1. $f(x_1, x_2, x_3, x_4) = m(0,3,5,7,8,10,11,13,15) + D(1,6)$

0	0 0 0 0 ✓
1	0 0 0 1 ✓
8	1 0 0 0 ✓
3	0 0 1 1 ✓
5	0 1 0 1 ✓
6	0 1 1 0 ✓
10	1 0 1 0 ✓
7	0 1 1 1 ✓
11	1 0 1 1 ✓
13	1 1 0 1 ✓
15	1 1 1 1 ✓

→

0,1	0 0 0 x
0,8	x 0 0 0
1,3	0 0 x 1 ✓
1,5	0 x 0 1 ✓
8,10	1 0 x 0
3,7	0 x 1 1 ✓
3,11	x 0 1 1 ✓
5,7	0 1 x 1 ✓
5,13	x 1 0 1 ✓
6,7	0 1 1 x
10,11	1 0 1 x
7,15	x 1 1 1 ✓
11,15	1 x 1 1 ✓
13,15	1 1 x 1 ✓

→

1,3,5,7	0 x x 1
~~1,5,3,7~~	~~0 x x 1~~
3,7,11,15	x x 1 1
~~3,11,7,15~~	~~x x 1 1~~
5,7,13,15	x 1 x 1
~~5,13,7,15~~	~~x 1 x 1~~

	0	3	5	7	8	10	11	13	15
~~P₁~~	0 0 0 x			~~X~~					
P₂	x 0 0 0	X				X			
P₃	1 0 x 0					X	X		
~~P₄~~	0 1 1 x				~~X~~				
P₅	1 0 1 x						X	X	
P₆	0 x x 1		X	X	X				
P₇	x x 1 1		X		X			X		X
P₈	x 1 x 1			X	X				⊗	X

dominated by P₂

dominated by P₆, P₇, P₈

essential, we get m₅, m₇, m₁₅ for free

essential, we get m₈ for free

					0	3	8	10	11
P₂	x	0	0	0	⊗		X		
P₃	1	0	X	0			X	X	
P₅	1	0	1	X				X	X
~~P₆~~	0	x	x	1		X			
P₇	x	x	1	1		⊗			X

dominated by P₇

↑ becomes essential
after P₆ dominated,
we get m₁₁ for free

					10
P₃	1	0	X	0	⊗
P₅	1	0	1	X	X

Choose P₃ arbitrarily

$$f = P_2 + P_3 + P_7 + P_8 = \overline{x_2}\,\overline{x_3}\,\overline{x_4} + x_1\overline{x_2}\,\overline{x_4} + x_3 x_4 + x_2 x_4$$

2.
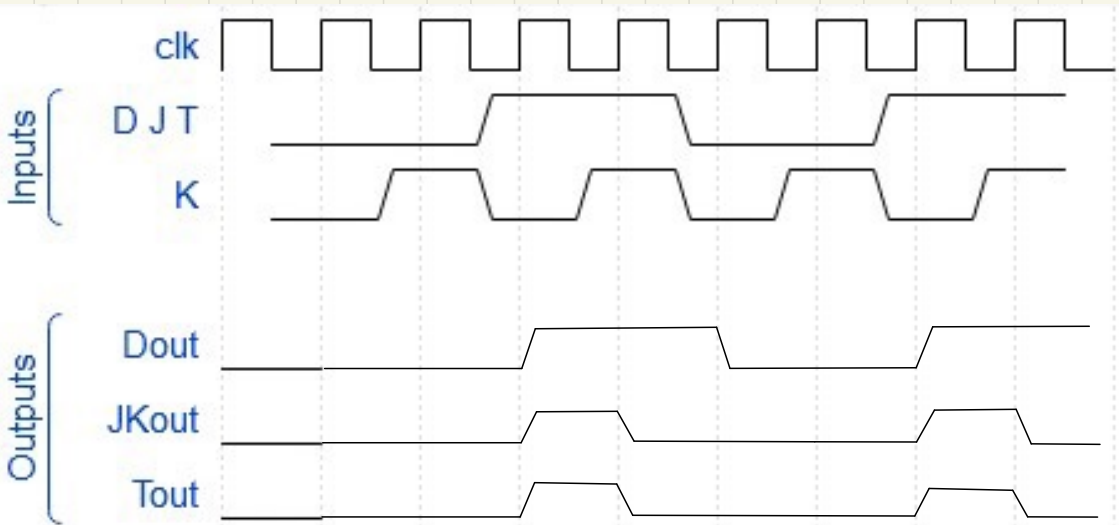
3. 6/2 → 0110 / 0010

N	M 0010 (-M 1110)	AQ	
4	0010	0000 0110	Init
4	0010	0000 1100	LS A:Q
4	0010	1110 1100	Trial Subtraction
3	0010	1101 1000	MSB=1→Q_0=0 LS A:Q
3	0010	1111 1000	Prev rest. + trial
2	0010	1111 0000	MSB=1→Q_0=0 LS A:Q
2	0010	0001 0000	Prev rest + trial
1	0010	0010 0010	MSB=0→Q_0=1 LS A:Q
1	0010	0000 0010	Trial Subtraction
F	0010	==0000 0011==	MSB=0→Q_0=1

Answer: 3 R0