ECE 358
Practice questions about **parity bits**

Q1. Compute the **even parity** bits for the data bits: 1 1 0 1 0 1 1 1 and 1 0 0 0 1 0 1 0

Q2. Compute the **odd parity** bits for the data bits: 1 1 0 1 0 1 1 1 and 1 0 0 0 1 0 1 0

Q3. Transform the following bit string (D) into a 3 x 8 matrix and compute the two-dimensional even parity EDC bits.

D = 1 1 0 1 0 0 1 0 1 1 1 0 0 0 1 1 0 0 1 1 1 0 1 1

Q4. Assume that a sender transmits <D, EDC> as shown and computed in Q3.
Next, assume that the receiver receives D' and EDC' as follows:

D' = 1 1 0 1 0 0 1 0 1 1 1 1 0 0 1 1 0 0 1 1 1 0 1 1
EDC' = EDC

Show that the receiver can detect the single bit error in D' and correct it.

Q5. Referring to Q3, if a sender transmits <D, EDC>, <u>try</u> to introduce two bit errors in the received <D', EDC'>
so that the receiver cannot detect it.

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Practice questions about **CRC** computation

Q1. Add the pairs of A and B given below using modulo-2 arithmetic. Let the result be C.

(a) A = 1 0 1 1
B = 0 1 0 1

C =

(b) A = 1 1 1 0
B = 0 1 0 1

C =

Q2. Using the binary strings from Q1, subtract B from C in part (a) and A from C in part (b) using modulo-2 arithmetic.

(a) C = (from Q1(a))
B = 0 1 0 1

D =

(b) C = (from Q1(b))
A = 1 1 1 0

D =

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Practice questions about **CRC** computation

Q3. Consider the following D and G bit-strings.

D = 1 1 0 0 0 0 1 0 G = 1 0 0 0 1 1 1 0 1

(a) For the given G bit-string, how many bits of CRC code will be computed? In other words, what is the value of r?

(b) Compute the bit string: $D.2^r$.

(c) Divide $D.2^r$ by G using modulo-2 arithmetic to find the CRC bits. Let these CRC bits be denoted by EDC.

(d) Show the bit string <D, EDC> that is transmitted by the sender.

(e) Let D' = 1 1 0 1 1 0 1 0 and EDC' = EDC, and let the receiver receive <D',EDC'> after the sender transmits the bits in (d).
What is the outcome of the receiver's error detection step: error-free frame or erroneous frame?

(f) Let D' = 0 0 1 1 1 1 0 1 (the complement of D) and EDC' = EDC, and let the receiver receive <D', EDC'> after the sender transmits the bits in (d).
What is the outcome of the receiver's error detection step: error-free frame or erroneous frame?

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Q4. Consider the following data (D) and G bit-strings.

D = 1 1 0 1 0 1 1 0 1 1 G = 1 0 0 1 1

Compute the frame to be transmitted by the sender.