Assignment 3

Question 1

① characteristic table

P	N	Qt+1	
0	0	0	clear to 0
0	1	Qt	no change
1	0	Qt'	complement
1	1	1	set to 1

③ excitation table

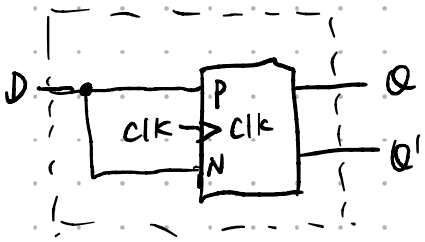
Qt	Q(t+1)	P	N
0	0	0	X
0	1	1	X
1	0	X	0
1	1	X	1

② truth table

P	N	Qt	Qt+1
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

④ PN flip flop → D flip flop

Present	Input	Next	PNFF Input	
Qt	x	Qt+1	P	N
0	0	0	0	X
0	1	1	1	X
1	0	0	X	0
1	1	1	X	1



D - Flip Flop

Qt	D	Qt+1
0	0	0
0	1	1
1	0	0
1	1	1

↓

D	Qt+1
0	0
1	1

karnaugh map

PN \ Qt	0	1
0 0	0	0
0 1	0	1
1 1	1	1
1 0	1	0

characteristic equation : $Q_{t+1} = QtN + Qt'P$

Question 2

JKFF : $Q_{t+1} = JQ_t' + K'Q_t$

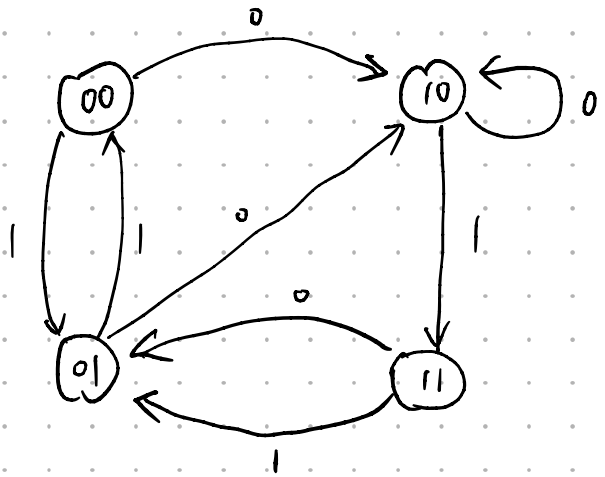
$A(t+1) = J_A A' + K_A' A = x'A' + B'A$

$B(t+1) = J_B B' + K_B' B = xB' + AB$

$$\begin{cases} A(t+1) = x'A'(t) + B'(t)\,A(t) \\ B(t+1) = x\,B'(t) + A(t)\,B(t) \end{cases}$$

present		Next			
		x = 0		x = 1	
A	B	A	B	A	B
0	0	1	0	0	1
0	1	1	0	0	0
1	0	1	0	1	1
1	1	0	1	0	1

