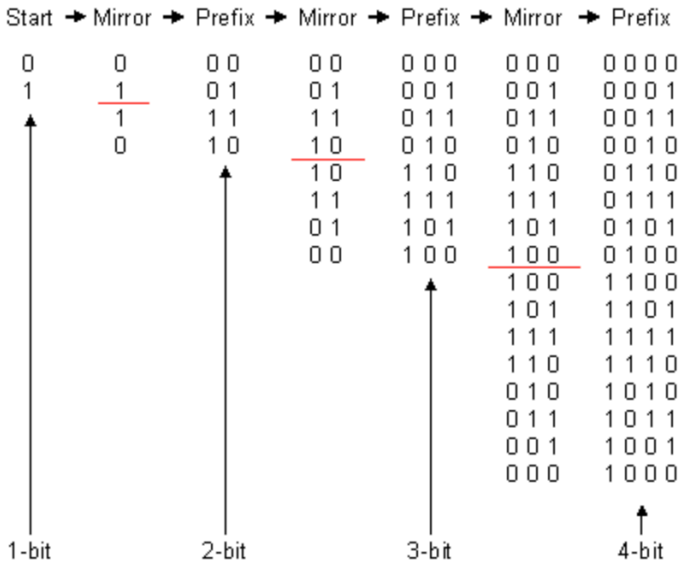
Quiz 8: Encoding Scheme & Error Detection/Correction

1. Please write the entire 4-bit Gray code by reflecting and prefixing. ¶



2. Please Convert the following Gray code word to Binary code.

1 0 0 1 1 0 1 0

1 1 1 0 1 1 0 0

3. Convert the following Binary code word to Gray code.

1 0 0 1 1 0 1 0

1 1 0 1 0 1 1 1

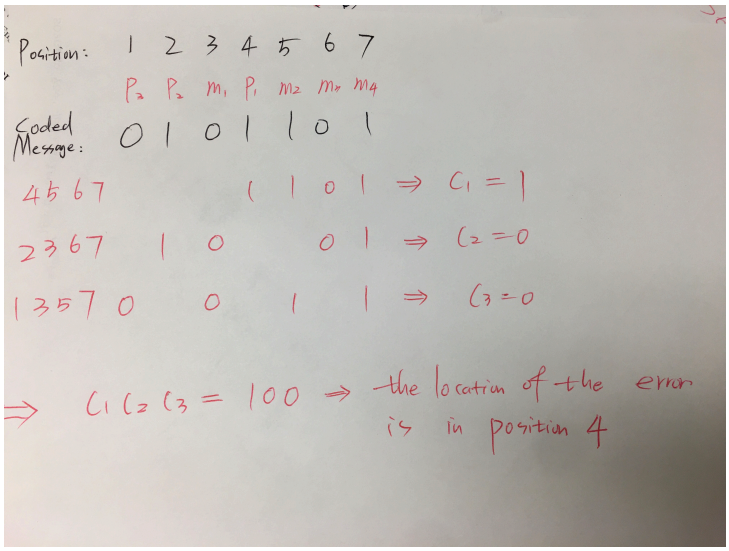
4. The following hamming coded message was received. Use it to answer questions 4.1 - 4.6

0 1 0 1 1 0 1

(4.1) Circle the parity bits p3, p2 and p1

0 1 0 1 1 0 1

(4.2) What position number is generated to determine if an error has ocurred in transmission?



4567 parity check: c1 = 1
2367 parity check: c2 = 0
1357 parity check: c3 = 0

100

(4.3) Did an error occur in transmission?

Yes. The location of the error is in position 4

(4.4) What was the original correct coded message?

0 1 0 0 1 0 1

(4.5) What was the original correct message?

0 1 0 1

(4.6) If the message is binary, what is the decimal value?

5

5. Convert a Negative Decimal Number –15 to an 8-bit binary number using Two's Complement.

1. **Convert the positive number (15) to binary (8-bit)**
   00001111

2. **Invert all bits (find the 1's complement)**
   11110000

3. **Add 1 to the result (to get 2's complement)**
   11110001

6. Converting a signed Binary Number 1111 0001 in Two's Complement to its Decimal Number.

1. **Check the sign bit (MSB)**
   The first bit is 1 → the number is negative.

2. **Invert all bits (1's complement):**
   00001110

3. **Add 1 to get the magnitude:**
   00001111
   Binary 00001111 = Decimal 15

4. **Apply the sign**
   -15

7. Encode a decimal number 4 using each of the following codes.

A. Binary Code **0100**
B. BCD Code **0100**
C. Gray Code **0110**
D. Excess-3 Code **0111**
E. 7-bit Hamming Code **1001100**

8. A self-complementing code has the special property that the 1's complement of a digit's code represents the code for its 9's complement. Using the (2,4,2,1) weighted code

8.1 what is the (2,4,2,1) binary code for decimal number 7?

2×1 + 4×1 + 2×0 + 1×1 = 7

(2,4,2,1) binary code is: 1101

8.2 what is the 1's complement of the above (2,4,2,1) code?

Flip each bit: 0010

8.3 what is the decimal value of its flipped code (1's complement)?

2×0 + 4×0 + 2×1 + 1×0 = 2
(which is the 9's complement of 7)

8.4 What is the necessary condition that a weighted code must satisfy in order to be self-complementing?

The sum of the weights must equal 9