

Exercises Week 11

Information Theory

1. Find the systematic cyclic codeword for the sequence $\mathbf{i} = [1010001100]$, considering a cyclic code with generator polynomial $g(x) = 1 \oplus x \oplus x^3$.
 - a. Do it “the mathematical way” (with polynomials)
 - b. Do it “the programming way” (XOR-ing bit sequences)
2. We receive a sequence $\mathbf{r} = 101011100101$, which was encoded with a cyclic code with generator polynomial $g(x) = 1 \oplus x^2 \oplus x^3$. Find if there are errors in the received data, and, if yes, perform correction and retrieve the transmitted information bits.
 - a. Do it “the mathematical way” (with polynomials)
 - b. Do it “the programming way” (XOR-ing bit sequences)
3. We do cyclic coding on information words of length $k = 8$ bits. We want the coding rate R to be at most 0.6. What degree must the generator polynomial $g(x)$ have?