104550118 徐宜君 HW1 #34~38. #40 #41

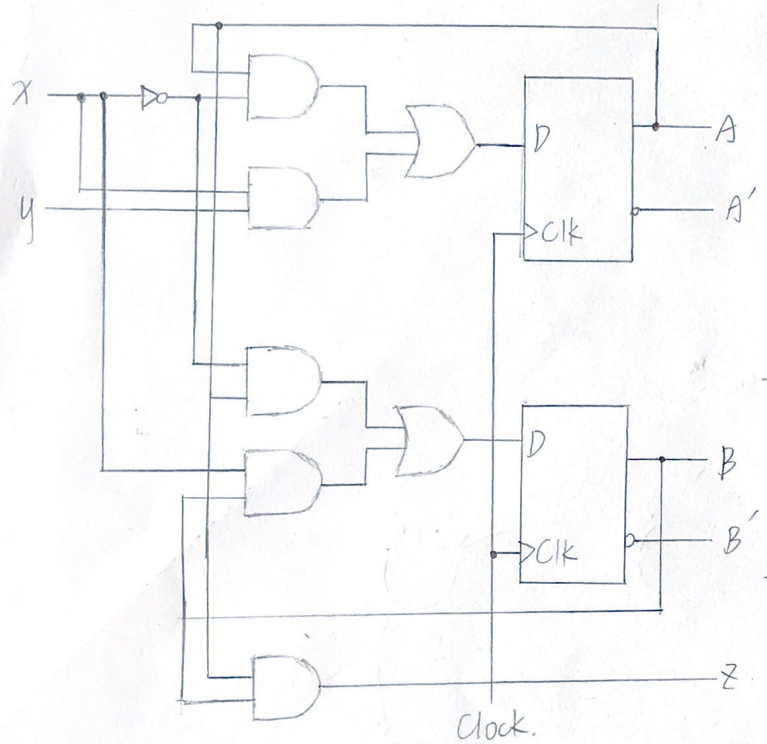
34.

$D_A = \bar{X}A + XY$

$D_B = \bar{X}A + XB$

$Z = A\bar{B}$

(a) Draw the logic diagram of the circuit.



(b) Derive the next state equation.

($Q^+ = D$).

$A(t+1) = D_A = \bar{X}A + XY$

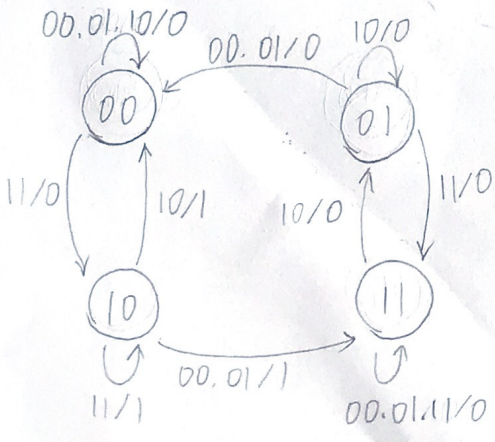
$B(t+1) = D_B = \bar{X}A + XB$

(c) Complete the transition / state table of the circuit.

Present state		Input		Next State		Output
A	B	X	Y	A^+	B^+	Z
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	0	1	0	0	0	0
0	0	1	1	1	0	0
0	1	0	0	0	0	0
0	1	0	1	0	0	0
0	1	1	0	0	1	0
0	1	1	1	1	1	0
1	0	0	0	1	1	1
1	0	0	1	1	1	1
1	0	1	0	0	0	1
1	0	1	1	1	0	1
1	1	0	0	1	1	0
1	1	0	1	1	1	0
1	1	1	0	0	1	0
1	1	1	1	1	1	0

(d) Draw the state diagram.

state (AB) Input/Output XY/Z



(e)

Cycle	0	1	2	3	4	5	6	7	
XY	01	11	11	00	10	01	11	10	
AB	00	00	10	10	11	01	00	10	00
Z	0	0	1	1	0	0	0	1	0

35.

(a) Derive the memory input equation and the output equation.

