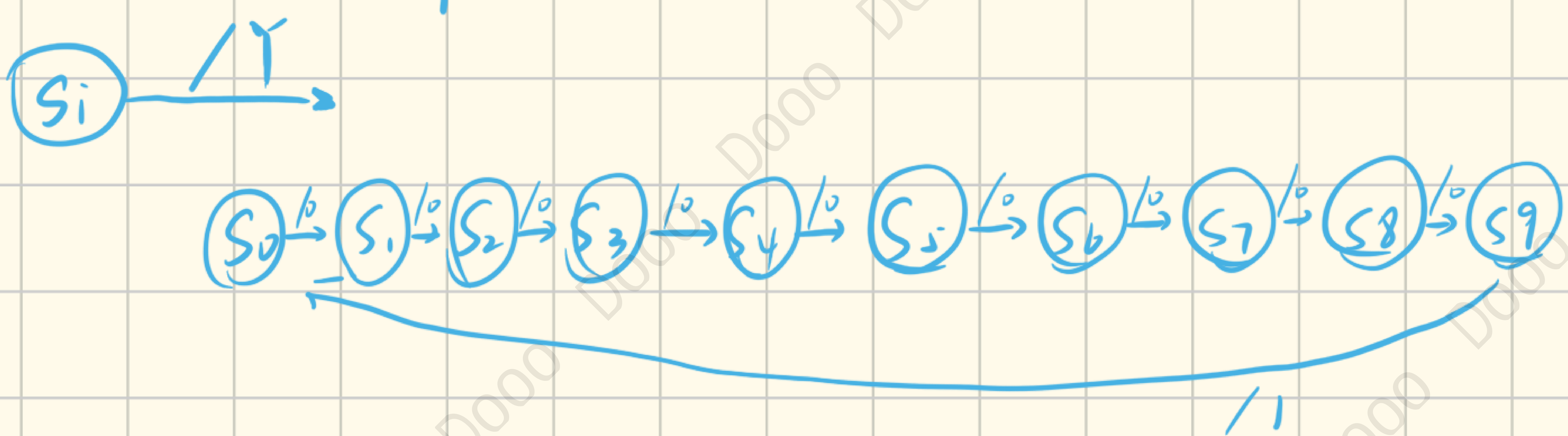
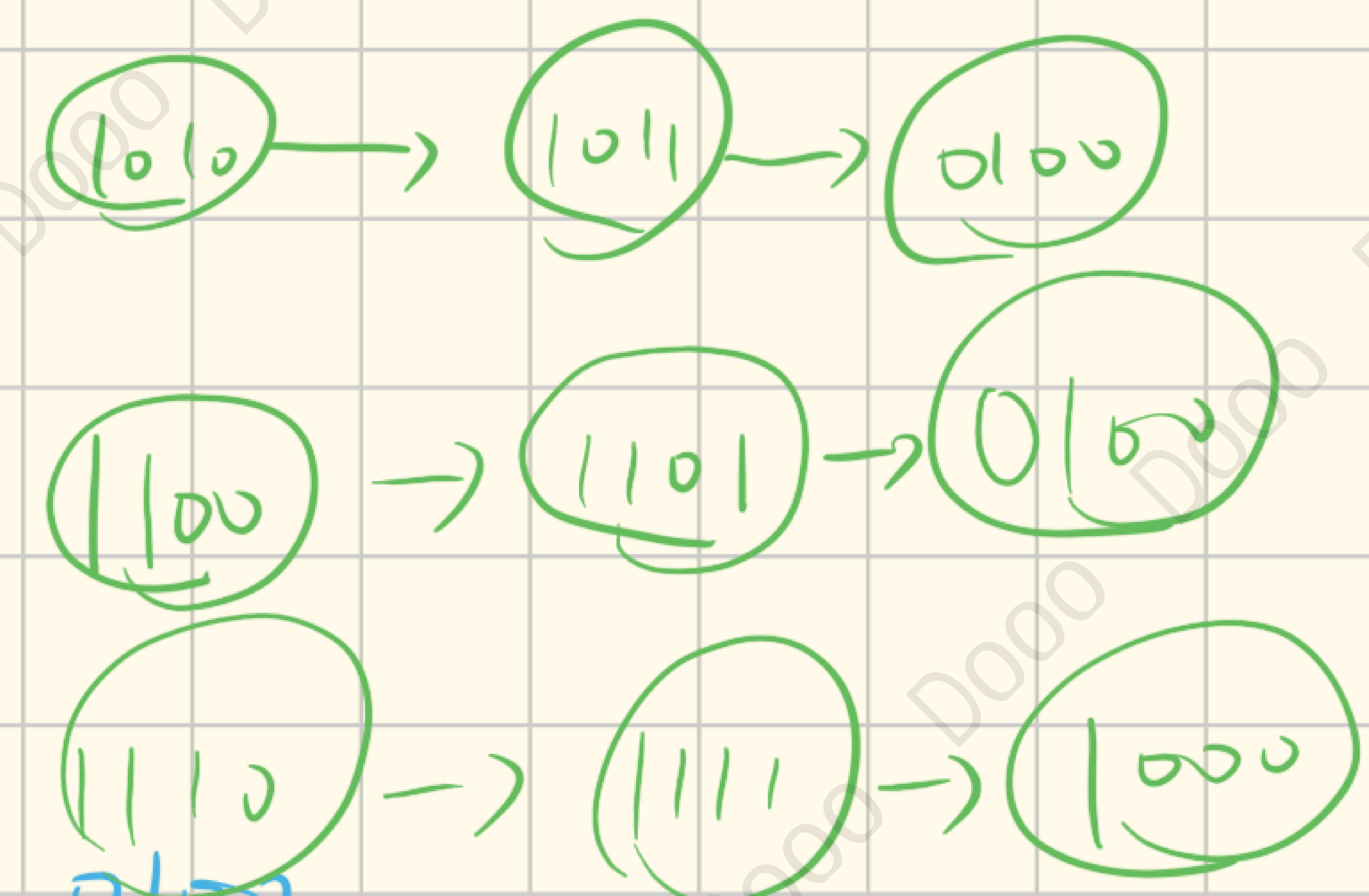
解：由题，有10个有效状态，记为S_i，不妨令输出为Y　　JK 10进制计数器

