

PN Sequences and Scramblers

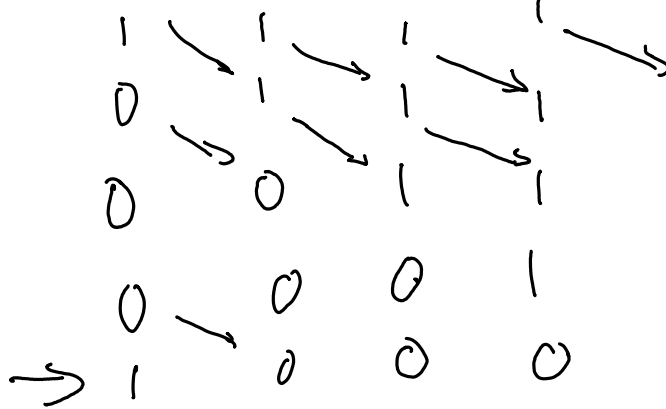
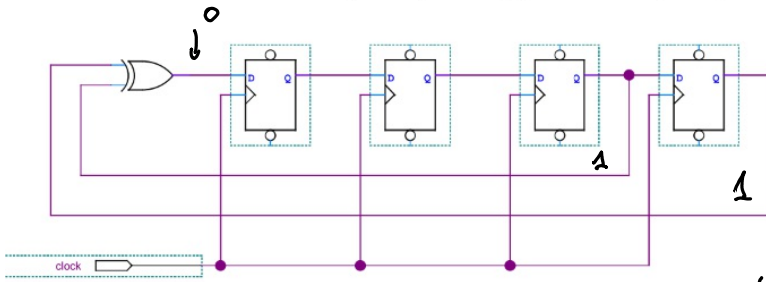
Exercise 1: How many bits are there in an m-sequence for $m = 6$?
How many are 1's? How many are 0's?

$$2^6 - 1 = 63$$

$$2^{m-1} = 2^5 = 32$$

$$2^{m-1} - 1 = 2^5 - 1 = 31$$

Exercise 2: If the initial value of each flip-flop is 1, what are the values of the next 4 bits output by the right-most flip-flop?



$m = 4$
period = $2^m - 1 = 16 - 1 = 15$

Exercise 3: How many flip-flops would be required to generate a ML PRBS of period 8191? How many ones would the sequence have? What is the longest sequence of 0's?

$$2^{12} = 4096$$

$$2^{13} = 8192$$

$$2^{14} = 16384$$

$$2^m - 1 = 8191$$

$$2^m = 8191 + 1 = 8192$$

$$\log_2 2^m = \log_2 8192$$

$$m = 13$$

$$2^{12} = 4096 \quad 1's$$

$$2^{12} - 1 = 4095 \quad 0's$$

longest run of 0's is $m-1 = 12$

Exercise 4: Why not?

- everybody knows how to unscramble the scrambling.

Exercise 5: How many errors will appear in the output of a V.34 descrambler if there is one input error?

3 — 1 from original error
2 from corrupted descrambling sequence

Exercise 6: In the diagram above, what two signals would the receiver compare to detect errors?

output of receiver & output of LFSR PRBS at receiver.