Math 350
Spring, 2000

FINAL HOMEWORK!!!

Do 50 (or 55) points of the following problems (due 4/20/00).

15 pts. **1** Construct a generator matrix for $R(2,5)$, the second order Reed-Muller code of length 32 (just show enough to indicate to me that you know the pattern).

15 pts. **2** Normalize the Hadamard matrix H below, and produce the Kronecker product of H with

$$\begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix}$$

H =

$$\begin{pmatrix} - & + & + & + & - & + & + & + \\ - & - & + & - & - & - & + & - \\ - & + & - & - & - & + & - & - \\ - & - & - & + & - & - & - & + \\ + & - & - & - & - & + & + & + \\ - & - & + & - & + & + & - & + \\ - & + & - & - & + & - & + & + \\ - & - & - & + & + & + & + & - \end{pmatrix}$$

20 pts. **3** Explain why the cyclic code over Z_4 generated by $x^3 + 2x^2 + x - 1$ has a minimum Lee weight of 6.

20 pts. **4** Decode 10011110 using the fast decoding algorithm for $R(1,3)$ described in class.

20 pts. **5** Describe your strategy for winning the monkey flipping game if you start with the position 1100011 and you go first (a 1 is a flipped monkey).

15 pts. **6** Compute the uncertainty in a system with 4 possible outcomes (like the DNA example from class), where the data is AACCGGGGTTTTTTTT. (The uncertainty is measured by $-\sum P_i \log_2(P_i)$).