University of Washington
Dept. of Electrical Engineering

Handout 7: Problem Set 4: (due Wednesday. March 10th in class)

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Book Problems Do problems 7.4(abcd),7.6,7.9,8.8,8.10,8.12,9.1,10.2

For problem 7.4d, compute the probability of the sequence $\omega_1\omega_2\ldots\omega_n$ which is then followed by any arbitrary sequence, where

$$\Omega = \sum_{p:\mathcal{U}(p) \text{ halts}} 2^{-l(p)}, \text{ and } \Omega = .\omega_1\omega_2\ldots.$$

Also, do not do 7.4e.

(note: a good break in this problem set is to be done with all chapter 7 problems, problem 1 and 2 below, and 1/2 of the chapter 8 problems by Friday).

Other Problems

Problem 1:

(The Ternary Confusion Channel): Consider a discrete memoryless channel with input alphabet $\mathcal{X}$ and output alphabet $\mathcal{Y}$, where $\mathcal{X} = \{0, 1, ?\}$ and $\mathcal{Y} = \{0, 1\}$. The stochastic matrix W given by $W(y|x) = 1$ if $x = 0, y = 0$ or if $x = 1, y = 1$, and $W(y|x) = 1/2$ if $x =?, y = 0$ or if $x =?, y = 1$. Compute the capacity of this channel, and determine the maximizing mass function over the input alphabet.

Problem 2:

In class and above, we defined the amazing incredible and unknowable number $0 < \Omega < 1$. In this problem, you are to choose a normally unsolvable problem (it can be one from mathematics, or even any general world problem you wish you could solve), and show how that if you have Ω available to you, you can compute a (guaranteed halting) solution to this problem. Be as precise as possible, in that you give a explicit algorithm for how, when Ω is given, you can compute an answer to your problem. Argue why your algorithm is correct, and why the problem you choose is normally unsolvable.