Norwegian University of Science and Technology
Department of Mathematical Sciences

Exercise 1 - Problems given during lectures

Problem 1 Let $C = \{00000000, 10101010, 11111111\}$.

a) How many errors can be detected? How many errors can be corrected?

b) Is C linear?

Problem 2 Let C be the code with basis $\{10101010, 11111111\}$. What is C? What is n and k?

Problem 3 Show that a parity check matrix has linearly independent rows.

Problem 4 Find a generator matrix on standard form and a parity check matrix for the code C generated by $\{(1110000), (0011001), (0100101), (1001100)\}$.

Problem 5 Show that if G and H is (respectively) a generator matrix and parity check matrix for C, then H and G (respectively) are generator matrix and parity check matrix for $C^{\perp}$. (Excersise 4 s.6.).

Problem 6 Show that $d(x, z) \leq d(x, y) + d(y, z)$ by using that $d(x, y) = wt(x - y)$.

Problem 7 Show that C_i^* (the punctured code of C in coordinate i) is linear.

Problem 8 Let C be the code with generator matrix $G = \begin{pmatrix} 1 & 1 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 1 & 1 & 0 \end{pmatrix}$.

a) What kind of code is C_2^* (find n, k and d)? Find a generator matrix.

b) Do the same for $(C_2^*)_4^*$.

Problem 9 Show that $\hat{C}$ (the extended code of the linear code C) is linear.