CSE 3100

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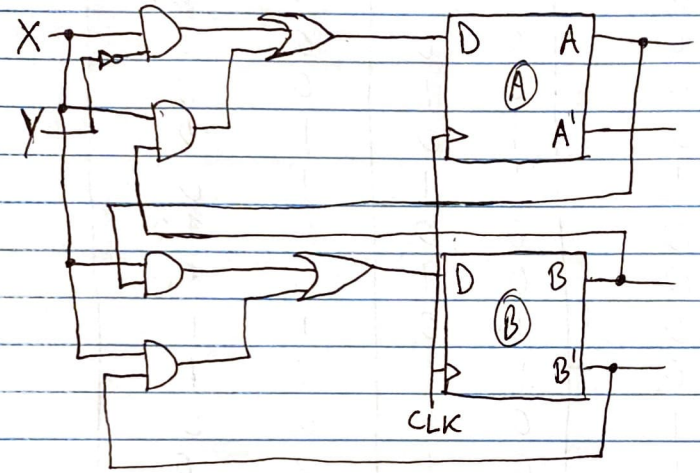
Homework #3

4-24-22

(5.6) A sequential ckt. w/ two D F.F.'s A & B, two I/p's, x & y; and one o/p z is specified by the following next-state & o/p equations:
$A(t+1) = xy' + xB$, $B(t+1) = xA + xB'$, $z = A$

a.) Draw the logic diagram of the ckt.



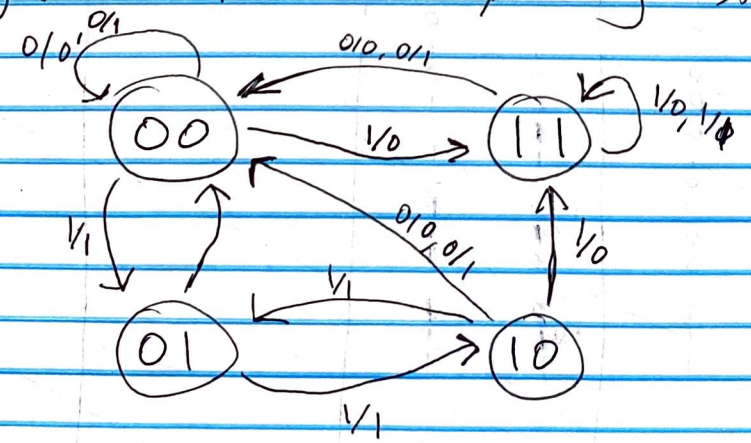
b) List the state table for sea. ckt.

Present State		I/p's		Next State		Output
A	B	x	y	A	B	x
0	0	0	0			
0	0	0	1			
0	0	1	0			
0	0	1	1			
0	1	0	0			
0	1	0	1			
0	1	1	0			
0	1	1	1			
1	0	0	0			
1	0	0	1			
1	0	1	0			
1	0	1	1			
1	1	0	0			
1	1	0	1			
1	1	1	0			
1	1	1	1			

b.) Draw the state table for the Seq. Ckt.

Present State		I/p's		Next State		output
A	B	X	Y	A	B	X
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	0	1	0	1	1	0
0	0	1	1	0	1	0
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	0	1	0	1	0	0
0	1	1	1	1	0	0
1	0	0	0	0	0	1
1	0	0	1	0	0	1
1	0	1	0	1	1	1
1	0	1	1	0	1	1
1	1	0	0	0	0	0
1	1	0	1	0	0	1
1	1	1	0	1	1	1
1	1	1	1	1	1	1

c.) Draw the corresponding State Diagram.



(5.8) Derive the state table and the state Diagram of the seq. ckt. shown in Fig P5.8. Explain the function that the ckt performs.

