

E9-251: Signal Processing for Data Recording Channels

Home Work #4 (Due 29th November 2012 in class)

Late Submission Policy: Points scored = Correct points scored * $e^{-\text{\#days late}}$

Problem 1:

Consider a memory less channel. Let the received signal be $y = x + n$, where $n \sim N(0, \sigma^2)$ and $x \in \{-1, 1\}$ with $\Pr(x = -1) = 1 - p$. Find the decision rule for optimal detection. Obtain the probability of error as a function of p, σ . What is the upper bound for the probability of error in the limit when the noise variance is very high? Prove your result. (50 pts)

Problem 2:

Consider a channel with memory. Let the ISI channel be $H(z) = 1 + \alpha z^{-1}$. Suppose the NRZ input is constrained such that a pattern '11' never occurs. Let the received sequence be \mathbf{r} .

- a) Sketch 2 stages of the trellis diagram for this channel. Indicate all the branch transitions showing only the relevant transitions.
- b) Show the computation of all the branch metrics for a single stage for this channel.

(50 pts)