118/0417

田耒井

1.

First, we have truth table:

A_t	B_t	C_t	D_t	A_{t+1}	B_{t+1}	C_{t+1}	D_{t+1}
0	0	0	0	0	0	1	0
0	0	0	1	0	0	1	0
0	0	1	0	0	1	1	0
0	0	1	1	0	0	1	0
0	1	0	0	0	0	1	0
0	1	0	1	0	0	1	0
0	1	1	0	1	0	0	0
0	1	1	1	0	0	1	0
1	0	0	0	1	0	0	1
1	0	0	1	1	1	0	0
1	0	1	0	0	0	1	0
1	0	1	1	0	0	1	0
1	1	0	0	1	1	0	1
1	1	0	1	0	0	1	0
1	1	1	0	0	0	1	0
1	1	1	1	0	0	1	0

Then we have k-maps:

A_{t+1}:

AB \ CD	00	01	11	10
00	0	0	0	0
01	0	0	0	0
11	1	0	0	0
10	1	0	0	0

$A_{t+1} = AC'D'$

B_{t+1}:

AB \ CD	00	01	11	10
00	1	1	1	1
01	1	1	1	0
11	0	1	1	1
10	0	0	1	1

$B_{t+1} = A'B' + A'C' + BD + AC$

C_{t+1}:

AB \ CD	00	01	11	10
00	0	0	0	0
01	0	0	0	0
11	1	0	0	0
10	0	1	0	0

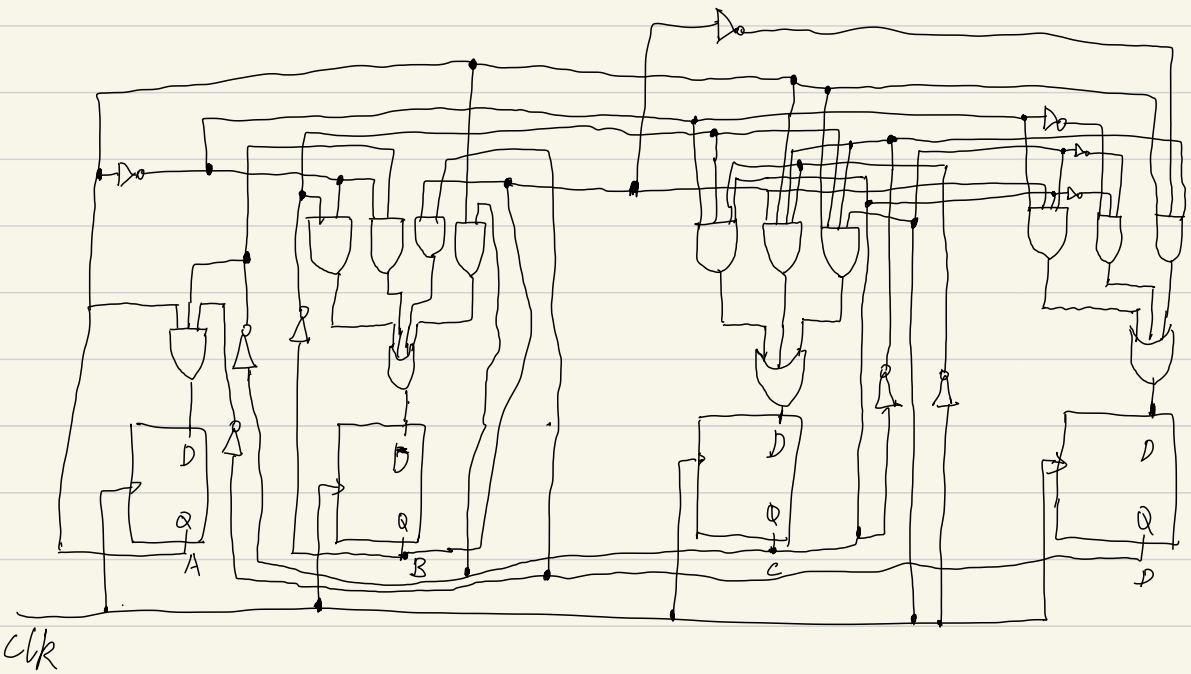
$C_{t+1} = A'B'CD' + AB'C'D' + AB'C'D$

D_{t+1}:

AB \ CD	00	01	11	10
00	0	0	0	0
01	0	0	0	1
11	1	0	0	0
10	1	1	0	0

$D_{t+1} = A'BCD' + AC'D' + AB'C'$

We have the circuit:



2.

