

ECE/MATH 641: HOMEWORK 5, DUE DEC 8.

Please solve the following problems.

1. Two binary codes C_1 and C_2 are called equivalent if one can permute the coordinates of C_1 to obtain the set of codewords of C_2 . Two binary codes, C_1 and C_2 , will be called different if they are not equivalent. Prove or disprove: the weight distributions $(A_0(C_1), A_1(C_1), \dots, A_n(C_1))$ and $(A_0(C_2), A_1(C_2), \dots, A_n(C_2))$ of two different binary linear codes C_1 and C_2 are different.

2. Factorize $x^{10} + 1$ into irreducible polynomials over \mathbf{F}_2 .

3. Construct a 10×20 parity-check matrix and draw the corresponding Tanner graph for a rate $1/2$ regular $(3, 6)$ LDPC code of length 20. Are there any cycles of length 4? If there are, write down a new parity-check matrix with all the 4-cycles eliminated.

4. Consider the ensemble of LDPC codes with (left) degree profile $(\lambda_2, \lambda_3, \dots)$, and constant right degree a . If the ensemble rate is $R = 4/5$, what is the smallest possible value for a ?