$T_A = A + B$ & $T_B = A' + B$

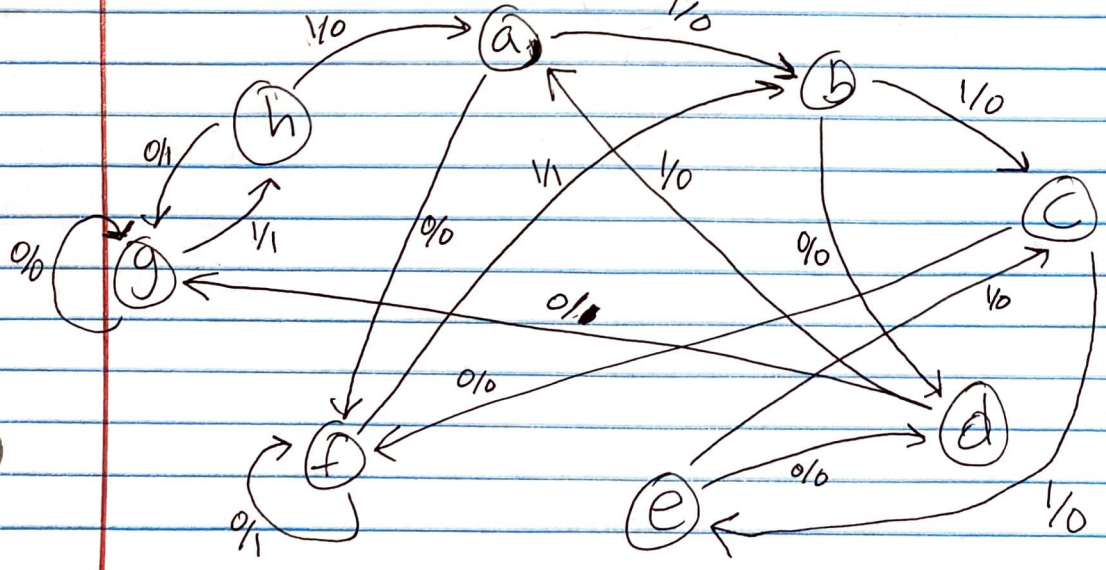
State Table:

Present State		Next State		I/p's to T F.F.'s	
A	B	A	B	T_A	T_B
0	0	0	1	0	1
0	1	1	0	1	1
1	0	0	0	1	0
1	1	0	0	1	1

State Diagram:

The ckt. counts from 0 to 2 then back to 0. And it is self correcting.

(5.12) a.) Draw the corresponding State Diagram.

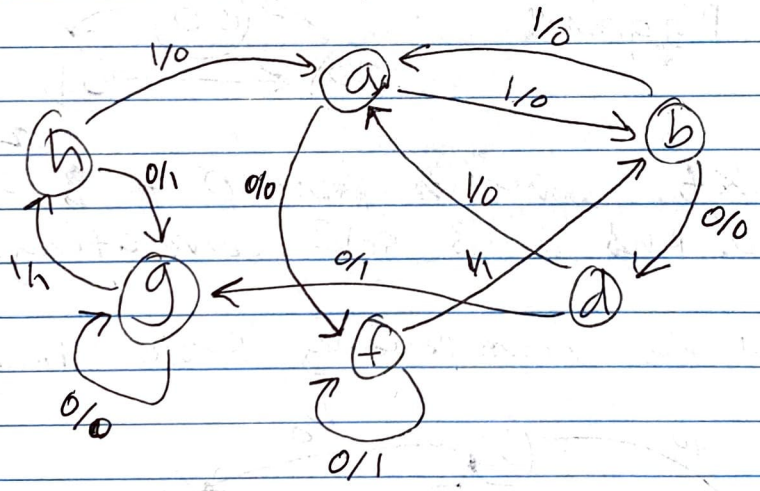


b.) Tabulate the reduced state table

a <=> c, b <=> e, d <=> h, therefore

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	h	0	1
h	g	a	1	0

c.) Draw the state diagram corresponding to the reduced state table

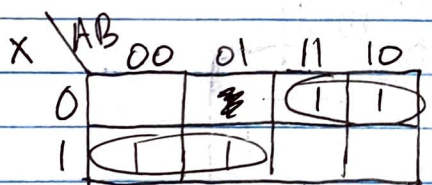


(5.16) Design a seq. ckt. w/ two D F.F.'s A & B, and one input X_in.

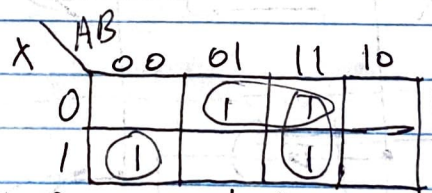
b.) When X_in = 0, the state of the ckt. remains the same. When X_in = 1, the ckt. goes through the state transitions from 00 to 11, to 01, to 10, back to 00, and repeats.