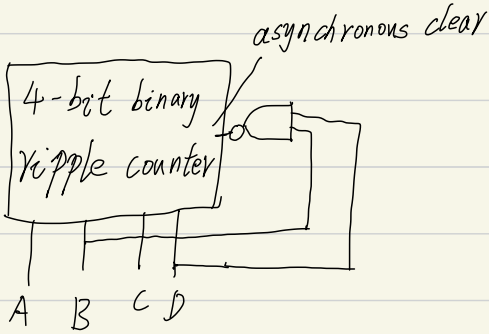
Let D, C, B, A be the outputs of the 4-bit binary ripple counter.

We have the truth table.

D_t	C_t	B_t	A_t	D_{t+1}	C_{t+1}	B_{t+1}	A_{t+1}
0	0	0	0	0	0	0	1
0	0	0	1	0	0	1	0
0	0	1	0	0	0	1	1
0	0	1	1	0	1	0	0
0	1	0	0	0	1	0	1
0	1	0	1	0	1	1	0
0	1	1	0	0	1	1	1
0	1	1	1	1	0	0	0
1	0	0	0	1	0	0	1
1	0	0	1	1	0	1	0
1	0	1	0	0	0	0	0
1	0	1	1	X	X	X	X
1	1	0	0	X	X	X	X
1	1	0	1	X	X	X	X
1	1	1	0	X	X	X	X
1	1	1	1	X	X	X	X

We look at the truth table and found that if and only if D_t and B_t were both 1, $D_{t+1}, C_{t+1}, B_{t+1}, A_{t+1}$ will be reset to 0000

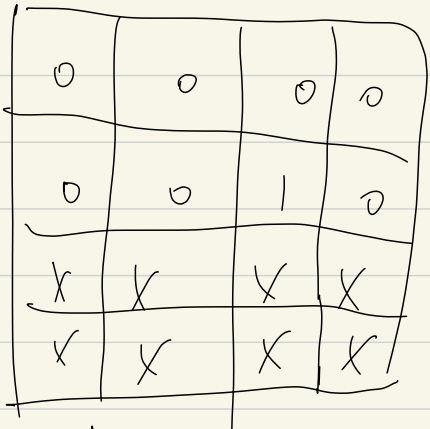
Hence, we have the circuit:



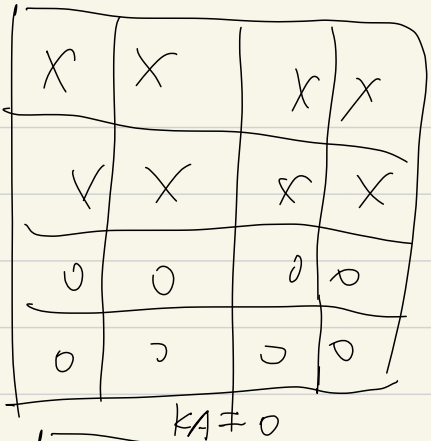
3.

First, we have the truth table.

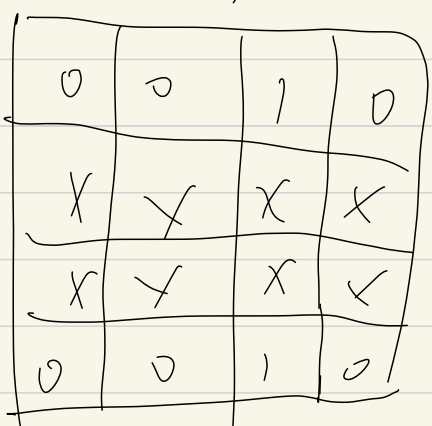
A_t	B_t	C_t	D_t	A_{t+1}	B_{t+1}	C_{t+1}	D_{t+1}	J_A	K_A	J_B	K_B	J_C	K_C	J_D	K_D	out.
0	0	0	0	0	0	0	1	0	X	0	X	1	X	1	X	0
0	0	0	1	0	0	1	0	0	X	1	X	X	X	X	1	1
0	0	1	0	0	0	1	1	0	X	X	0	1	0	1	X	1
0	0	1	1	0	1	0	0	0	X	X	1	X	1	X	1	1
0	1	0	0	0	1	0	1	0	X	0	X	1	X	1	X	1
0	1	0	1	0	1	1	0	0	X	1	X	X	X	X	1	1
0	1	1	0	0	1	1	1	0	X	X	0	1	0	1	X	1
0	1	1	1	1	0	0	0	1	X	X	1	X	1	X	1	1
1	0	0	0	1	0	0	1	X	0	0	X	1	X	1	X	1
1	0	0	1	1	0	1	0	X	0	1	X	X	X	X	1	1
1	0	1	0	1	0	1	1	X	0	X	0	1	0	1	X	1
1	0	1	1	1	1	0	0	X	0	X	1	X	1	X	1	1
1	1	0	0	1	1	0	1	X	0	0	X	1	X	1	X	1
1	1	0	1	1	1	1	0	X	0	0	X	X	X	X	0	0
1	1	1	0	1	1	1	1	X	0	X	1	1	1	X	0	0
1	1	1	1	1	1	0	1	X	0	X	1	X	1	X	0	0



