Coding Theory: Math 567

Problem Set 5- Clarifications/Hints

Here are some clarifications relevant to this problem set.

Problem 1(a) . [§5.1 Exercise 14]

In the problem statement $\hat{H}$ should read $\hat{L}$.

Problem 2. [§5.1 Exercise 25]

Note that the statement of Theorem 5.1.18 assumes that L is a q-ary code.

Hint: To obtain Theorem 5.1.18 as stated, you may need to use the fact that the left side of the inequality must be an integer.

Problem 4.

There is a misprint. The identity to be proved is

$$W_L(s) = s^n W_L(1/s).$$

Problem 5. [§5.2 Exercise 18]

There is a misprint in part (a), and added below is a part (d) bonus question.

(a) Show that for all $n \geq 1$ and $0 \leq k \leq n$ that these polynomials are equal:

$$K_k(x; n, 2) = (-1)^k K_k(n - x; n, 2).$$

Note here that $q = 2$.

(b) Show that for arbitrary q and for all $n \geq 1$ and $0 \leq i \leq n$, $0 \leq k \leq n$ that

$$(q-1)^i \binom{n}{i} K_k(i; n, q) = (q-1)^k \binom{n}{k} K_i(k; n, q).$$

(c) Use (a) and (b) to show for $q = 2$ and for all $n \geq 1$ and $0 \leq i \leq n$, $0 \leq k \leq n$ that

$$K_k(2i; n, 2) = K_{n-k}(2i; n, 2).$$

(d) [Bonus Question –5pt] Show that the Krawtchouk polynomial $K_k(x; n, q)$ is identically zero if $k \geq n + 1$.

Problem 7 [§6.1 Exercise 16]

The Golay code G_{11} is a ternary $[11, 6, 5]$ linear code that is a perfect code.

Problem 8 [Bonus problem]

In part (b) of this problem, prove it for distance $d = 2$. (It fact the statement is true for all $d \geq 2$.)

Part (c) of this problem may be hard.