Information theory and error control coding

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List of Tutorial Questions 1

1. The (7,4) Hamming code has the generator matrix given by



Compute the code word for the message **m** = [ 1 0 01] using

1. The original generator matrix **G**
2. The generator matrix in systematic form **G’**
3. Consider a (7,3) code, a generator matrix given by



* 1. Compute the code word for the message **m** = [0 1 1]
	2. Construct the parity-check matrix **H**

Assuming that **r** = [0 1 1 0 0 0 1] was received,

* 1. Compute the syndrome
	2. Construct the error/syndrome table
	3. Correct the error

3. Develop a Matlab code to simulate linear block codes with arbitrary parameters (n,k) using BPSK modulation and additive white Gaussian noise.

a) Plot the bit error ratio (BER) against the signal-to-noise ratio (SNR) for a range of values. Suggestion: set SNR from 0 to 8dB with steps of 1 or 2 dB.

b) Compare the BER x SNR performance of different codes with that of uncoded systems using syndrome decoding.

c) Compare the BER x SNR performance of a Hamming code with syndrome decoding and maximum likelihood decoding.