Exam 3
Algebraic Coding Theory
Math 525
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Problem 3: Let C be the cyclic of length six with generator polynomial $g(x) = x^4 + x^2 + 1$. Find a parity-check matrix for C. Your answer must be a binary matrix, i.e., a matrix whose entries are 0s and 1s only.

Notice the following:

$$\begin{aligned} 1 &\mod g(x) = 1 \\ x &\mod g(x) = x \\ x^2 &\mod g(x) = x^2 \\ x^3 &\mod g(x) = x^3 \\ x^4 &\mod g(x) = x^2 + 1 \\ x^5 &\mod g(x) = x^3 + x \end{aligned}$$

Thus we get the following parity check matrix:

$$H = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}$$