Digital Logic Ass4 1231040l 王子恒.

T	Q(t)	Q(t+1)
0	0	0
0	1	1
1	0	1
1	1	0

1.

Present State		Input	Next State		Flip-Flop Inputs	
A	B	x	A	B	T_A	T_B
0	0	0	0	1	0	1
0	0	1	0	0	0	0
0	1	0	1	1	1	0
0	1	1	1	0	1	1
1	0	0	1	1	0	1
1	0	1	1	0	0	0
1	1	0	0	0	1	1
1	1	1	1	1	0	0

T_A

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

$T_A = A'B + Bx'$

T_B

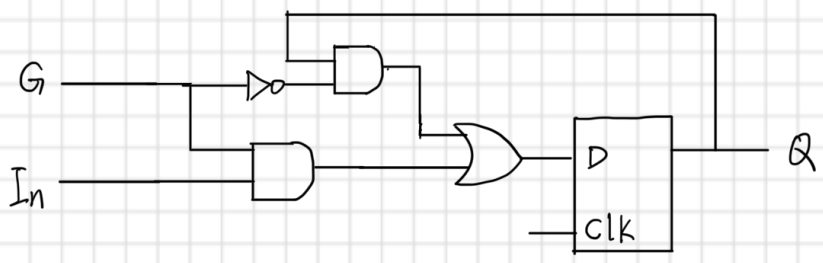
x \ AB	00	01	11	10
0	1	0	1	1
1	0	1	0	0

$T_B = A'B'x' + A'Bx + Ax'$

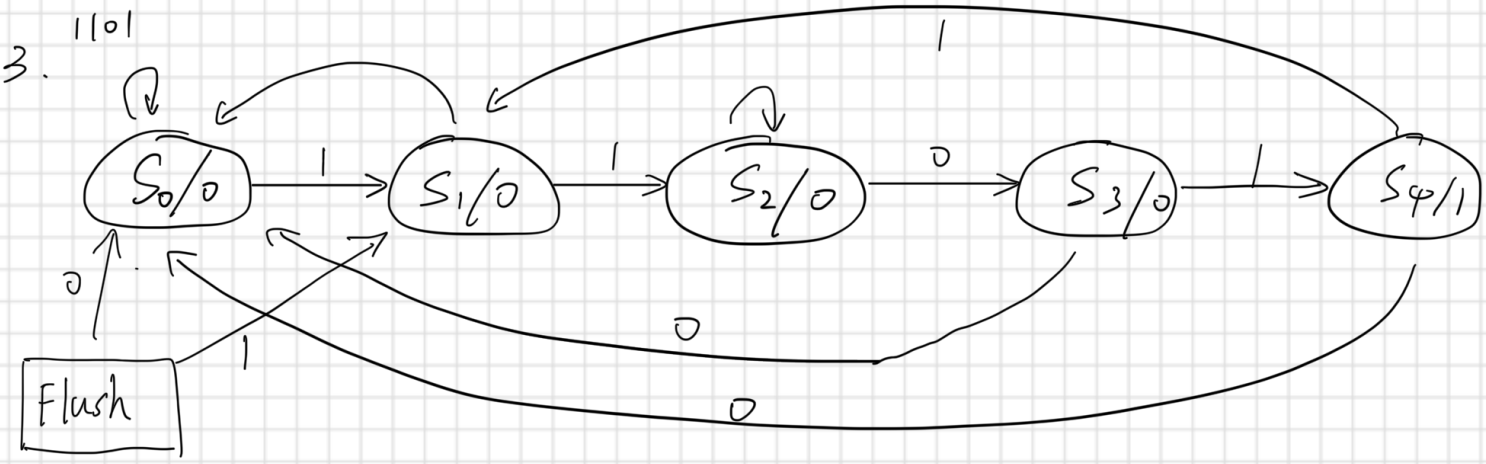
$= A'(B' \oplus x) + Ax'$

2.

$Q(t+1) = G \cdot In + G'Q(t)$



3. 1101



$S_0 = 000$, $S_1 = 001$, $S_2 = 010$, $S_3 = 011$ $S_4 = 100$

To deal with the flush signal, we set the next state by the input.

