Exercises Week 12

Information Theory

1. Consider a systematic code with generator matrix

$$[G] = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$$

   a. Compute the parity-check matrix $[H]$;
   b. Find out how many errors this code can detect, and how many it can correct.

2. Compute the codewords for transmitting the information words $\mathbf{i_1} = [1001]$ and $\mathbf{i_2} = [1110]$ with the Hamming (7,4) code and with the Hamming (8,4) SECDED code.

3. We receive a sequence $\mathbf{r} = 10101010$, which was encoded with the Hamming (8,4) SECDED code. Find if there are errors in the received data, and, if yes, perform correction and retrieve the transmitted information bits.

4. Find out how many errors can the Hamming (15, 11) code detect / correct.