Information Theory
Spring semester, 2025

Assignment 8
Assigned: Thursday, May 22, 2025
Due: Wednesday, June 4, 2025 M. Skoglund

Problem 8.1: MWS 7.19 (p. 200); while solving this problem you can also study the proof of Theorem 8 (the BCH bound)

Problem 8.2: MWS 9.1 (p. 264)

Problem 8.3: Specify $g(x)$ for a cyclic code of length $n = 27$ over GF(2) for which $d_{\min} \geq 9$.

Problem 8.4: Specify $g(x)$ for a cyclic code of length $n = 26$ over GF(3) for which $d_{\min} \geq 4$.

Problem 8.5: Consider the primitive and narrow-sense binary BCH code of length $n = 15$ and with $\delta = 7$. Assuming the received word (polynomial) is

$$y(x) = x^3 + x^{10}$$

demonstrate by going through the decoding algorithm described in class (and in MWS) how $y(x)$ is decoded into the positions of the corresponding errors.

Problem 8.6: Consider a narrow-sense RS code with designed distance 3 and of length 15.

1. Compute the generator polynomial in the form

$$g(x) = g_0 + g_1 x + \cdots + g_{r-1} x^{r-1}$$

2. Derive a generator and a parity-check matrix