ELEC-E7240 Coding Methods

All answers must be well motivated; just giving the answer does not suffice. In particular, a one-word answer for yes/no questions gives 0 points.

1. (6p.) Binary error-detecting codes. CRC codes.
   Hint. Recall that encoding of CRC codes is systematic. If you do not remember how to do systematic encoding, you may still get a maximum of 1p for question (a) by stating *explicitly* that you do nonsystematic encoding.

   (a) Use the code CRC-7, which has generator polynomial $x^7 + x^3 + 1$, to encode the message 1001101011001.

   (b) Using the code CRC-8, which has generator polynomial $x^8 + x^7 + x^6 + x^4 + x^2 + 1$, is the received sequence 1010111001110101 a possible codeword?

   (c) The code CRC-1 is actually a one-bit parity check. What is the generator polynomial of CRC-1 ? Encode a short message to demonstrate that this works.

2. (6p.) Convolutional codes. Construct a state diagram and a trellis diagram for the following convolutional encoder, decode the received word

$$(001, 100, 001, 011, 101, 101, 111, 110)$$

   using hard-decision Viterbi decoding for the binary symmetric channel (BSC), and find the original message x.
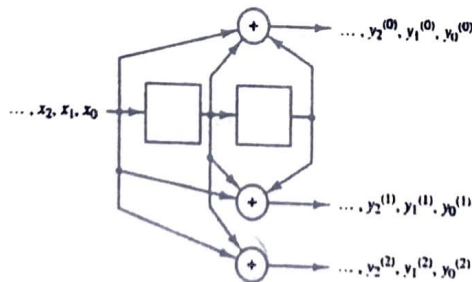
3. (0.5p, bonus) Feedback. If you will fill out the official feedback form no later than on February 24, write YES (0.5p if you do so), otherwise write NO (0p).