Question 1: Assume that you listen to stereo music on your iPod at a rate of 128 kbps. Find the compression ratio (You need to read the lecture notes to know parameters of the original audio signal).

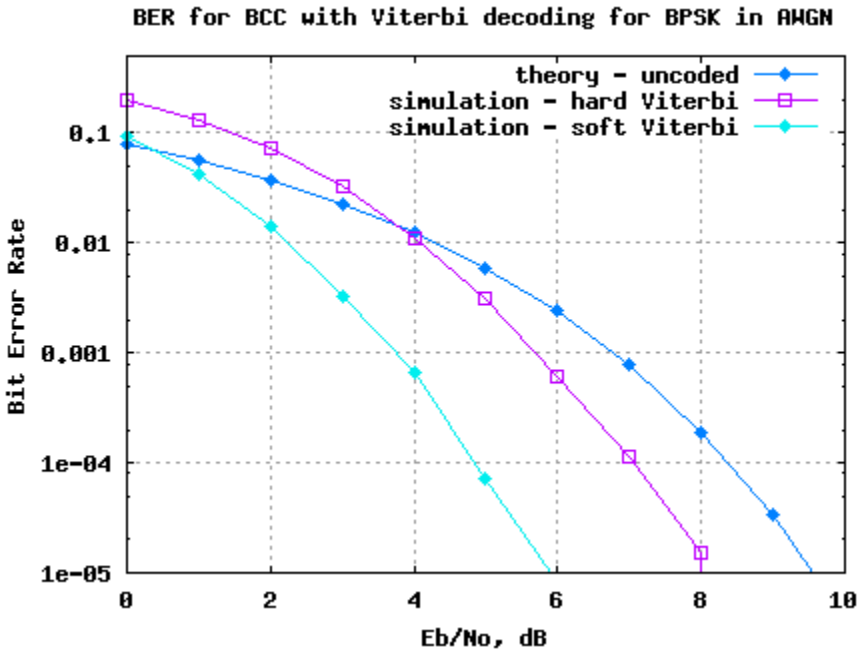
Question 2: Assume that a 4K, 4:2:2, 10 bit Video signal with a frame rate of 60 fps has been compressed with a compression ratio of 500. In addition there are 5 stereo channels of audio (left, right, center, plus two surrounding) each with a bit rate of 192 kbps.

a) Find the total bit rate.
b) Find the required bandwidth if 16 QAM modulation with a roll-off factor of 0.1 is used.
c) Repeat part b if the standard Reed Solomon (RS) code is used.

Ignore any other overhead.

Question 3: Assume that a broadcasting system uses QPSK modulation with an $\frac{E_b}{N_0}$ of 6 dB. Find an approximation for the bit error probability if a (255, 249) RS code over $GF(2^8)$ is used. Justify any assumption you make to arrive at the approximate BER value.

Question 4: Repeat the question 3 if the (255, 249) code is used as the outer code in a concatenated scheme where the inner code is a convolutional code with the following performance curve. Consider both hard and soft decision decoding.



Question 5: Consider a (63, 51) RS code over $G(2^6)$. a) What is the block length of the code in bits? What is the maximum number of erroneous symbols the code can correct? c) What is the maximum length of the bursts that the code can correct?

Note: $GF(2^m)$ is the Galois Field defined over the set of m-bit symbols. $GF(2)$ is the binary field with elements 0 and 1 and operations addition AND (as multiplication) and OR (as addition).