Solution of HW 5
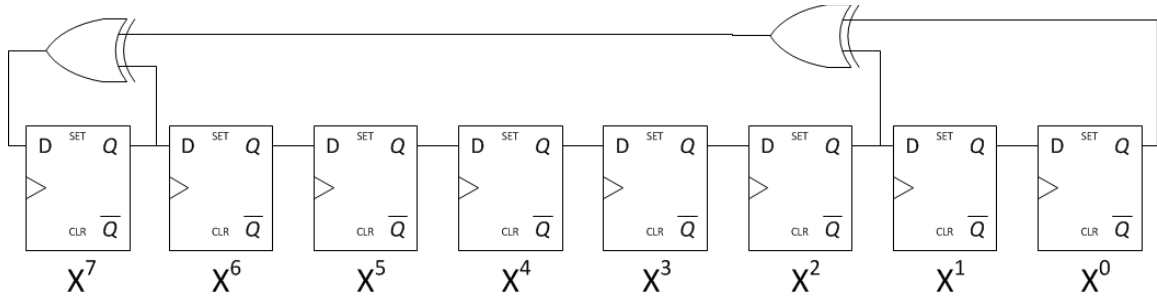
(1) Consider the polynomial for a **standard** LFSR given by:

$$F(x) = x^8 + x^7 + x^2 + 1$$

Implemented:

$X^7 \quad X^6 \quad X^5 \quad X^4 \quad X^3 \quad X^2 \quad X^1 \quad X^0$

System of equations:

$$
\begin{bmatrix} X_0(t+1) \\ X_1(t+1) \\ X_2(t+1) \\ X_3(t+1) \\ X_4(t+1) \\ X_5(t+1) \\ X_6(t+1) \\ X_7(t+1) \end{bmatrix}
=
\begin{bmatrix}
0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\
1 & 0 & 1 & 0 & 0 & 0 & 0 & 1
\end{bmatrix}
\begin{bmatrix} X_0(t) \\ X_1(t) \\ X_2(t) \\ X_3(t) \\ X_4(t) \\ X_5(t) \\ X_6(t) \\ X_7(t) \end{bmatrix}
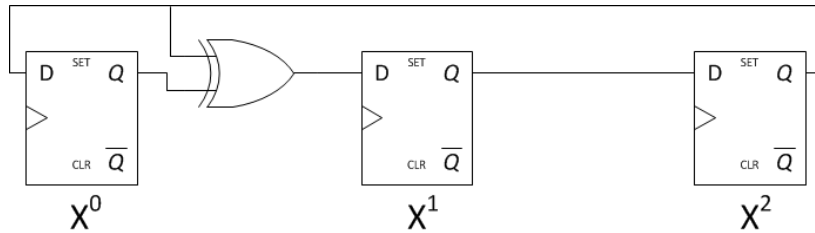$$

(2)

CLK	X_7	X_6	X_5	X_4	X_3	X_2	X_1	X_0	Decimal
0	0	0	0	0	0	0	0	1	1
1	1	0	0	0	0	0	0	0	128
2	1	1	0	0	0	0	0	0	192
3	1	1	1	0	0	0	0	0	224
4	1	1	1	1	0	0	0	0	240
5	1	1	1	1	1	0	0	0	248
6	1	1	1	1	1	1	0	0	252
7	0	1	1	1	1	1	1	0	126
8	1	0	1	1	1	1	1	1	191

(3) Consider the polynomial for a **modular** LFSR given by:

$$F(x) = x^3 + x + 1$$

Implemented:

System of equations:

$$\begin{bmatrix} X_0(t+1) \\ X_1(t+1) \\ X_2(t+1) \end{bmatrix} = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} X_0(t) \\ X_1(t) \\ X_2(t) \end{bmatrix}$$

(4)

CLK	X_2	X_1	X_0	Decimal
0	0	0	1	1
1	0	1	0	2
2	1	0	0	4
3	0	1	1	3
4	1	1	0	6
5	1	1	1	7
6	1	0	1	5
7	0	0	1	1
8	0	1	0	2