5 Labwork

5.1 ASK Modulation and Demodulation

a. Assume that you have binary information $\mathbf{b} = [0\ 1\ 0\ 1\ 1]$ where the bit duration is 20 ms and the sampling frequency is $F_s = 10$ kHz. Generate $\mathbf{b}$ as a row vector.

b. Generate your message signal in on-off form based on $\mathbf{b}$.
Hint: You can either use for loop or *repmat()* and *reshape()* functions of MATLAB. Message signal should be as a row vector $\mathbf{m} = [\underbrace{00\ldots0}_{k}\ \underbrace{11\ldots1}_{k}\ \underbrace{00\ldots0}_{k}\ \underbrace{11\ldots1}_{k}\underbrace{11\ldots1}_{k}]$ where k is the bit sample size.

c. Obtain the BASK signal where $f_c = 2.5$ kHz. Information bit 0 is represented by 0V amplitude level while bit 1 is represented by 5V amplitude level.

d. Your BASK modulated signal is passing through an Additive White Gaussian Noise (AWGN) channel with 10 dB SNR without using built-in *awgn(.)* function.

e. Demodulate the noisy BASK signal (received signal) using the correlation type demodulator shown in Figure 1. For the decision device, you need to choose a suitable threshold value l_{th}.
Hint: Use *xcorr()* function to compute the correlation of two sequences. Set maximum lag as 0.

f. Plot message signal, BASK signal, noisy BASK signal and demodulated signal in 4×1 subplot.

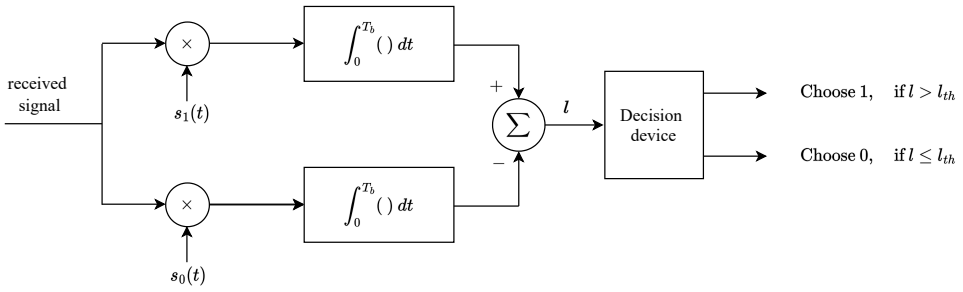

Figure 1: Correlator

5.2 FSK Modulation and Demodulation

a. Using the same message signal, obtain BFSK signal where the carrier frequencies are $f_0 = 0.5$ kHz and $f_1 = 0.75$ kHz. Information bit 0 is represented by f_0 frequency while bit 1 is represented by f_1 frequency.

b. Repeat steps **5.1.d**, **5.1.e**, and **5.1.f** for the BFSK signal.

5.3 Report Questions

- What are the advantages and disadvantages of ASK and FSK?
- What were the observed differences between ASK and FSK signals in terms of waveform and characteristics?
- How was the ASK signal generated in this experiment?
- How was the FSK signal generated in this experiment?