得初始状态转移图如下所示

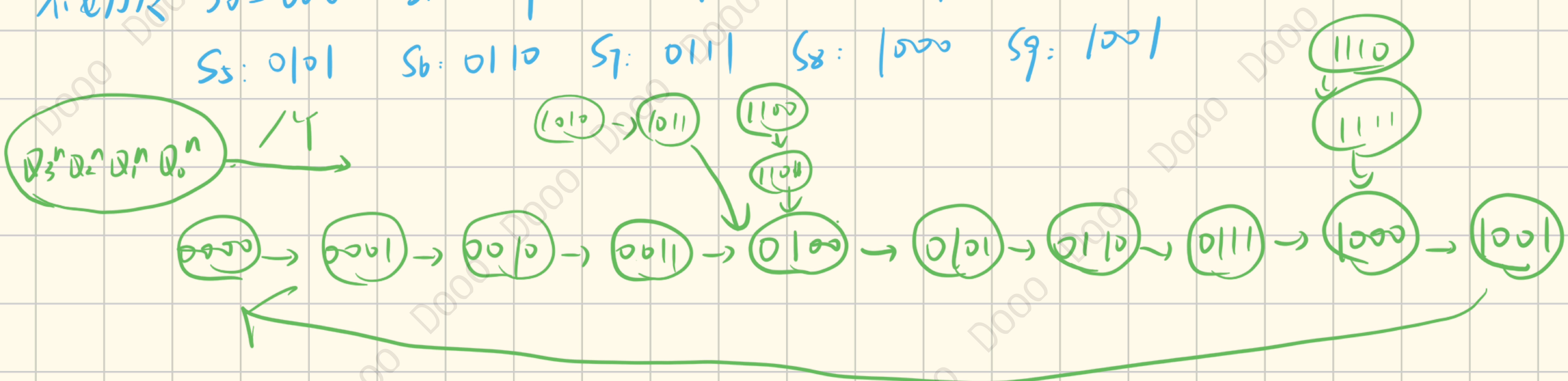




易知，用4个触发器即可实现该电路。

不妨令 $S_0=0000$　$S_1=0001$　$S_2:0010$　$S_3:0011$　$S_4:0100$

$S_5:0101$　$S_6:0110$　$S_7:0111$　$S_8:1000$　$S_9:1001$



得状态转移表如下所示.

