

Class,

Problem 6-45

The autocorrelation function for these digital sequences is defined as:

$$R(n) = \sum_{i=0}^m A_i(0) A_i(n)$$

where $n = 0, \dots, 7$ is the shift value, $A(0)$ is the original sequence, $A(n)$ is the sequence after n shifts, and m is the number of bits in the pseudorandom sequence. This is like a dot product.

Here are some sequence examples

$$A(0) = 1 \ 1 \ 1 \ 0 \ 1 \ 0 \ 0 \Rightarrow +1 \ +1 \ +1 \ -1 \ +1 \ -1 \ -1$$

$$\dots$$
$$\bar{A}(5) = 1 \ 0 \ 1 \ 0 \ 0 \ 1 \ 1 \Rightarrow +1 \ -1 \ +1 \ -1 \ -1 \ +1 \ +1$$

$$\dots$$
$$A(7) = A(0) = 1 \ 1 \ 1 \ 0 \ 1 \ 0 \ 0 \Rightarrow +1 \ +1 \ +1 \ -1 \ +1 \ -1 \ -1$$

Here are some autocorrelations:

$$R(0) = A(0) \bullet A(0)$$

$$= (+1)(+1) + (+1)(+1) + (+1)(+1) + (-1)(-1) + (+1)(+1) + (-1)(-1) + (-1)(-1) = 7$$

$$R(5) = A(0) \bullet A(5)$$

$$= (+1)(+1) + (+1)(-1) + (+1)(+1) + (-1)(-1) + (+1)(-1) + (-1)(+1) + (-1)(+1)$$
$$= 1 - 1 + 1 + 1 - 1 - 1 - 1 = -1$$