Hardware/Software Codesign for Wireless Systems

Problem Set 2

Gold Codes

The GPS coarse acquisition (C/A) code is a 1023-chip Gold code. Each satellite has a separate code. The codes are nearly but not exactly orthogonal to each other and to shifted versions of themselves.

Write a MATLAB program to produce an array containing the C/A codes for each satellite. The array should contain 1023 rows and 32 columns. Each entry should be either 0 or 1.

Refer to Table 4.3 of Kaplan for the C/A code specification. Note that satellite 6 has an incorrect entry; it should be 2 XOR 10.

You will use your code in subsequent labs.

In the code, a logic 0 represents -1 and a logic 1 represents 1. If a 1023-bit C/A code is correlated against itself, the result should be 1023. If it is correlated against a shifted version of itself, the result ideally would be 0 if the code were orthogonal to shifted versions of itself. At best, the result would be +/-1 because the code is of odd length. Unfortunately, the code is not perfectly orthogonal. What is the maximum value of the C/A code for satellite 1 correlated against shifted versions of itself?

What to Turn In

1) Your Matlab program that generates the codes.
2) The first 10 bits of each of the 32 codes. Do these bits match the expected values listed by Kaplan?
3) What is the maximum correlation of a C/A code with a shifted version of itself?