**Exer 5-1**We are given an 8-bit byte with binary value **1010,1111**. To encode with even-parity Hamming code, we begin by identifying our check bit indices, which are 1, 2, 4, and 8, which we leave blank for now. The rest of the indices are data bits, which we can fill in with each bit of the binary value. To find the total number of bits, we add the number of check bits (4) with the number of data bits (8) to get 12.

**\_ \_ 1 \_ 0 1 0 \_ 1 1 1 1**

Now, we can create a table of check bits and contributing data bits.

|  |  |
| --- | --- |
| Check bit | Contributing data bits |
| 1 | 3, 5, 7, 9, 11 |
| 2 | 3, 6, 7, 10, 11 |
| 4 | 5, 6, 7, 12 |
| 8 | 9, 10, 11, 12 |

Then, at each check bit index, we will check the corresponding data bit indices. If the number of 1s in the corresponding data bit indices is even, we will make that check bit 0. If the number of 1s in the corresponding data bit indices id odd, we will make that check bit 1. As an example, for check bit 1, we check the corresponding data bit indices 3, 5, 7, 9 ,11. At those data bit indices, there are 3 1s (odd), so we make the first check bit 1. We repeat this encoding process for the rest of the check bits, and get the following binary value:

**1 0 1 0 0 1 0 0 1 1 1 1**

**Exer 5-2** If one station outputs a 1000-bit frame per 100 seconds, we know it simply outputs 10 bits per second. We can then use the following formula:

S (effective throughput) = maximum efficiency \* C (channel capacity)

where the maximum efficiency of an ALOHA channel is 18%, and the channel capacity is given to be 56-kbps.

Therefore, effective throughput S = 0.18 \* 56,000 bits/sec = 10,080 bit/sec.

Then we can use the following equation:

N (number of stations) \* R\_s (transmission rate per station) = S (effective throughput)

where R\_s = 10 bits/sec and S = 10,080 bits/sec. Solving for N, we get **1,008 maximum stations**.

--Jason McCauley

I pledge my honor that I have abided by the Stevens Honor System.