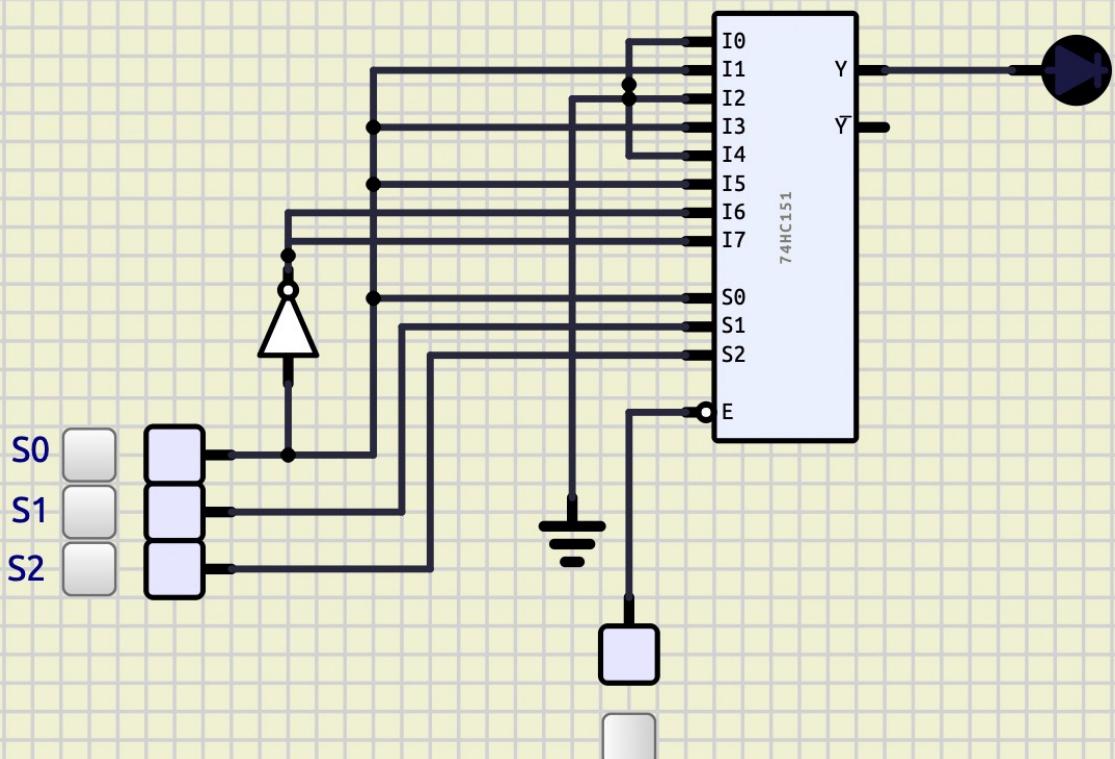


$$f(s_2, s_1, s_0) = \sum(1, 5, 6)$$

	$s_2$	$s_1$	$s_0$	$y$
0	0	0	0	0 $\rightarrow 0$ $I_0$
1	0	0	1	1 $\rightarrow s_0$ $I_1$
2	0	1	0	0 $\rightarrow 0$ $I_2$
3	0	1	1	1 $\rightarrow s_0$ $I_3$
4	1	0	0	0 $\rightarrow 0$ $I_4$
5	1	0	1	1 $\rightarrow s_0$ $I_5$
6	1	1	0	1 $\rightarrow s_0$ $I_6$
7	1	1	1	0 $\rightarrow s_0$ $I_7$

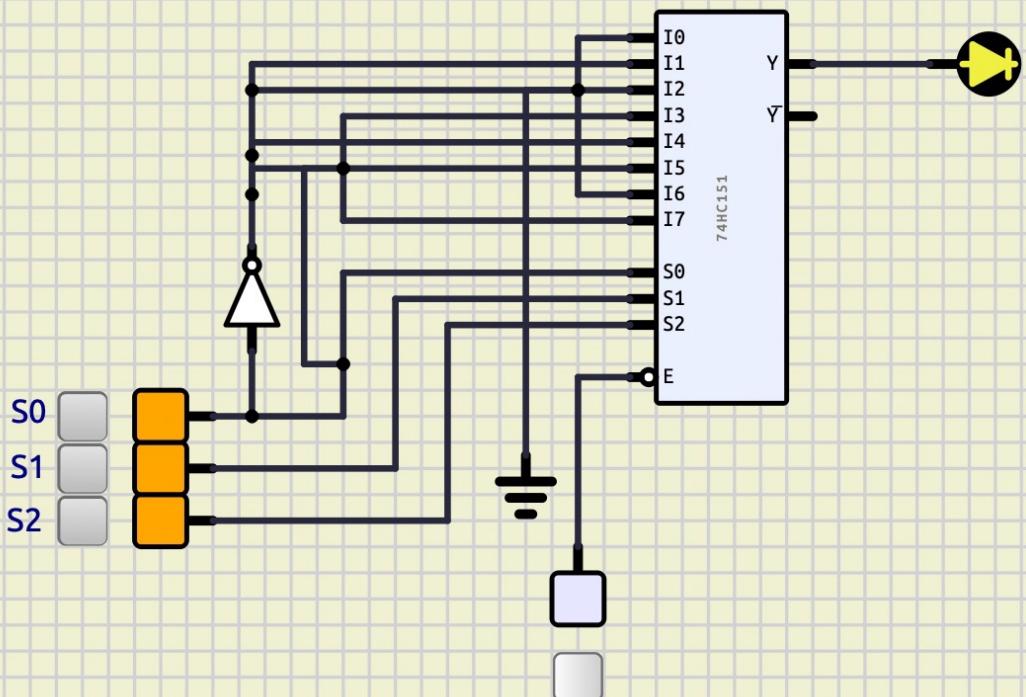
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$$F = \Sigma(2, 3, 4, 7)$$

