Universiteit van Stellenbosch

Toegepaste Wiskunde 314

Tutoriaal 11: Donderdag 20 Mei 2004

(1) Check whether the following are ISBN's.

(a) 0-13165332-6

(b) 0-1392-4101-4

(c) 07-028761-4

(2) The following ISBN's have been received with smudges. What are the missing digits?

(a) 0-13-1▮9139-9

(b) 0-02-32▮▮80-0

(3) Show that the decimal code

$$\left\{(x_1, x_2, \ldots, x_{10}) \in (F_{10})^{10} \mid \sum_{i=1}^{10} x_i \equiv 0 \pmod{10},\ \sum_{i=1}^{10} i x_i \equiv 0 \pmod{10}\right\}$$

is *not* a single-error-correcting code.

(4) Let C be the linear [10,8]–code over $GF(11)$ with parity–check matrix

$$H = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \end{bmatrix}.$$

(a) Write down the syndrome $S(\mathbf{y})$ of the vector $\mathbf{y} = y_1 y_2 \ldots y_{10}$.

(b) Assume that a single error of magnitude k was made in position j of a codeword $\mathbf{x}$. Find the syndrome of the resultant vector $\mathbf{y}$.

(c) Use C to decode the received vectors 0617960587 and 3617960587.

(5) Prove that if E_n is the binary code of all even–weight vectors of length n, then $E_n^{\perp}$ is the binary repetition code of length n.