

# Assignment 3

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T1. a) state equation :

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

$$= x A' + B' A$$

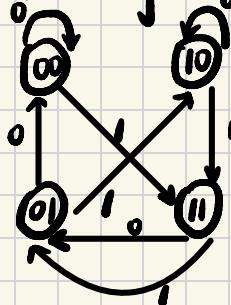
$$B(t+1) = J_B B'(t) + K_B B(t)$$

$$= x B' + AB$$

State table :

present state	input		next state		
	A	B	x	A	B
00	0	0	0	0	0
00	0	0	1	1	1
00	0	1	0	0	0
00	0	1	1	1	0
01	1	0	0	1	0
01	1	0	1	1	0
01	1	0	0	0	1
10	1	1	1	0	1

State diagram :



T2. input function:  $T_A = A + B$

$$T_B = A' + B$$

state function:  $A(t+1) = A(t) \oplus T_A$

$$= A(A+B)' + A'(A+B)$$

$$= A(A'B') + A'(A+B)$$

$$= A'B$$

State table :

present state	next state
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present state	next state	A	B	A	B
00	01	0	0	0	1
01	10	0	1	1	0
10	11	1	0	0	0
11	00	1	1	0	0

$$B(t+1) = B(t) \oplus T_B$$

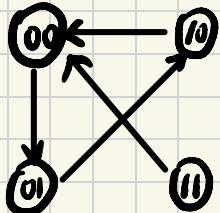
$$= B(A'+B)' + B'(A'+B)$$

$$= B(AB') + A'B'$$

$$= A'B'$$

there is no output

state diagram:



function: if present state is 11, next state will be 00; otherwise, the circuit cycles through three states in the order of  $00 \rightarrow 01 \rightarrow 10 \rightarrow 00$ .

T3. a) input function:

$$J_1 = X, K_1 = (XQ_2')' = X' + Q_2$$

$$J_2 = X, K_2 = (XQ_1)' = X' + Q_1'$$

state function:

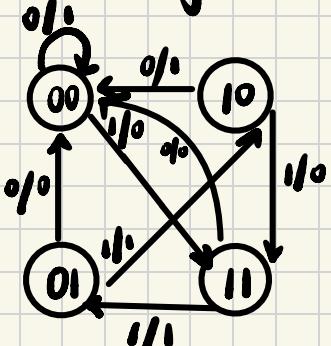
$$Q_1(t+1) = J_1 Q_1(t) + K_1' Q_1(t) \\ = XQ_1' + XQ_2' Q_1$$

$$Q_2(t+1) = J_2 Q_2(t) + K_2' Q_2(t) \\ = XQ_2' + XQ_1 Q_2$$

output function:

$$F = Q_2' \oplus X$$

state diagram:



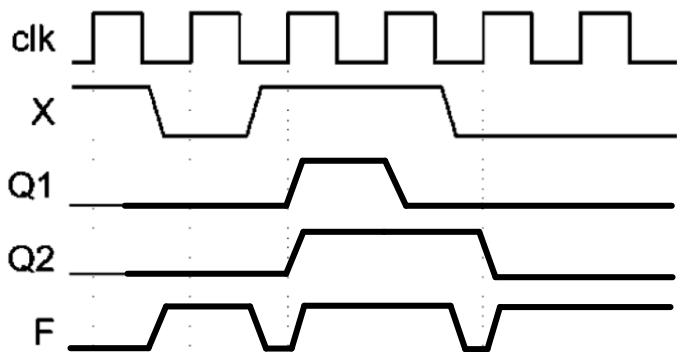
state table

present state $Q_1\ Q_2$	input X	next state $Q_1\ Q_2$	
		0 0	0 0
0 0	0	0 0	0 0
0 0	1	1 1	1 1
0 1	0	0 0	0 0
0 1	1	1 1	1 0
1 0	0	0 0	0 0
1 0	1	1 1	1 1
1 1	0	0 0	0 0
1 1	1	0 1	0 1

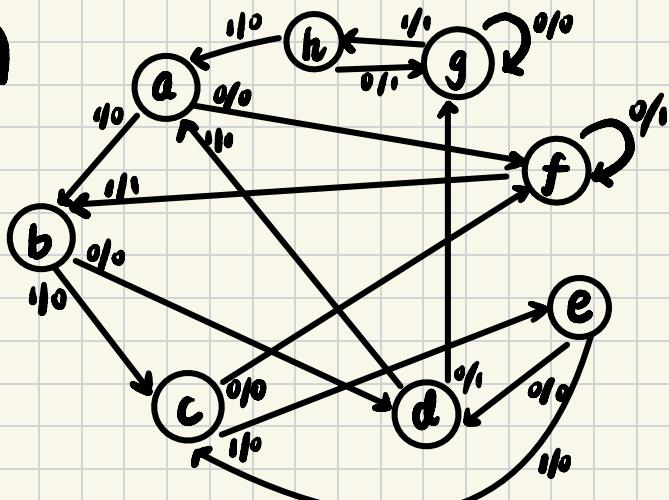
b) Mealy machine

output is function of both present state and input.

c)



T4 a)



b) state minimization

Present State	Next State		Output	
	$x = 0$	$x = 1$	$x = 0$	$x = 1$
a	f	b	0	0
b	d	a	0	0
c	f	b	0	0
d	g	a	1	0
e	d	c	0	0
f	f	b	1	1
g	g	d	0	1
h	g	a	1	0

$$a = c$$

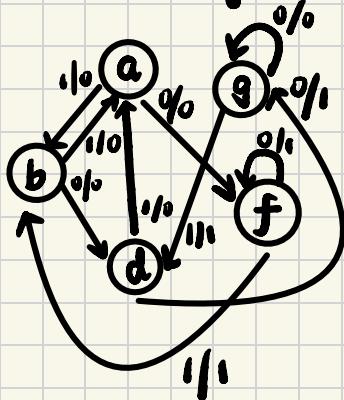
$$b = e$$

$$d = h$$

reduced state table :

present state	next state		output	
	$x=0$	$x=1$	$x=0$	$x=1$
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

State diagram :



c) original table :

0	1	0	1	0	0	1	0	1	1	1
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$a \rightarrow f \rightarrow b \rightarrow d \rightarrow a \rightarrow f \rightarrow f \rightarrow b \rightarrow d \rightarrow a \rightarrow b$  还产生一个状态

0	1	0	0	0	1	1	0	0	0	0
---	---	---	---	---	---	---	---	---	---	---

reduced table :

0	1	0	1	0	0	1	0	1	1	1
---	---	---	---	---	---	---	---	---	---	---

$a \rightarrow f \rightarrow b \rightarrow d \rightarrow a \rightarrow f \rightarrow f \rightarrow b \rightarrow d \rightarrow a \rightarrow b$

0	1	0	0	0	1	1	0	0	0	0
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Output sequence : 01000110000

T5. a)  $R=0, H=0$

$\Rightarrow P=1, Q=0$

$R=0, H=1$

$\Rightarrow$  if  $Q(t)=0, Q(t+1)=0$ ; if  $P(t)=0, P(t+1)=0$

if  $Q(t)=1, Q(t+1)=1$ ; if  $P(t)=1, P(t+1)=1$

$R=1, H=0$

$\Rightarrow P=1, Q=1$

$R=1, H=1$

$\Rightarrow Q=1, P=0$

function table :

R	H	Q	P
0	0	0	1
0	1	lost Q	lost P (no change)
1	0	1	1
1	1	1	0

(reset state)

(forbidden)

(set state)

b)

