Math 350
Spring, 2000

HOMEWORK #5

Do 50 points of the following problems (due 2/17/00).

20 pts. **1** List the (Slepian) array for the binary code with the generator matrix listed below, and decode 10101, 11111, and 00010 using your scheme. Also calculate $P_{corr}(C)$ if the symbol error probability is $p = .01$.

$$\begin{pmatrix} 1 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 \end{pmatrix}$$

15 pts. **2** Find a parity check matrix for a code that is equivalent to the linear code over Z_5 with the following generator matrix.

$$\begin{pmatrix} 1 & 0 & 2 & 0 & 3 & 0 & 4 \\ 0 & 1 & 0 & 3 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 & 4 & 4 \\ 0 & 2 & 2 & 0 & 4 & 0 & 1 \end{pmatrix}$$

15 pts. **3** Explain how you would decode the 3 vectors in problem 1 by using syndrome decoding.

20 pts. **4** Show that every binary linear code has the property that either all of the codewords are even or that exactly half of them are even.

$\star$ 30 pts. **5** Show that in a binary linear code with the property that $C \subset C^{\perp}$, either all of the codewords have weight divisible by 4, or half of the codewords have weight that is even and not divisible by 4 and the other half have weight that is divisible by 4.