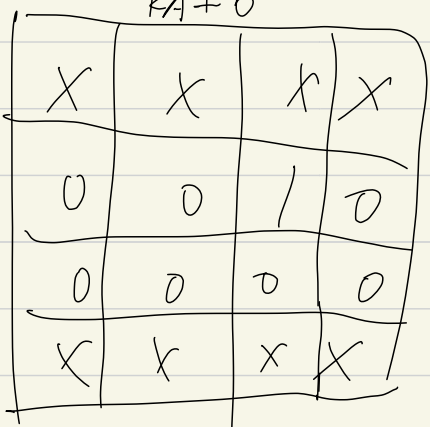
$J_A = BCD$



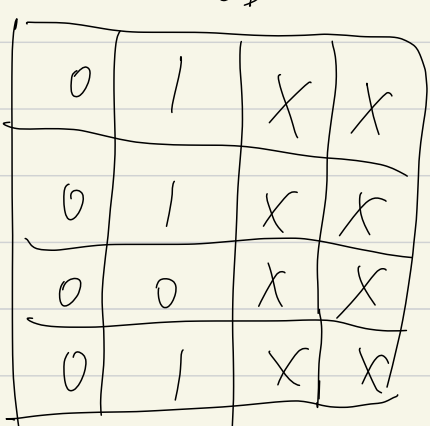
$K_A = 0$



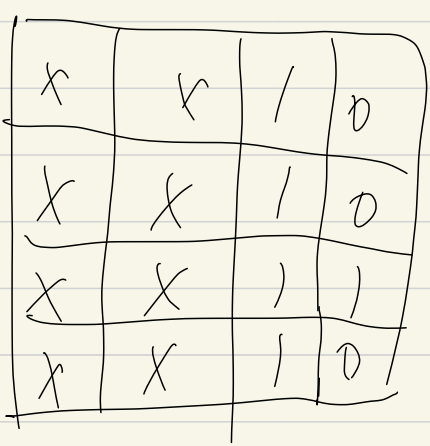
$J_B = CD$



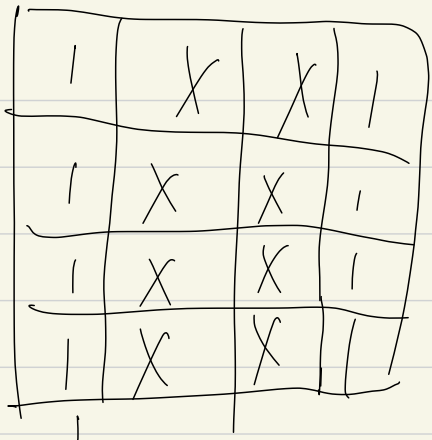
$K_B = A'CD$



