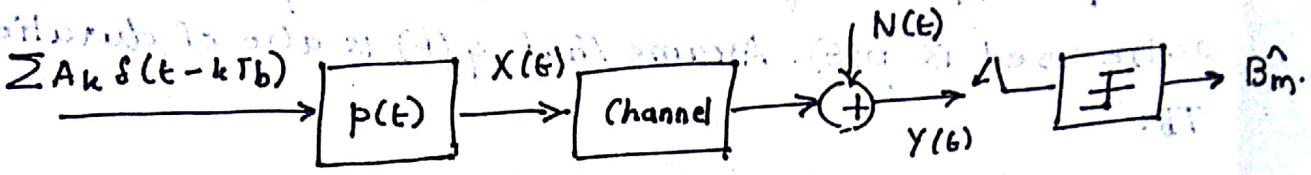
AVS 24 - Assignment 2

Not required to be submitted.

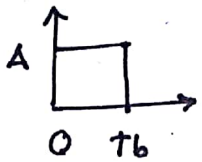
Please note that notation is as used in class.

1) Consider the following digital communication system.

$(B_0, B_1, \ldots, B_{M-1}) \rightarrow (A_0, A_1, \ldots A_{M-1}) \longrightarrow \sum A_k \delta(t - kT_b)$.



- Suppose channel impulse response is $\delta(t) + 1/2\,\delta(t - T_b)$
- Suppose $p(t)$ is a rectangular pulse



- $N(t)$ is a noise signal and modelled as a random process.
- Samples of $c(X(t)) + N(t)$ which is $Y(t)$ are taken every T_b, where $c(X(t))$ is the transformation of $X(t)$ by the channel. Let these samples of $Y(t)$ be Y_m.
- The noise samples N_m in Y_m are assumed to be Gaussian with mean 0 and variance σ^2.
- Assume that the decision device has a threshold of 0.

Find out an expression for BER (i.e., $Pr\{\hat{B_m} \neq B_m\}$).

2) Suppose a digital communication system uses a line code with a pulse $p(t)$ of duration T_b. What is the impulse response of a matched filter, matched to $p(t)$? Show that the matched filter output can also be obtained from a correlator, for the sample at T_b.

3) Suppose a digital communication system uses a line code with a pulse $p(t)$ of duration T_b. A receiver thinks that the pulse is $q(t)$ and uses a matched filter for $q(t)$. Compare the SNR value at the o/p of the matched filter for $q(t)$ at T_b with that for a matched filter for $p(t)$ when the pulse used is $p(t)$. Assume that $q(t)$ is also of duration T_b.