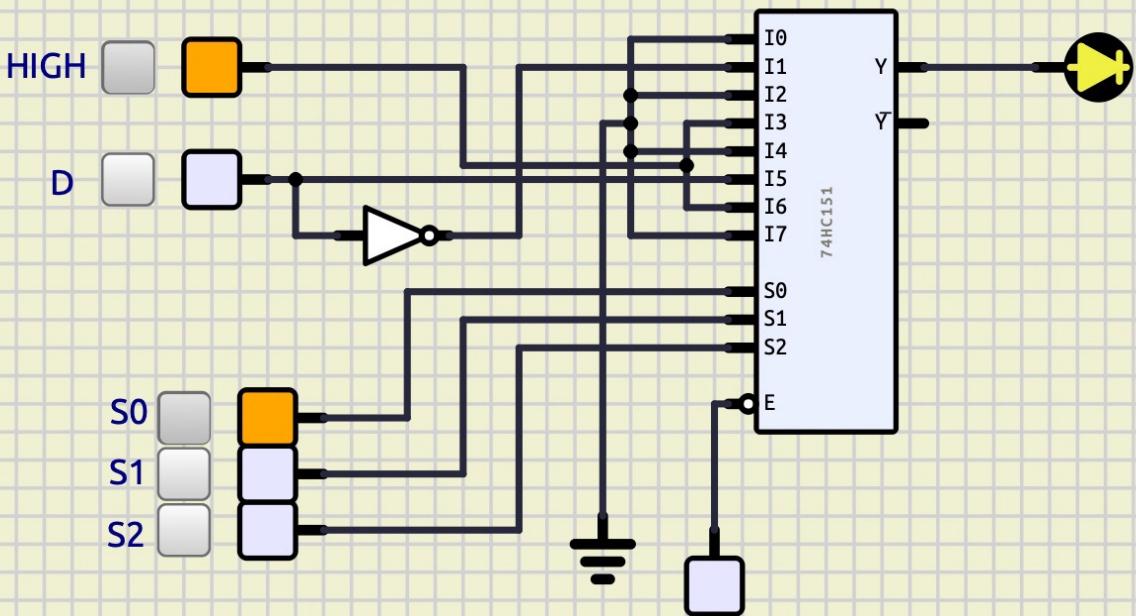
	$S_2$	$S_1$	$S_0$	$Y$
0	0	0	0	$0 \rightarrow 0$
1	0	0	1	$0 \rightarrow \bar{S}_0$
2	0	1	0	$1 \rightarrow S_0$
3	0	1	1	$1 \rightarrow \bar{S}_0$
4	1	0	0	$1 \rightarrow S_0$
5	1	0	1	$0 \rightarrow \bar{S}_0$
6	1	1	0	$0 \rightarrow 0$
7	1	1	1	$1 \rightarrow S_0$

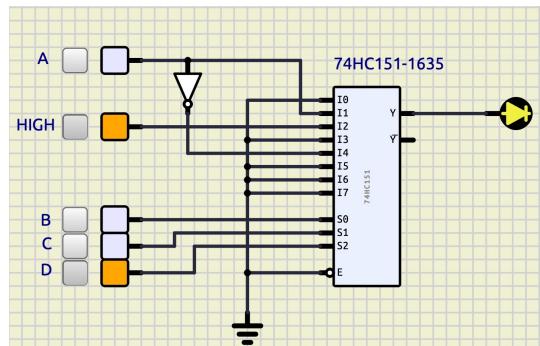
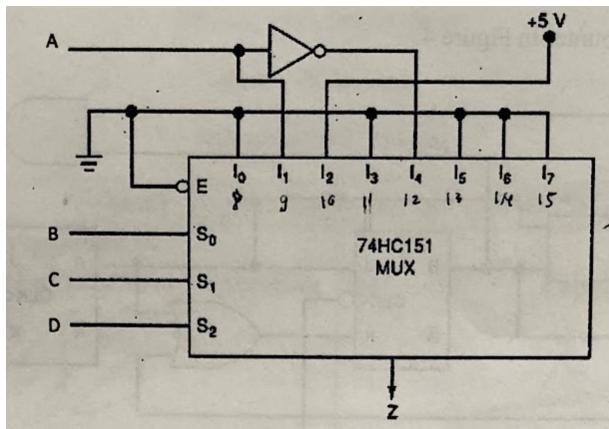
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$S_2\ S_1\ S_0\ D$	$Y$	$= S_2S_1\bar{S}_0D + S_2S_1\bar{S}_0\bar{D} + \bar{S}_2S_1S_0D + \bar{S}_2\bar{S}_1S_0\bar{D}$
0 0 0 0	0	$I_0$
1 0 0 1	0	$I_1$
2 0 0 1 0	1	$\bar{D}$
3 0 0 1 1	0	$I_1$
4 0 1 0 0	0	$I_2$
5 0 1 0 1	0	
6 0 1 1 0	1	$I_3$
7 0 1 1 1	1	$I_3$
8 1 0 0 0	0	$I_4$
9 1 0 0 1	0	
10 1 0 1 0	0	$I_5$
11 1 0 1 1	1	$\bar{D}$
12 1 1 0 0	1	$I_6$
13 1 1 0 1	1	$I_6$
14 1 1 1 0	0	$I_7$
15 1 1 1 1	0	$I_7$

