figure T8.1 for the data sequence 110. The bit rate is 500 b/s. If the transmission channel is an ideal low-pass filter having minimum cut-off frequency determine the minimum cut-off frequency for zero ISI transmission.

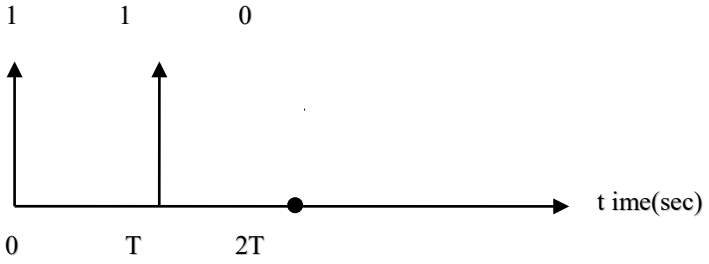


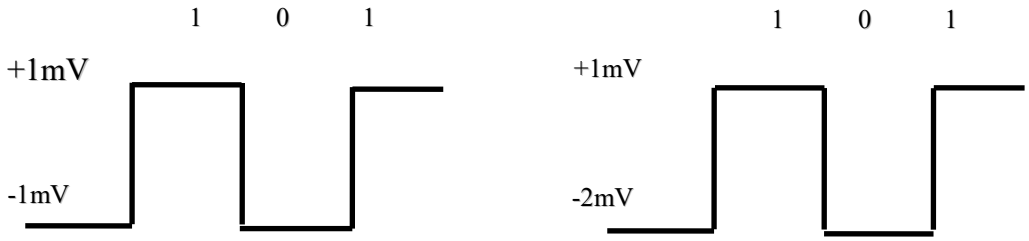
Figure T8.1

3. What is the probability that a 0.1 volt RMS Gaussian noise signal exceeds a magnitude of 0.5 volt?

4. What is the probability that a 0.5 volt RMS Gaussian noise signal exceeds +1 volt?

5. In a digital communication system, it is equally likely to send a '1' (5 volts) or a '0' (0 volt). If the rms Gaussian noise is 0.4 volt, calculate the error probability.

6. The signal component of the input to the receiver of a baseband transmission system is of the form :



This signal is corrupted by additive, white Gaussian noise with an rms value of 0.5 mV. The threshold device at the receiver is a comparator. If the received voltage is above V_T (threshold voltage) at the sampling instant, the signal is decoded as binary 1; if it is below V_T then it is decoded as binary 0. For both cases above, determine the value of V_T to obtain a minimum probability of bit error (P_e), and hence find P_e. The probability of occurrences of binary 1 and 0 are assumed equal and independent.