ELEC-E7240 Coding Methods, Pre-assignment B1

Return your solution when you come to the lecture. Remember to include your name and your student number.

Use the attached page from [Wic, Appendix E] to get a binary BCH code of length $n = 15$ and dimension $k = 5$. Specifically, answer the following questions. (Focus just on the encoding part.)

1. Give an example of how a word is encoded into a codeword. (Not an all-zero word, $00 \cdots 0$, because that is too easy as it is always encoded into another all-zero word.)

2. Determine the weight enumerator of the code by inspecting it (you are not allowed to use any theoretical results available). It is possible to do this manually, but you might also want to write a computer program. Explain what the weight enumerator tells us about the error-correcting properties of the code.

—Appendix E[1]—

Generator Polynomials of Binary BCH Codes of Lengths 7 Through 255

The following is a list of all of the generator polynomials for all binary, narrow-sense, primitive BCH codes of lengths 7 through 255. The polynomials are ordered by the length n, dimension k, and error correcting capability t of the corresponding BCH code. The polynomials themselves are written using an octal representation. To read an entry, the octal expression is first expanded into binary form. The ones in the binary form correspond to the nonzero terms in the generator polynomial, while the position of the ones determines the terms' degrees. For example, the two-error correcting (31, 21) BCH code has the following generator polynomial.

$$3551 \Rightarrow 011, 101, 101, 001 \Rightarrow g(x) = x^{10} + x^9 + x^8 + x^6 + x^5 + x^3 + 1$$

n	k	t	generator polynomial in octal form
7	4	1	13
15	11	1	23
15	7	2	721
15	5	3	2467
31	26	1	45
31	21	2	3551
31	16	3	107657
31	11	5	5423325
31	6	7	313365047