State diagram



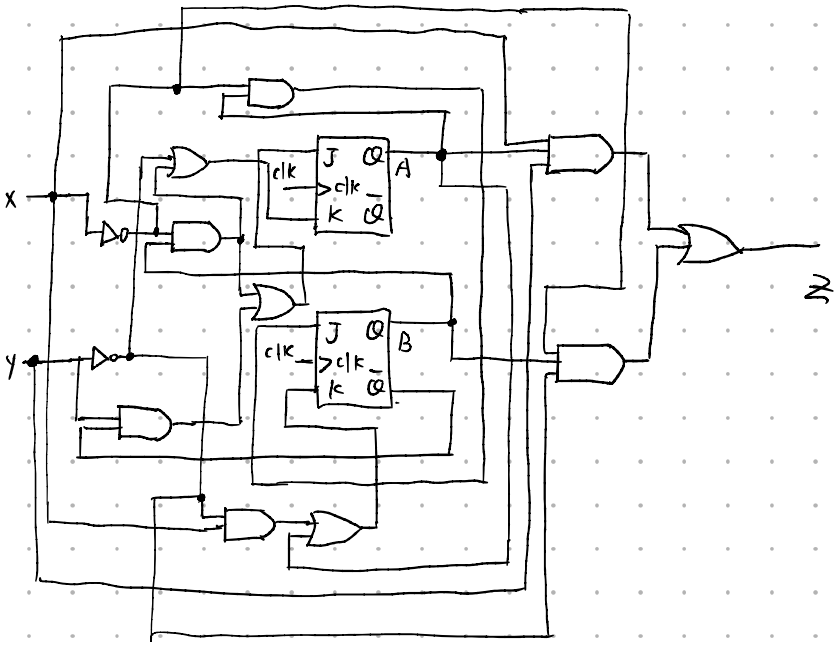
Question 3

JKFF: $Q_{t+1} = JQ_t' + K'Q_t$

① $\begin{cases} J_A = Bx' + B'y \\ K_A = Bx' + y' \end{cases}$ $\begin{cases} J_B = Ax' \\ K_B = A + xy' \end{cases}$

$z = Axy + Bx'y'$

logic diagram:



② state table

如果写代行格式:

Present A	Present B	Next x=0,y=0 A	Next x=0,y=0 B	Next x=0,y=1 A	Next x=0,y=1 B	Next x=1,y=0 A	Next x=1,y=0 B	Next x=1,y=1 A	Next x=1,y=1 B	Output x=0,y=0	Output x=0,y=1	Output x=1,y=0	Output x=1,y=1
0	0	0	0	1	0	0	0	1	0	0	0	0	0
0	1	1	1	1	1	0	0	0	1	1	0	0	0
1	0	0	1	1	1	0	0	1	0	0	0	0	1
1	1	0	0	0	0	0	0	1	0	1	0	0	1

如果写成列格式 →

Present A	Present B	Input x	Input y	Next A	Next B	Output z
0	0	0	0	0	0	0
0	0	0	1	1	0	0
0	0	1	0	0	0	0
0	0	1	1	1	0	0
0	1	0	0	1	1	1
0	1	0	1	1	1	0
0	1	1	0	0	0	0
1	0	0	0	0	1	0
1	0	0	1	1	1	0
1	0	1	0	0	0	0
1	0	1	1	0	1	0
1	1	0	0	1	0	0
1	1	0	1	1	0	1
1	1	1	0	1	0	0
1	1	1	1	1	0	1

③ karnaugh map for A_{t+1}

At Bt \ xy	00	01	11	10
00	0	1	1	0
01	1	1	0	0
11	0	0	1	0
10	0	1	1	0

$A(t+1) = B'(t)y + A(t)xy + A'(t)B(t)x'$

karnaugh map for B_{t+1}

At Bt \ xy	00	01	11	10
00	0	0	0	0
01	1	1	1	0
11	0	0	0	0
10	1	1	0	0

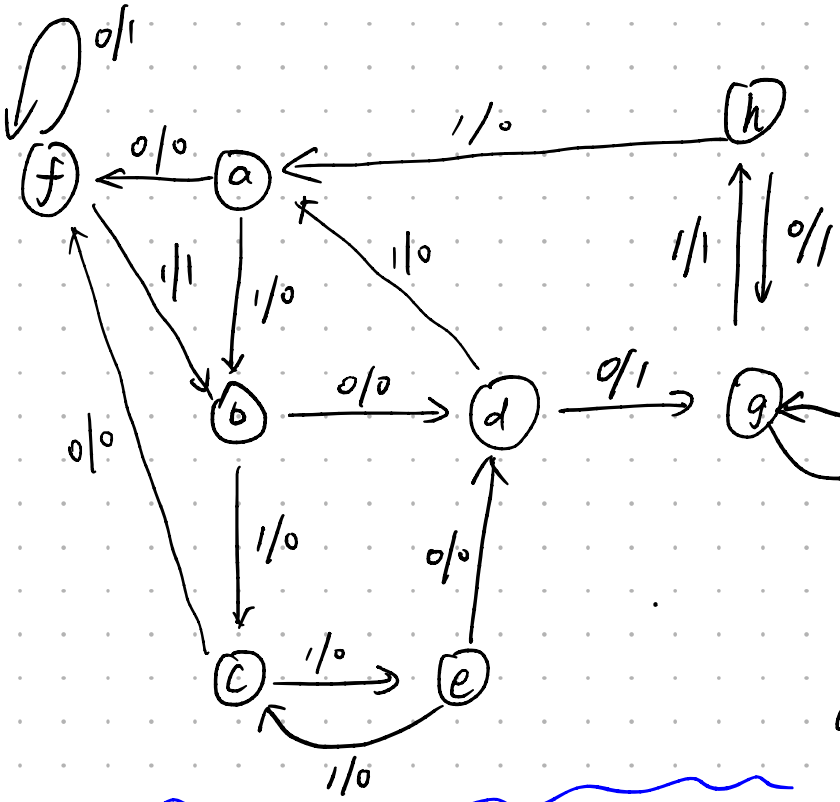
$B(t+1) = A'(t)B(t)x' + A'(t)B(t)y + A(t)B'(t)x'$