$J_A = x'B$

$K_A = xB$

$J_B = x$

$K_B = (x \oplus A)' = xA + x'A'$

$z = x'B$

(b) Derive the next state equation

$(Q^+ = JQ' + K'Q)$

$A^+ = J_A A' + K_A' A = x'A'B + (x' + B')A$

$= xA'B + x'A + AB' = x'B + AB'$

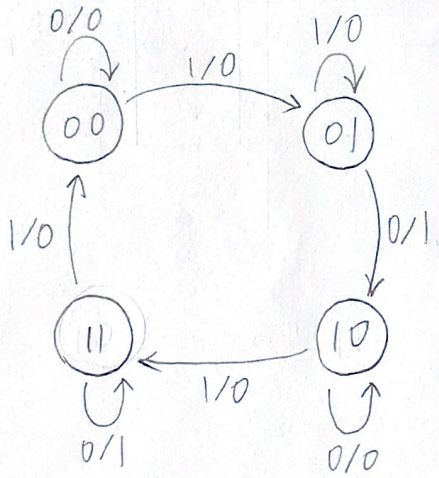
$B^+ = J_B B' + K_B' B = xB' + (xA' + x'A)B$

$= xB' + xBA' + x'BA = xA' + xB' + x'AB$

(c).

Present State		Input	Next State		Output
A	B	x	A^+	B^+	z
0	0	0	0	0	0
0	0	1	0	1	0
0	1	0	1	0	1
0	1	1	0	1	0
1	0	0	1	0	0
1	0	1	1	1	0
1	1	0	1	1	1
1	1	1	0	0	0

(d)



36.

(a) XOR + XOR = 2(ns) + 2(ns) = 4(ns)

(b) XOR + Inverter + setup time = 2(ns) + 0.5(ns) + 1(ns) = 3.5(ns)

(c) Flip-flop * 2 (sync Seq Ckt) + XOR + XOR = 2(ns) + 2(ns) + 2(ns) = 6(ns)

(d) Flip-flop * 2 (sync Seq Ckt) + XOR + setup time + Inverter = 2(ns) + 2(ns) + 1(ns) + 0.5(ns) = 5.5(ns)

(e) max(4, 3.5, 6, 5.5) = 6(ns) = tp.

$f = 1/tp = \frac{1}{6} \approx 0.167\,GHz = 167\,MHz$.

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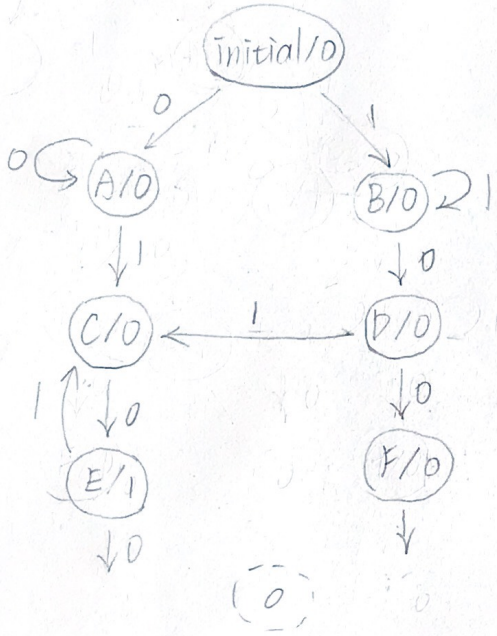
37.

(b)

Cycle	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Input	0	0	1	1	1	0	1	0	1	0	0	1	0	1	
State	A	A	C	D	D										
Output	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0

(a)



initial
A=0
B=1
C=01
D=10
E=010
F=100

∴ 7 states.

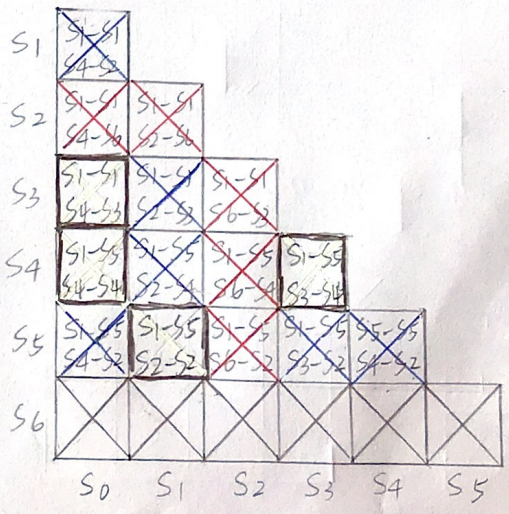
38.

