Data Compression

1. 11 letters, each = 8 bits → 88 bits
   m = 109, i = 105, s = 115, p = 112

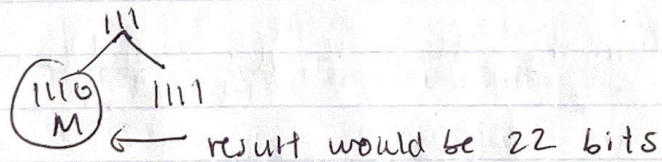   01101101

2. 000 010 100 100 010 100 100 010 110 110 010
   33 bits

3.

0 10 110 110 10 110 110 10 111 11 110
27 bits

M = 1
I = 4
S = 4
P = 2

111 0 10 10 0 10 10 0 110 110 0
21 bits

↳ so that m ends in 0

← result would be 22 bits
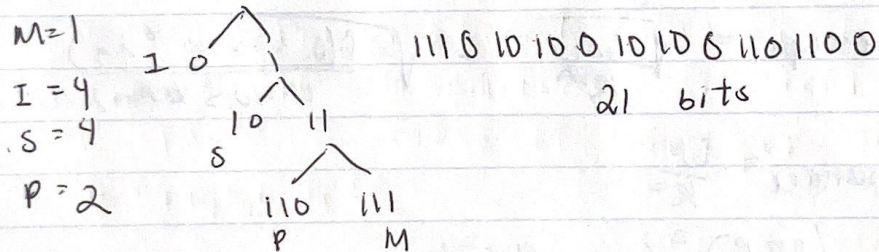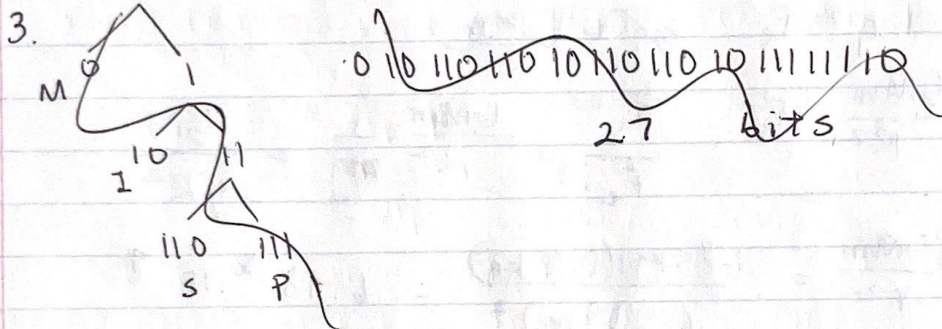
Error Correction and Detection

4. |1011011|

    upon receiving: 11011011 = no error

                10011011 = error

                00011011 = false negative

                10011010 = false negative

                11011010 = false positive

5.
sent
0 0 1 1 1	0
0 0 1 1 1	0
1 1 1 1 1	0
1 1 1 1 1	0
1 1 1 1 1	0

received
1 1 1 1 1	0
1 1 1 1 1	0
1 1 0 1 1	0
1 1 1 0 0	0
1 1 1 1 1	0

a) ~~They are all wrong~~
   The first four have errors

b) 110110, 111000 because
   it has errors in one ~~or~~ or
   both colums and rows.

c) 110110, because it is only
   a single-bit error

d) 111110, 111110 because
   the rows still has odd
   # of 1's and so does the
   columns of the bits that
   changed.

6. 140 in L1, 40 in L2, 18 in L3, 2 in memory

L1: $140 \times 1 = 140$ cycles

L2: $40 \times 1 = 40$ } 120 cycles
    $40 \times 2 = 80$

L3: $18 \times 1 = 18$
    $18 \times 2 = 36$ } 108 cycles
    $18 \times 3 = 54$

mem: $2 \times 1 = 2$
    $2 \times 2 = 4$
    $2 \times 3 = 6$ } 32 cycles
    $2 \times 10 = 20$

| 400 cycles |