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Homework Assignment 5 (**Final Version**)
Due (in class) 9am November 10, 2000

Reading: Wicker, Sections 16.1. 16.4.2
Handout: "Chapter 8: Cyclic Codes," pp. 27–31.

Problems to Hand In:

Problem 1. Problem 8.68 from the handout "Chapter 8: Cyclic Codes."

Problem 2. For $n = 31$, and for each $b = 1, 2, \ldots, 15$, use the Abramson and Reiger bounds to estimate the minimum redundancy needed for a burst-b correcting code of length n.

Problem 3. (Continued) Now focus on the case $n = 31$, $b = 3$. Do you think there is a cyclic code that meets the bound you found in Problem 2? [Hint: Use Table 8.1 in the handout.]

Problem 4. Using the definition of "Classical" Fire codes as given in the Corollary on page 30, and the list of primitve polynomials in Wicker, Appendix A, design (i.e., find a generator polynomial for) a cyclic code with $k \geq 100,000$, capable of correcting any single burst error pattern of length 11 or less. Explicitly calculate n and k for your code.

Problem 5. Let $g_m(x) = (x^5 + 1)f_m(x)$, where $f_m(x)$ is a primitive polynomial of degreee m. Then for $m \geq 3$, $g_m(x)$ generates a $b = 3$ Fire code, which we denote by F_m.

(a) Find the parameters (n_m, k_m) for the code F_m.

(b) Compare the actual redundancy $r_m = n_m - k_m$ of F_m to that predicted by the "weak" Abramson bound $r \geq \lceil \log_2(n + 1) \rceil + (b - 1)$, as $m \to \infty$