

DM 5 Codes

5.1. How many errors will detect and how many will correct the code with the following set of all code words:

a) 00000, 01011, 10101, 11110; b) 000000, 010101, 101010, 111111;

Are these codes perfect?

5.2. How many errors will detect and how many will correct the code which repeats each digit seven times?

5.3 Consider the linear code generated by the following matrix. Find the set of all code words. How many errors will it detect and how many will it correct? Find parity check matrix. Is the given code perfect?

a) $\begin{bmatrix} 1 & 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 & 0 \end{bmatrix}$, b) $\begin{bmatrix} 1 & 1 & 1 & 1 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$, c) $\begin{bmatrix} 0 & 1 & 1 & 1 & 1 & 0 & 1 & 0 & 0 & 0 & 1 & 1 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 & 1 & 1 & 1 & 1 & 0 & 1 & 1 & 0 & 0 & 1 & 1 & 1 \end{bmatrix}$, d) $\begin{bmatrix} 0 & 1 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 & 1 \\ 1 & 0 & 0 & 0 & 1 & 1 & 1 & 1 & 0 & 1 & 1 & 0 & 0 & 1 & 1 & 1 \end{bmatrix}$.

e) $\begin{bmatrix} 1 & 0 & 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 & 1 \end{bmatrix}$

5.4 Consider the linear code generated by the following matrix. Find the set of all code words. Find the parity check matrix for this code. Correct received words. Is the given code perfect?

a) $\begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}$, b) $\begin{bmatrix} 1 & 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 & 0 & 0 & 1 \end{bmatrix}$, c) $\begin{bmatrix} 0 & 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$.

Received words 1) 0111110, 2) 0001111 3) 1010101 4) 1111111 .

5.5 Find the generator matrix for the Hamming code defined by the parity check matrix:

$$H = \begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 1 \end{bmatrix}.$$

5.6. Let (000000), (011101), (100111), (111010) be all code words of a linear code C .

a) How many generator matrices are there for C ?

b) Find one of them.

c) How many errors will this code detect and how many will it correct?

d) Is the code C perfect?

e) Find the parity check matrix for C .

f) What was sent if (111110) is received and at most one error has arisen during the transmission?