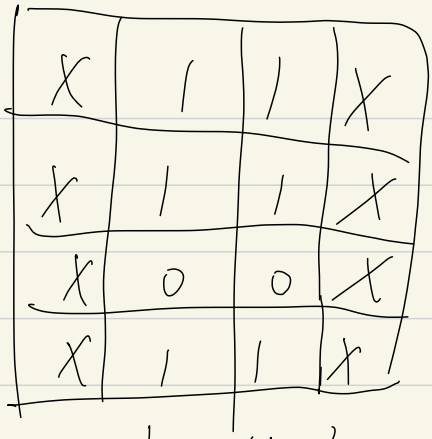
$J_C = A'D + B'D$



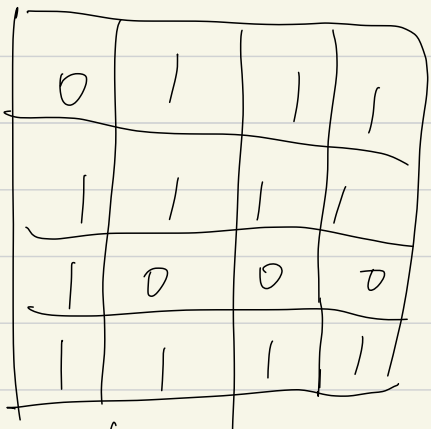
~~J_C~~ $K_C = ABD$



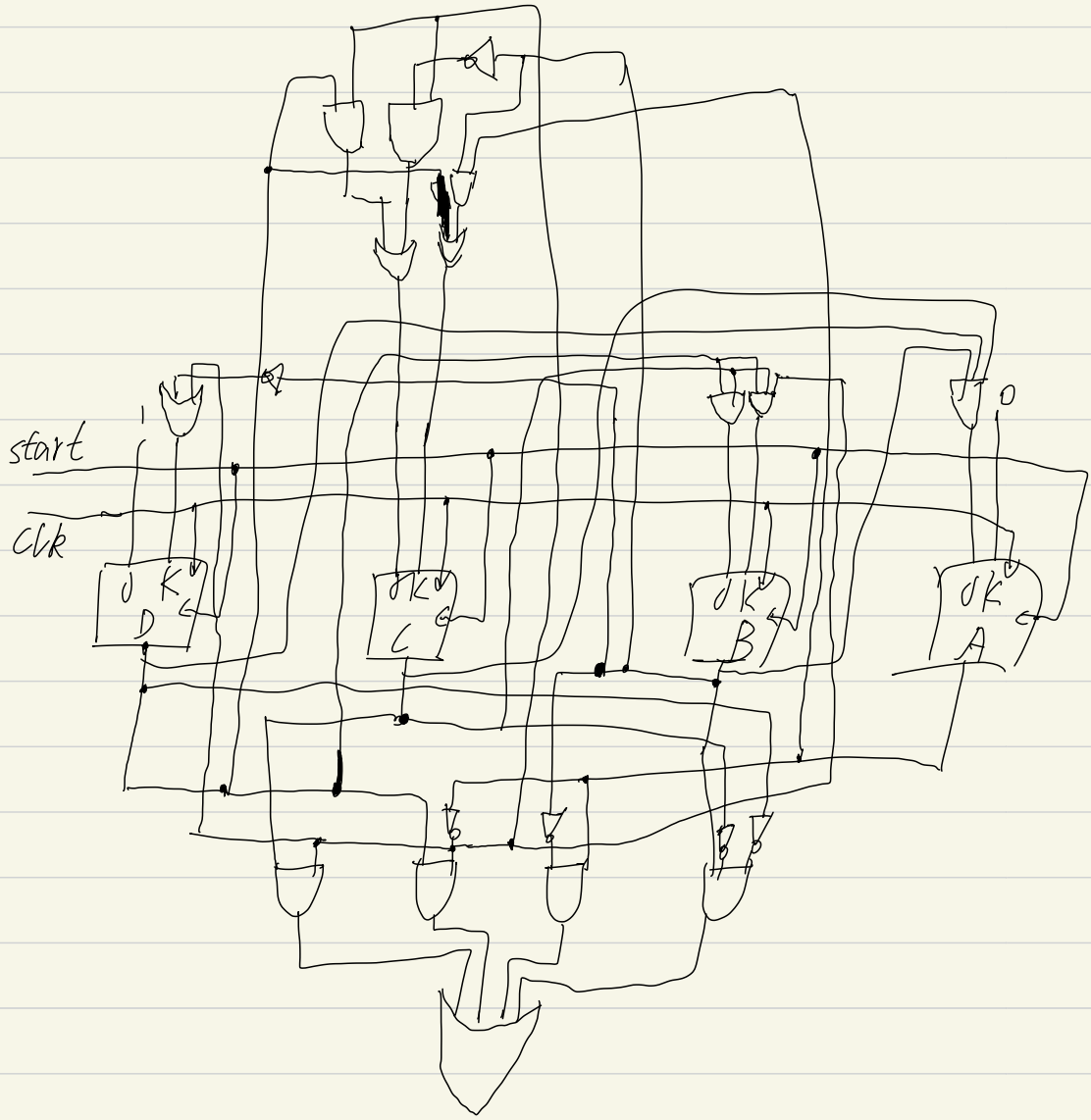
$J_D = 1$



$K_C = A'+B'$



$out = BC'D' + AB' + A'D + A'C$


start
clk
1
0
J
K
D
C
B
A