EE/Ma 127c Homework Assignment 5
(Final Version)
Due (in class) 9am May 25, 2001

Problems to Hand In:

Problem 1.
    (a) How many 4×6 binary matrices have exactly 2 ones per column and 3 ones per row? (Notice that the rows are not independent, but sum to zero. Therefore, the code that is defined by such a parity check matrix is a (6,3) code.)
    (b) How many such matrices are there if we also ask that the columns be distinct? What is the significance of distinct columns in a parity-check matrix?
    (c) How many $(6, 3)$ binary linear codes are there?
    (d) How many of the codes in part (c) have parity-check matrices of the form in part (a)? How many of them have parity-check matrices of the form in part (b)?

Problem 2.
Using the "Density Evolution" method discussed in class today, compute using matlab/mathematica/maple/...the BEC erasure probability threshold for the ensemble of $(3, 6)$ LDPC codes. (Hint: The condition $p_i(0) \to 0$ is equivalent to the condition $p\lambda(\rho(x)) < x \; \forall \; 0 < x \leq 1$. In other words, the equation $p\lambda(\rho(x)) = x$ should have no non-zero solution.)