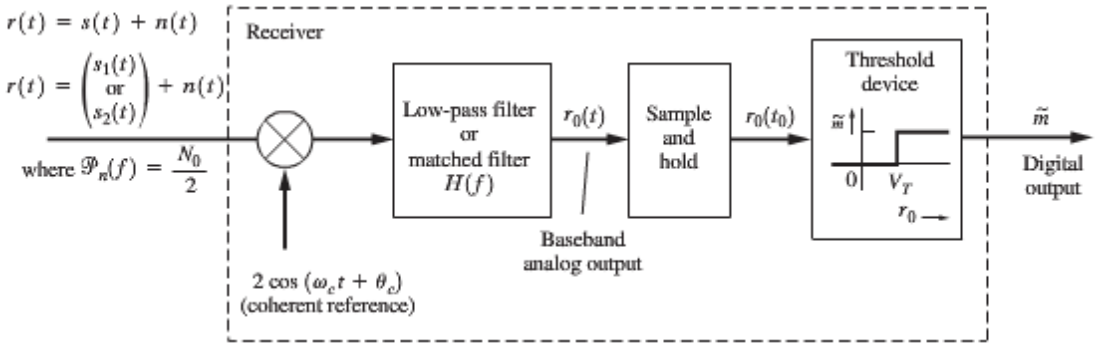
Question 1:
Carefully read Section 7-3 of the text book. A coherent detection for BPSK can be given as follow:



Note that the filter can be either a matched filter of LPF. If we use the matched filter BER can be found as Note that in this case VT is exactly the mid-point.

$$P_e = Q\left(\sqrt{\frac{A^2T}{N_0}}\right) = Q\left(\sqrt{2\left(\frac{E_b}{N_0}\right)}\right)$$

For LPF the BER can be found as

$$P_e = Q\left(\sqrt{\frac{A^2}{2N_0B}}\right)$$

Using Matlab plot the BER for BPSK signaling in the presence of AWGN using the matched filter receiver and a LPF receiver when Eb/No varies between -1:0.5:15 dB range (note that your x-axis must represent Eb/No in dB). Assume B=2/T whereT is the sample and hold time. You can assume T =1 sec.

Using the data cursor on your plot, for a given BER, what is the difference between Eb/No of a LPF and a Matched Filter receiver in dB? Justify your answer.

What should be the value of B in order for both receivers to have the same BER?

You can use the code below:

```
clear;
clf

% x is Eb/No in dB
x = % your noise range in dB

% Generating  Pmf(x) and Plps
Pp = zeros(length(x),1);

for (i = 1:1:length(x))
  Pp(i) = % convert x(i) from dB to decimal values
end;

Pmf = %define your equ. for matched filter  - define in terms of Pp(i)
Plpf = %define your equ. for LPF  - define in terms of Pp(i)

% Plotting your results here
xlabel('EbNo (in dB) -->');
```

Question 2:
Binary data is transmitted using ASK through a channel that adds white Gaussian noise with power spectral density No=10^-11 W/Hz. Determine the amplitude of a received carrier burst to provide a BER 10^-5 for the following data rates: (a) 300 bps; (b) 3 kbps; (c) 9.6 kbps.

Question 3:
Compare the SNR/bit and average power P_{av} (Eb.Rb) required at the demodulator to maintain a BER= 10^-6 using BPSK, coherent BFSK, and non-coherent BFSK signaling schemes for data transmission over a radio channel at 56 kbps. Assume that the channel adds white Gaussian noise with power spectral density No=10^-10 W/Hz. Tabulate your results:

Modulation Scheme	SNR/bit (dB)	Average Power (uW)	Average Power (dB)