Current State			Input	Next			Output	J_A	K_A	J_B	K_B	J_C	K_C
A	B	C		A	B	C							
0	0	0	0	0	0	0	0	0	X	0	X	0	X
0	0	0	1	0	0	1	0	0	X	0	X	1	X
0	0	1	0	0	0	0	0	0	X	0	X	X	1
0	0	1	1	0	1	0	0	0	X	1	X	X	1
0	1	0	0	0	1	1	0	0	X	X	0	1	X
0	1	0	1	0	1	0	0	0	X	X	0	0	X
0	1	1	0	0	0	0	0	0	X	X	1	X	1
0	1	1	1	1	0	0	0	0	X	X	1	X	1
1	0	0	0	0	0	0	1	1	X	0	X	0	X
1	0	0	1	0	0	1	1	X	1	0	X	1	X
1	0	1	0	0	0	0	0	X	1	0	X	X	1
1	0	1	1	0	0	1	0	X	1	0	X	X	0
1	1	0	0	0	0	0	0	X	1	X	1	0	X
1	1	0	1	0	0	0	0	X	1	X	1	1	X
1	1	1	0	0	0	0	0	X	1	X	1	X	1
1	1	1	1	0	0	1	0	X	1	X	1	X	0

J_A

AB \ CX	00	01	11	10
00	0	0	0	0
01	0	0	1	0
11	X	X	X	X
10	X	X	X	X

$J_A = BCX$

K_A

AB \ CX	00	01	11	10
00	X	X	X	X
01	X	X	X	X
11	1	1	1	1
10	1	1	1	1

$K_A = 1$

J_B

AB \ CX	00	01	11	10
00	0	0	1	0
01	X	X	X	X
11	X	X	X	X
10	0	0	0	0

$J_B = A'CX$

K_B

AB \ CX	00	01	11	10
00	X	X	X	X
01	0	0	1	1
11	1	1	1	1
10	X	X	X	X

$K_B = A + C$

J_C

AB \ CX	00	01	11	10
00	0	1	X	X
01	1	0	X	X
11	0	1	X	X
10	0	1	X	X

$J_C = AX + B'X + A'BX'$

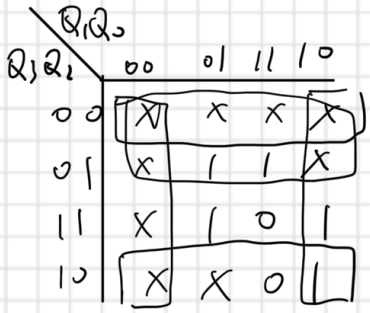
K_C

AB \ CX	00	01	11	10
00	X	X	1	1
01	X	X	1	1
