Tutorial 9 – Optimum baseband transmission

1. What is the impulse response of a matched filter for the Manchester coding signal given below in Figure T9.1:

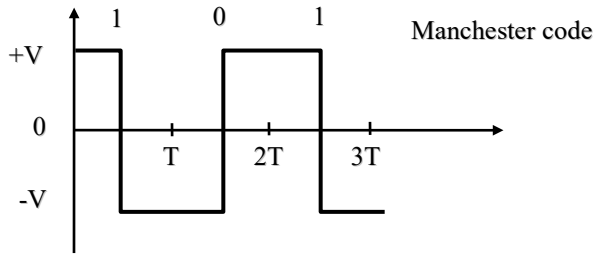

Figure T9.1

2. A polar binary signal, s(t), is a +1 V or -1 V pulse during the spectral interval (0, T_b). Additive white Gaussian noise having two-sided power density of 10^{-3} W/Hz is added to the signal. If the received signal is detected with a matched filter, determine the maximum bit rate that can be sent with a bit error probability of $P_e \leq 10^{-3}$.

3. An integrate and dump correlation receiver is shown in Figure T9.2. For the following input :
   (a) a polar NRZ waveform of amplitude V volt,
   (b) a Manchester code waveform of amplitude V volt,

   Sketch the waveforms at A to E for a 1011 sequence. Explain the operations of SW1 and SW2.

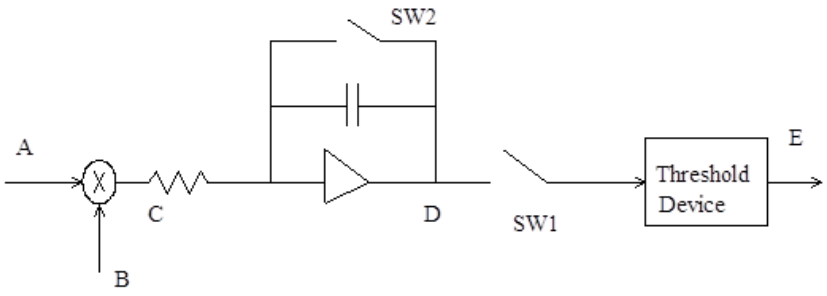

Figure T9.2

4. The input to a matched filter receiver is a baseband signal of data rate 1200 b/s. The signal is in the form of :
   (a) a polar NRZ waveform of amplitude 5 mV.
   (b) a unipolar NRZ waveform of amplitude 5 mV

   For both cases, find the probability of bit error, if the single-sided power spectral density of the channel AWGN is 2 nanowatt/HZ. Assume that the bits of the source binary sequence are independent and equiprobable.