3.2. Methods for Cache Replacement
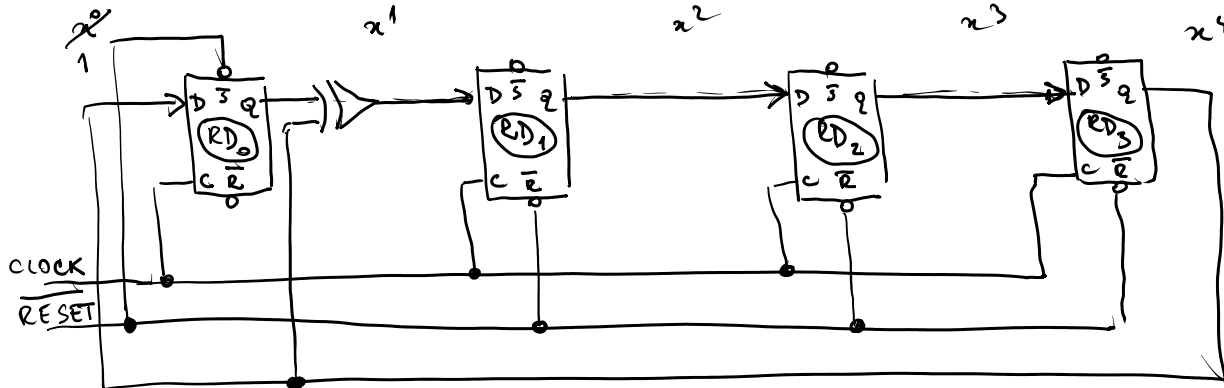
- does not concern DM
- 3 methods

a) Random   Linear Feedback Shift Register (LFSR)

$2^m - 1$ binary combinations

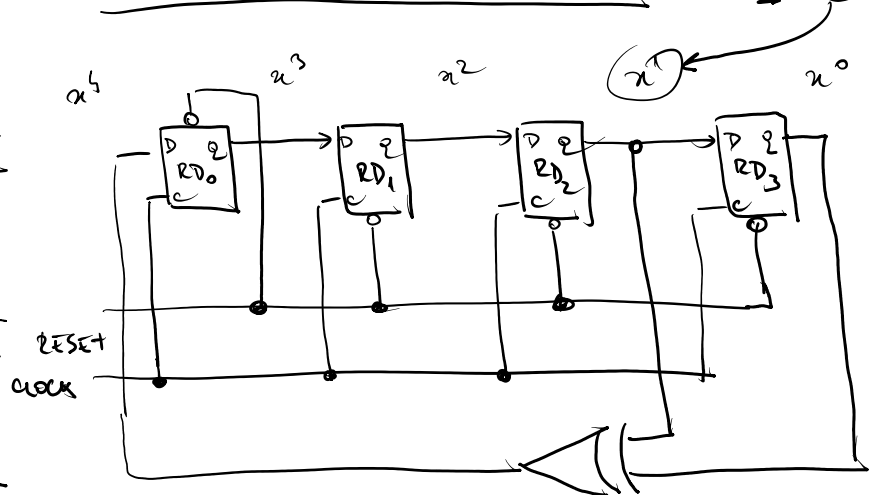$$G(x) = \boxed{x^4} + \underline{x} + \boxed{1}$$

$m = 4$

x^0 1 x^1 x^2 x^3 x^4

CLOCK
RESET

2^0	2^1	2^2	2^3	
RD_0	RD_1	RD_2	RD_3	Dec
1	0	0	0	1
0	1	0	0	2
0	0	1	0	4
0	0	0	1	8
1	1	0	0	3
0	1	1	0	6
0	0	1	1	12
1	1	0	1	11
1	0	1	0	5
0	1	0	1	10
1	1	1	0	7
0	1	1	1	14
1	1	1	1	15
1	0	1	1	13
1	0	0	1	9
1	0	0	0	1

Version with external XORs

$$G(x) = x^4 + \boxed{x} + 1 \qquad x^0$$

x^4 x^3 x^2 $\boxed{x^1}$ x^0

RESET
CLOCK

b) LRU Solution   (Least Recently Used)
   - age registers

Addr seq   14, 7, 6, 12, 10, 7, 6, 14, 7, 3, 14
   Cache: 4-way SA , same Index Blocks
                    Age registers

Cache: 4-way SA, same Index Blocks
Age counters

Data	0	1	2	3	0*	1*	2*	3*
	0	0	0	0	0	0	0	0
M 14	14	0	0	0	0	0	0	0
M 7	14	7	0	0	1	0	0	0
M 6	14	7	6	0	2	1	0	0
M 12	14	7	6	12	3	2	1	0
M 10	10	7	6	12	0	3	2	1
H 7	10	(7)	6	12	1	0	3	2
H 6	10	7	6	12	2	1	0	(3)
M 14	10	7	6	14	3	2	1	0
I 7	10	(7)	6	14	(3)	0	2	1
M 3	3	7	6	14	0	1	3	2
H 14	3	7	6	(14)	1	2	3	0

c) FIFO (First In - First Out)
Not used anymore!