Q_3^n	Q_2^n	Q_1^n	Q_0^n	Q_3^{n+1}	Q_2^{n+1}	Q_1^{n+1}	Q_0^{n+1}	Y
0	0	0	0	0	0	0	1	0
0	0	0	1	0	0	1	0	0
0	0	1	0	0	0	1	1	0
0	0	1	1	0	1	0	0	0
0	1	0	0	0	1	0	1	0
0	1	0	1	0	1	1	0	0
0	1	1	0	0	1	1	1	0
0	1	1	1	1	0	0	0	0
1	0	0	0	1	0	0	1	0
1	0	0	1	0	0	0	0	1
1	0	1	0	x	x	x	x	x
1	0	1	1	x	x	x	x	x
1	1	0	0	x	x	x	x	x
1	1	0	1	x	x	x	x	x
1	1	1	0	x	x	x	x	x
1	1	1	1	x	x	x	x	x

得次态卡诺图与输出卡诺图共5个.

$Q_3^nQ_2^n$ \ $Q_1^nQ_0^n$	00	01	11	10
00	0	0	0	0
01	0	0	1	0
11	x	x	x	x
10	1	0	x	x

Q_3^{n+1}

$Q_3^nQ_2^n$ \ $Q_1^nQ_0^n$	00	01	11	10
00	0	0	1	0
01	1	1	0	1
11	x	x	x	x
10	0	0	x	x

Q_2^{n+1}

$Q_3^nQ_2^n$ \ $Q_1^nQ_0^n$	00	01	11	10
00	0	1	0	1
01	0	1	0	1
11	x	x	x	x
10	0	0	x	x

Q_1^{n+1}

$Q_3^nQ_2^n$ \ $Q_1^nQ_0^n$	00	01	11	10
00	1	0	0	1
01	1	0	0	1
11	x	y	x	x
10	1	0	x	x

Q_0^{n+1}

$A+\bar{A}B = A(\bar{B}+B)+\bar{A}B = A\bar{B}+AB+\bar{A}B = A\bar{B}+B$

$= A+B$

$Q_3^nQ_2^n$ \ $Q_1^nQ_0^n$		01	11	10
00	0	0	0	0
01	0	0	0	0
11	X	X	X	X
10	0	1	X	X

Y.

由卡诺图得表达式.　　JK $Q^{n+1}=J\overline{Q^n}+\overline{K}Q^n$

$$Q_3^{n+1} = Q_3^n\overline{Q_0^n} + Q_2^nQ_1^nQ_0^n = (\overline{Q_0^n}+Q_2^nQ_1^n)Q_3^n + Q_2^nQ_1^nQ_0^n\overline{Q_3^n}$$

$$Q_2^{n+1} = Q_2^n\overline{Q_1^n} + Q_2^n\overline{Q_0^n} + \overline{Q_2^n}Q_1^nQ_0^n = (\overline{Q_1^n}+\overline{Q_0^n})Q_2^n + Q_1^nQ_0^n\overline{Q_2^n}$$

$$Q_1^{n+1} = Q_1^n\overline{Q_0^n} + \overline{Q_3^n}\,\overline{Q_1^n}\,Q_0^n = Q_1^n\overline{Q_0^n} + \overline{Q_3^n}Q_0^n\overline{Q_1^n}$$

