

Coding Theory / Discrete Mathematics II Assignment 8 (June 29, 2006)

(This assignment is due on July 06, 2006, 1.00 p.m., by dropping it into the wooden box
in front of F 310)

Exercise 1 (Theorem 4.5):

Prove Theorem 4.5.

(30 Points)

Exercise 2 (Cyclic codes):

Let $n=9$.

- (a) Find a factorization of $x^9 + 1$. (You are allowed to use a computer.)
- (b) Write down the generating polynomial and the parity-check polynomial for $k=3$.
- (c) Write down the generated code?

(15 Points)

Exercise 3 (Dual codes):

Let C be a code of length n . The product of two words $v = (v_1, \dots, v_n)$ and $w = (w_1, \dots, w_n)$ is defined as $v \cdot w = v_1 \cdot w_1 + \dots + v_n \cdot w_n$. The dual code of C consists of all words of length n which satisfy $v \cdot c = 0$ for every $c \in C$. We denote the dual code (of C) by C^\perp .

- (a) Find the dual code of $C = \{0100, 0101\}$.
- (b) Find a nonzero word c such that $c \cdot c = 0$. What can you say about the weight of such a word?

(15 Points)