S-72.340 INFORMATION THEORY

Exercise 10, November 22, 2000

1. Evaluate the bound on average error probability over an ensemble of codes with two code words given in formula 6.3.8 of the lectures (or 5.5.10 in Gallager's book) for the Z channel defined in Exercise 8. Minimize the bound over $Q(l)$.

2. Repeat Problem 1 for a binary erasure channel with erasure probability ϵ .

3. Find the random coding exponent $E_r(R)$ for a binary erasure channel with erasure probability ϵ .

4. Find the random coding exponent $E_r(R)$ for the 5-input, 5-output channel shown in Figure 1. All transition probabilities are equal to $1/2$.

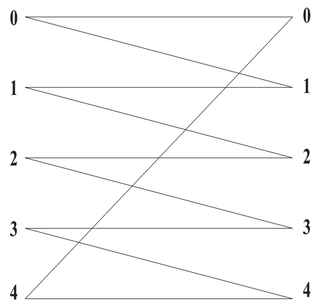

Figure 1: A five-input, five-output channel

5. Show that for an arbitrary DMC (discrete memoryless channel) with a binary input, the function $E_0(\rho, \mathbf{Q})$ is maximized over $\mathbf{Q}$ at $\rho = 1$ by $Q(0) = Q(1) = 1/2$.

Try to solve as many problems as you can. Return your solutions by the time that the exercise begins. You can bring them to the exercise or put them into the 'return box' below the information board of our laboratory on the 2nd floor.