State Table

Present State A	Present State B	I/p X_in	Next State A	Next State B	I/p for D F.F. D_A	I/p for D F.F. D_B
0	0	0	0	0	0	0
0	1	0	0	1	0	1
1	0	0	1	0	1	0
1	1	0	1	1	1	1
0	0	1	1	1	1	1
1	1	1	0	1	0	1
0	1	1	1	0	1	0
1	0	1	0	0	0	0

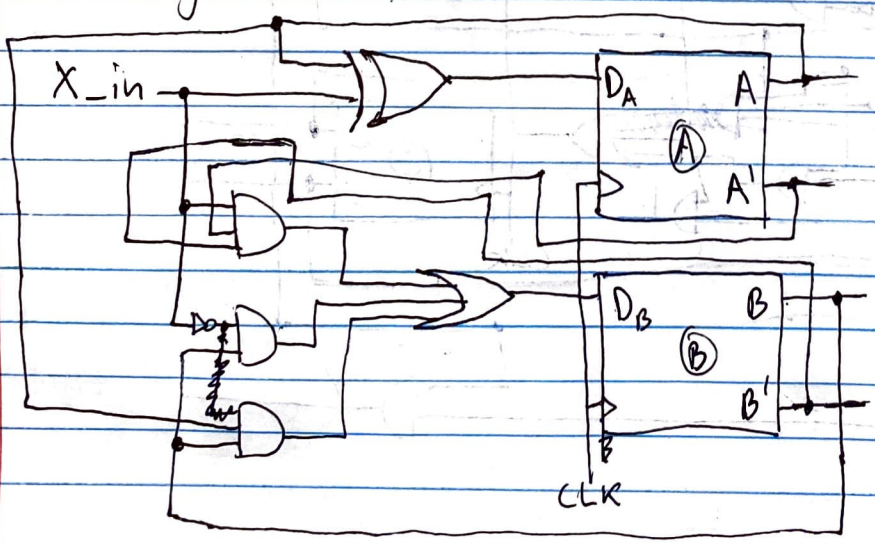


$D_A = X'A + XA' = X \oplus A$



$D_B = XA'B' + X'B + AB$

Ckt. Diagram:



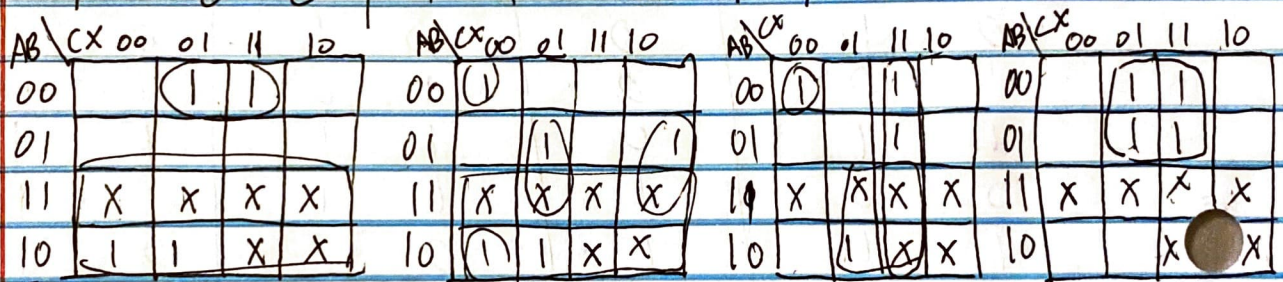
(5.20) Design the sequential ckt. specified by the state diagram of Fig 5.19 using T F.F.s

State table:

Present state			I/P	Next state			O/P	Unused
A	B	C	X	A	B	C	Y	
0	0	0	0	0	0	1	0	1010
0	0	0	1	0	1	0	0	1011
0	0	1	0	0	1	1	0	1100
0	0	1	1	0	1	0	0	1101
0	1	0	0	0	1	1	0	1110
0	1	0	1	1	0	0	0	1111
0	1	1	0	1	0	0	0	
0	1	1	1	1	0	0	0	
1	0	0	0	1	0	1	0	
1	0	0	1	1	0	1	0	
1	0	1	0	1	0	1	0	
1	0	1	1	1	0	1	0	
1	1	0	0	1	0	0	0	
1	1	0	1	1	0	0	0	
1	1	1	0	1	0	0	0	
1	1	1	1	1	0	0	0	

I/p T F.F

T_A	T_B	T_C
0	0	0
0	0	1
0	1	0
0	1	1
1	0	0
1	0	1
1	1	0
1	1	1



$T_A = A + B'X$ $T_B = B'C'X' + BC'X + BCX' + A$ $T_C = A'B'C'X' + CX + AX$

$Y = A'X$