$$Q_0^{n+1} = \overline{Q_0^n}$$

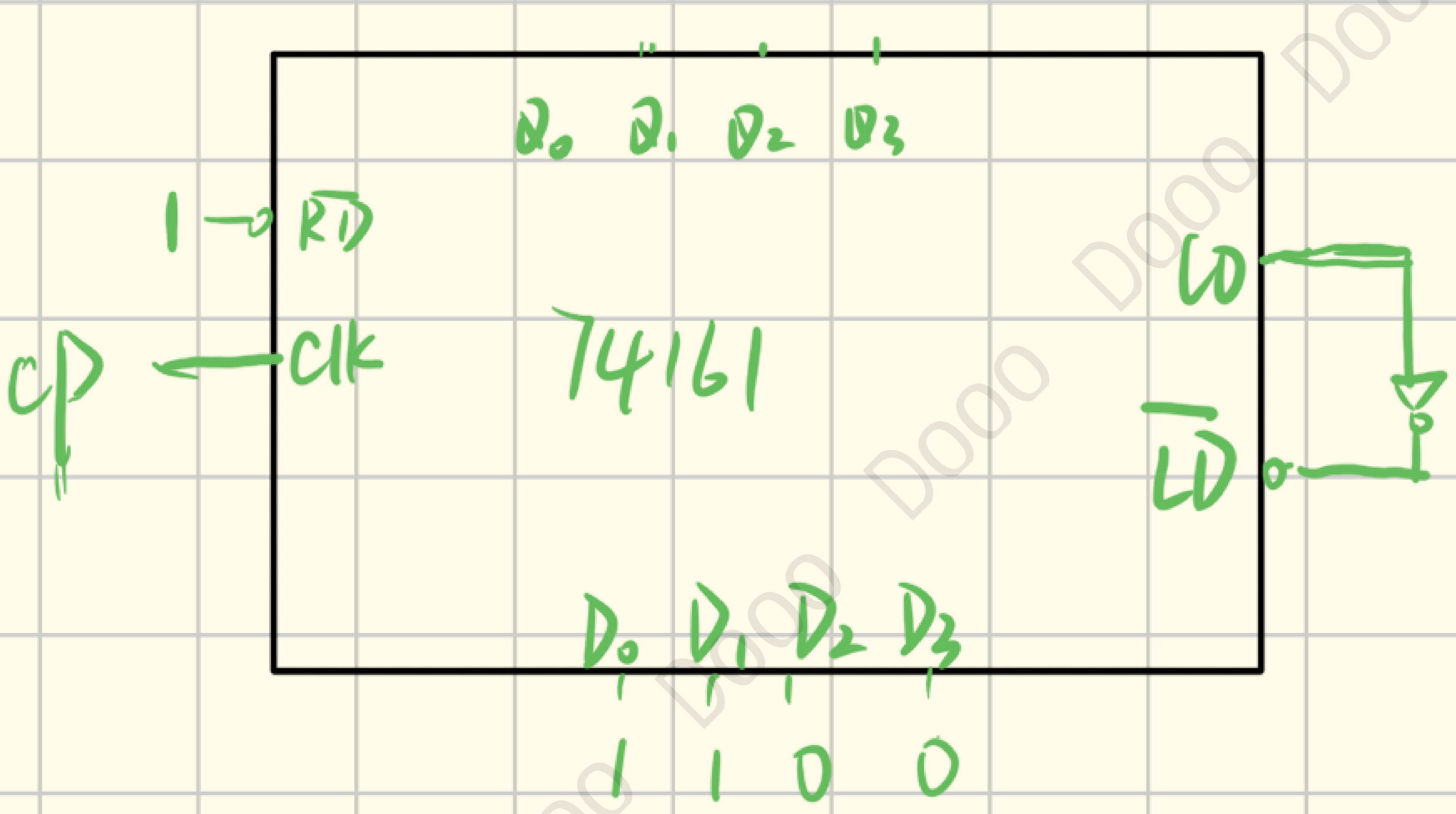
$$Y = Q_3^nQ_0^n$$

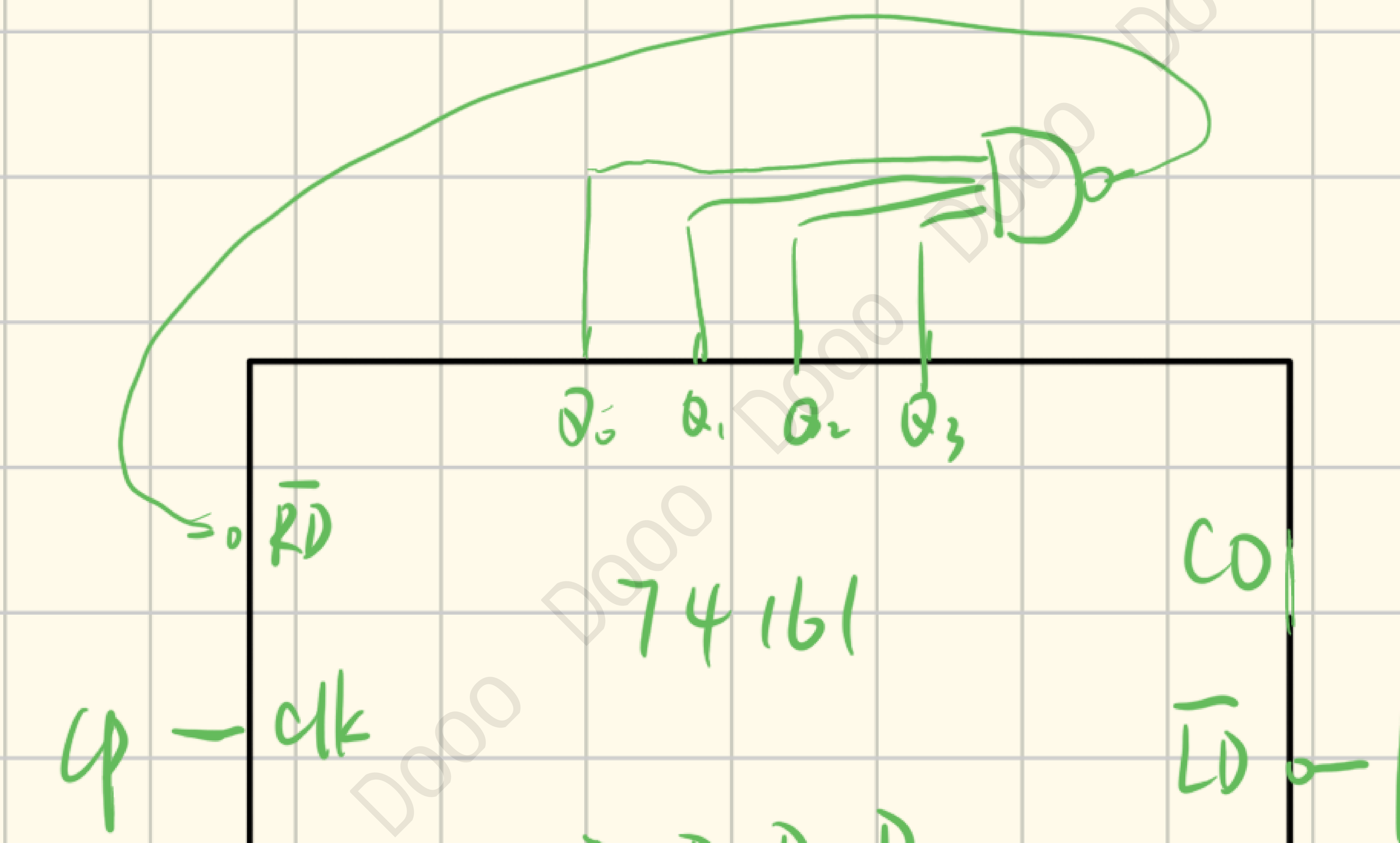
易知 $J_3 = Q_2^nQ_1^nQ_0^n$　　$K_3 = \overline{\overline{Q_0^n}+Q_2^nQ_1^n}$

$J_2 = Q_1^nQ_0^n$　　$K_2 = Q_1^nQ_0^n$

$J_1 = Q_1^n$　　$K_1 = \overline{\overline{Q_3^n}Q_0^n}$

$J_0 = 1$　　$K_0 = 1$


74161
1
RD
CP
clk
Q0 Q1 Q2 Q3
CO
LD
D0 D1 D2 D3
1 1 0 0


74161
RD
CP
clk
Q0 Q1 Q2 Q3
CO
LD
1
D0 D1 D2 D3

1001 序列检测器.

设状态为Si、输出为Y. 原始状态转移图.