state equation for A and B

$$\begin{cases} A(t+1) = B'(t)y + A(t)xy + A'(t)B(t)x' \\ B(t+1) = A'(t)B(t)x' + A'(t)B(t)y + A(t)B'(t)x' \end{cases}$$

Question 4

① State diagram



④ 0/0/00/011

original table:

a →(0) f →(1) b →(0) d →(1) a →(0) f →(0) f

0 1 0 0 0 1

→(1) b →(0) d →(1) a →(1) b →(1) c

1 0 0 0 0

Output → 01000110000

reduced table.

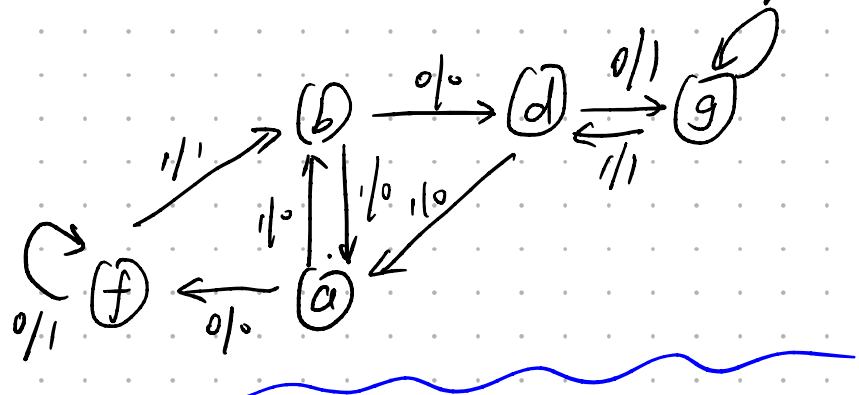
a →(0) f →(1) b →(0) d →(1) a →(0) f →(0) f

→(1) b →(0) d →(1) a →(1) b →(1) a

② Output → 01000110000

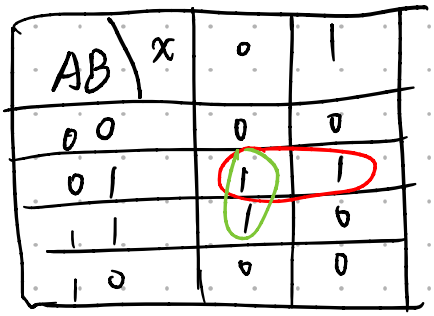
present	Next State x=0	Next State x=1	Output x=0	Output x=1
a	f	b	0	0
b	d	a	0	0
d	g	a	1	0
f	f	b	1	1
g	g	d	0	1

③

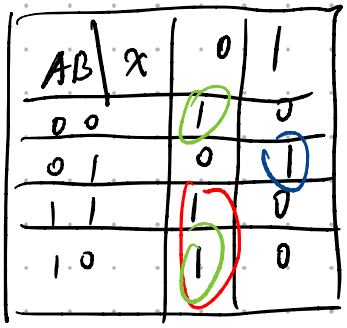


Question 5

Present A	Present B	Input x	Output A′	Output B′	Input for TFF T_A	Input for TFF 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



$T_A = A'B + Bx'$



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

Input Equation

$$\begin{cases} T_A = A'B + Bx' \\ T_B = A'Bx + B'x' + Ax' \end{cases}$$