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$P$	$C$	$B$	$A$	$Z$	
0	0	0	0	0	$I_6$
1	0	0	1	0	
2	0	0	10	0	$I_1$
3	0	0	11	1	
4	0	1	00	1	$I_2$
5	0	1	01	1	
6	0	1	10	0	$I_5$
7	0	1	11	0	
8	1	0	00	1	$I_4$
9	1	0	01	0	
10	1	0	10	0	$I_5$
11	1	0	11	0	
12	1	1	00	0	$I_C$
13	1	1	01	0	
14	1	1	10	0	$I_7$
15	1	1	11	0	

$\Delta C$	$BA$	00 01 11 10
00	0	1 3 2
01	4	5 7 6
11	12	13 15 14
10	8	9 11 10

$\Delta C$	$BA$	00 01 11 10
00	0	
01	1	
11	1	
10	1	1

$$b) F(CDCBA) = \Sigma(3, 4, 5, 8)$$

$$= \bar{D}C\bar{B} + DC\bar{B}\bar{A} + \bar{D}\bar{C}BA$$

## Asynchronous Counter

Count down,  $M=6$  ( $7-6-5-4-3-2$ )

$$\text{Maximum count} = 2^3 - 1 \Rightarrow 6 - 1 = 5$$

Total states : 6

0-1-2-3-4-5-6-7

0-1-2-3-4-5-6

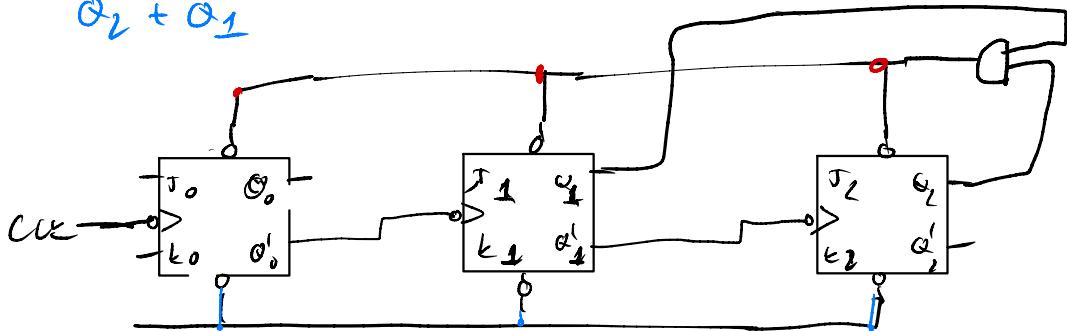
0-1-2-3-4-5

$Q_2$	$Q_1$	$Q_0$	Decimal
1	1	1	7
1	1	0	6
1	0	1	5
1	0	0	4
0	1	1	3
0	1	0	2
0	0	1	1
↓	↓	↓	
1	0	1	

TTTG < TTD  $\rightarrow$  lag bit 0

$Q_2 + Q_1$

Count down  $\rightarrow Q'$  consider to the CLK



PRE-CLR active low, triggered when = 0

	$Q_2$	$Q_1$	$Q_0$
0	0	0	0
1	0	0	1
2	0	1	0
3	0	1	1
4	1	0	0
5	1	0	1
6	1	1	0
	↓	↓	↓
	0	0	0
	$\overline{Q_2} + \overline{Q_1}$		

$110 > 000 \Rightarrow$  take bit 1

	$Q_2$	$Q_1$	$Q_0$
1	1	1	1
1	1	1	0
1	0	1	1
1	0	0	0
0	1	1	1
0	1	0	0
	↓	↓	↓
	1	1	1

Decimal

7  
6  
5  
4  
3  
2

$Q_2 + Q_1$

Q3 Q2 Q1

1  
0 0 1

2  
0 1 0

3  
0 1 1

4  
1 0 0

5  
1 0 1

6  
1 1 0

7  
1 1 1

8  
0 0 1