Northwestern University

Department of Electrical and Computer Engineering

ECE 428: Information Theory — Spring 2004

Problem Set 2

Date issued: April 6, 2004
Date Due: April 13, 2004

Reading Assignment: Chapter 3,4

Do the following problems:

1. Problem 2.35 in C&T.

2. Let *X*, *Y*, *Z* be three discrete random variables. For each sample value *z* of *Z*, define $A(z) = \sum_{x,y} p(y)p(z \mid x, y)$.
   a. Show that this satisfies: $H(X \mid Y) \le H(Z) + E(\log A)$.
   b. Show that Fano's inequality is a special case of the result in part (a).

3. Problem 3.1 in C&T.

4. Problem 3.5 in C&T (*Hint:* Use the Strong Law of large numbers, express your answers in terms of relative entropy and entropy.)

5. Problem 4.2 in C&T.

6. Problem 4.4 in C&T.