11	0	X	1	0
10	0	X	1	0

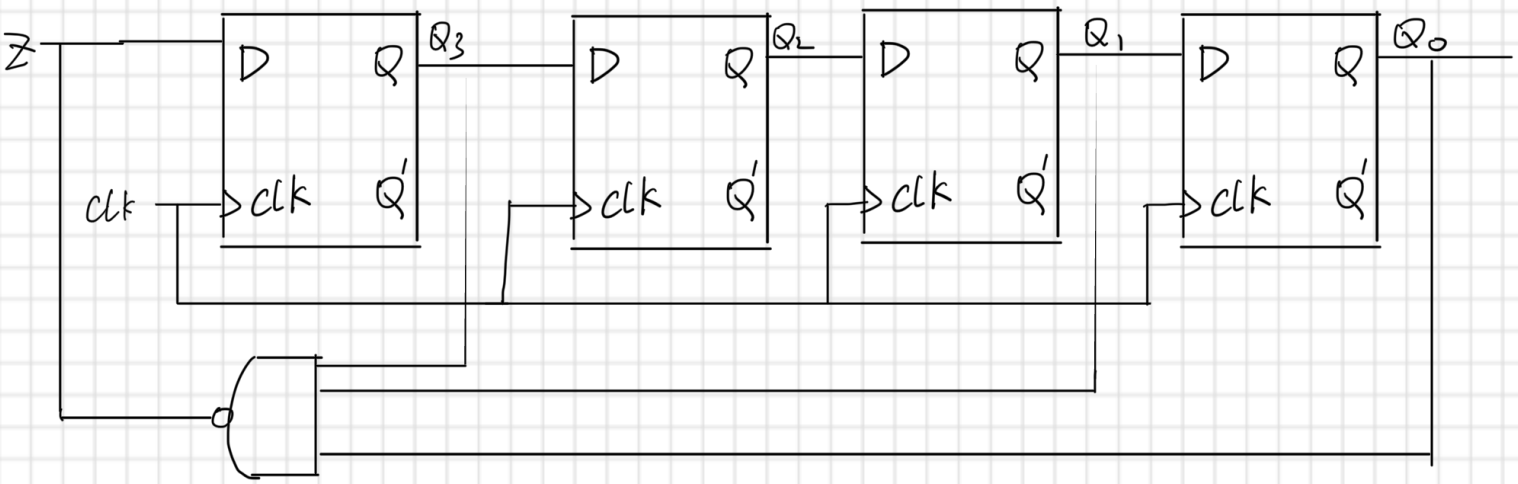
$K_B = A' + X$

4.

Clk	Q_3	Q_2	Q_1	Q_0	Z
↑	1	0	1	1	0
↑	0	1	0	1	1
↑	1	0	1	0	1
↑	1	1	0	1	1
↑	1	1	1	0	1
↑	1	1	1	1	0
↑	0	1	1	1	1

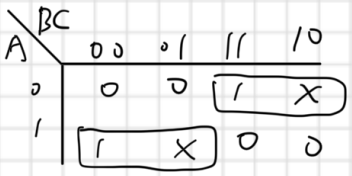


$$Z = Q_0' + Q_1' + Q_3' = (Q_0 Q_1 Q_3)'$$

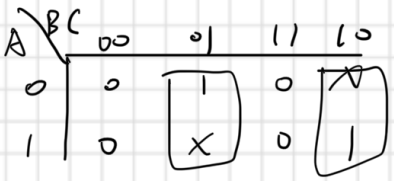


5. Current Next

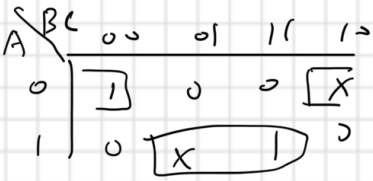
A	B	C	A	B	C	T_A	T_B	T_C
0	0	0	0	0	1	0	0	1
0	0	1	0	1	1	0	1	0
0	1	1	1	1	1	1	0	0
1	1	1	1	1	0	0	0	1
1	1	0	1	0	0	0	1	0
1	0	0	0	0	0	1	0	0



$T_A = A \oplus B$



$T_B = B \oplus C$



$T_C = A' \oplus C$

If ABC = 010 $T_A = 1$, $T_B = 1$, $T_C = 1$

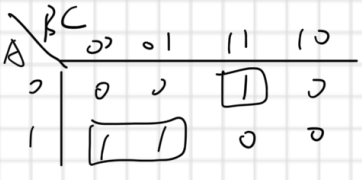
Then next state is ABC = 101

If ABC = 101 $T_A = 1$ $T_B = 1$ $T_C = 1$

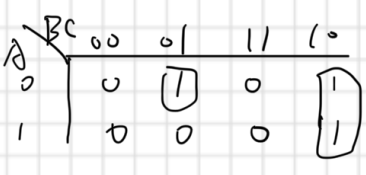
Then next state is ABC = 010

So if we get into the state 010 or 101, then we will stuck into the 2 states.

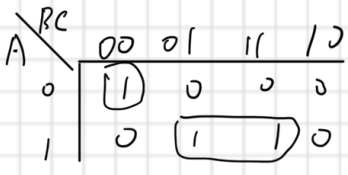
To correct it, let the next state of 010 and 101 be 000



$T_A = AB' + A'BC$



$T_B = A'B'C + BC'$



$T_C = A'B'C' + AC$