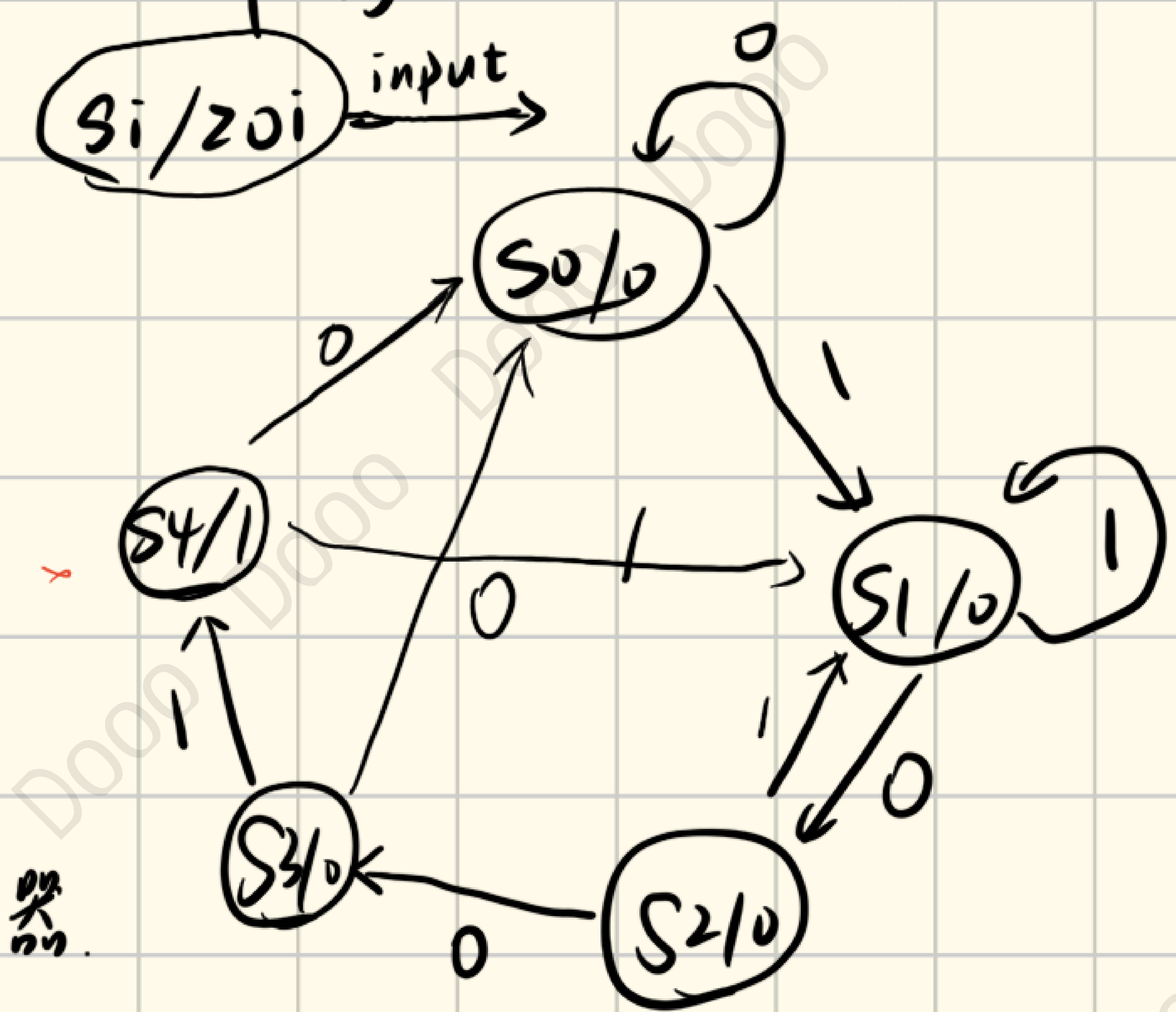
S0：默认状态.

S1：接收1.

S2：接收10.

S3：~100

S4：~1001



因为有5个状态. 所以需要3个触发器.

不化简. $S_0=000$

$S_1=001$

$S_2=010$

$S_3=011$

$S_4=100$

$Q_2^n Q_1^n Q_0^n$	$Q_2^{n+1} Q_1^{n+1} Q_0^{n+1}$	Y
0 0 0	0 0 0 0 0 1	0
0 0 1	0 1 0 0 0 1	0
0 1 0	0 1 1 0 0 1	0
0 1 1	0 0 0 1 0 0	0
1 0 0	0 0 0 0 0 1	1
1 0 1	x x x x x x	x
1 1 0	x x x x x x	x
1 1 1	x x x x x x	x

X=0 上

X=1 下.

Q_2^{n+1}

$Q_2^n Q_1^n$ \ $Q_0^n X$	00	01	11	10
00	0	0	0	0
01	0	0	1	0
11	x	x	x	x
10	0	0	x	x

Q_1^{n+1}

$Q_2^n Q_1^n$ \ $Q_0^n X$	00	01	11	10
00	0	0	0	1
01	1	0	0	0
11	x	x	x	x
10	0	0	x	x

Q_0^{n+1}

$Q_2^n Q_1^n$ \ $Q_0^n X$	00	01	11	10
00	0	1	1	0
01	1	1	0	0
11	x	x	x	x
10	0	1	x	x

Y

$Q_2^n Q_1^n$ \ $Q_0^n X$	00	01	11	10
00	0	0	0	0
01	0	0	0	0
11	x	x	x	x
10	1	1	x	x

$Y=Q_2^n$.