(a)

Present State	Next State x=0	Next State x=1	Output x=0	Output x=1
S_0	S_1	S_4	0	0
S_1	S_1	S_2	0	0
S_2	S_1	S_6	0	0
S_3	S_1	S_3	0	0
S_4	S_5	S_4	0	0
S_5	S_5	S_2	0	0
S_6	S_5	S_3	0	(1)

by row matching method can't find any equivalent states ※

(b)



(0,3,4) (1,5) ※

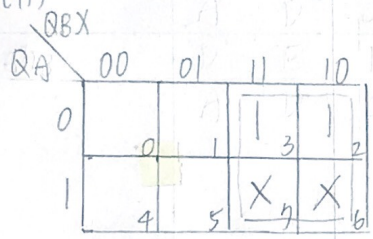
40.

$Q_A(t+1) = D_A(Q_A, Q_B, X) = \Sigma m(2,3)$

$Q_B(t+1) = D_B(Q_A, Q_B, X) = \Sigma m(1,4,5)$

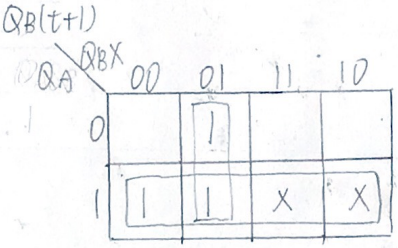
$Z(A,B,X) = \Sigma m(3,4)$

$Q_A(t+1)$



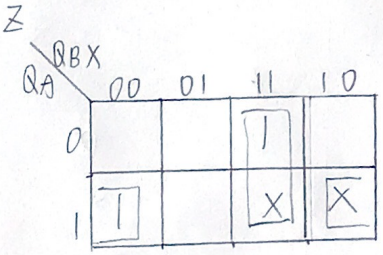
$Q_A(t+1) = Q_B$

$Q_B(t+1)$



$Q_B(t+1) = Q_B'X + Q_A$

Z



$Z = Q_BX + Q_AX'$

★ 11 — is Don't Care Condition.

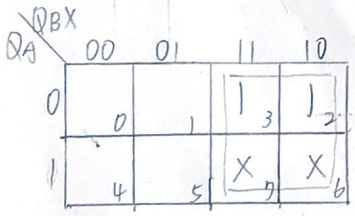
$$\begin{cases} D_A = Q_B \\ D_B = Q_A + Q_B'X \\ Z = Q_AX' + Q_BX, \text{ ★} \end{cases}$$

41.

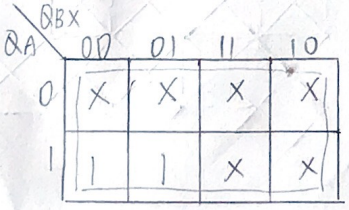
Present state		Input	Next state		Output	Excitation Table			
Q_A	Q_B	X	Q_A^+	Q_B^+	Z	J_A	K_A	J_B	K_B
0	0	0	0	0	0	0	X	0	X
0	0	1	0	1	0	0	X	1	X
0	1	0	1	0	0	1	X	X	1
0	1	1	1	0	1	1	X	X	1
1	0	0	0	1	1	X	1	1	X
1	0	1	0	1	0	X	1	1	X

★ 11 — is Don't Care Condition

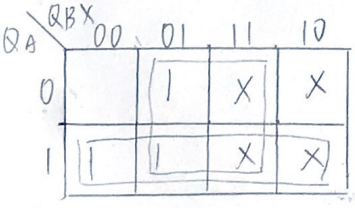
J_A



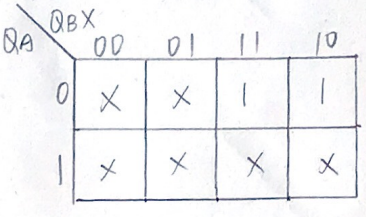
K_A



J_B



K_B



$$\begin{cases} J_A = Q_B \\ K_A = X \text{ (Don't Care)} \\ J_B = Q_A + X \\ K_B = X \text{ (Don't Care)} \text{ ★} \end{cases}$$