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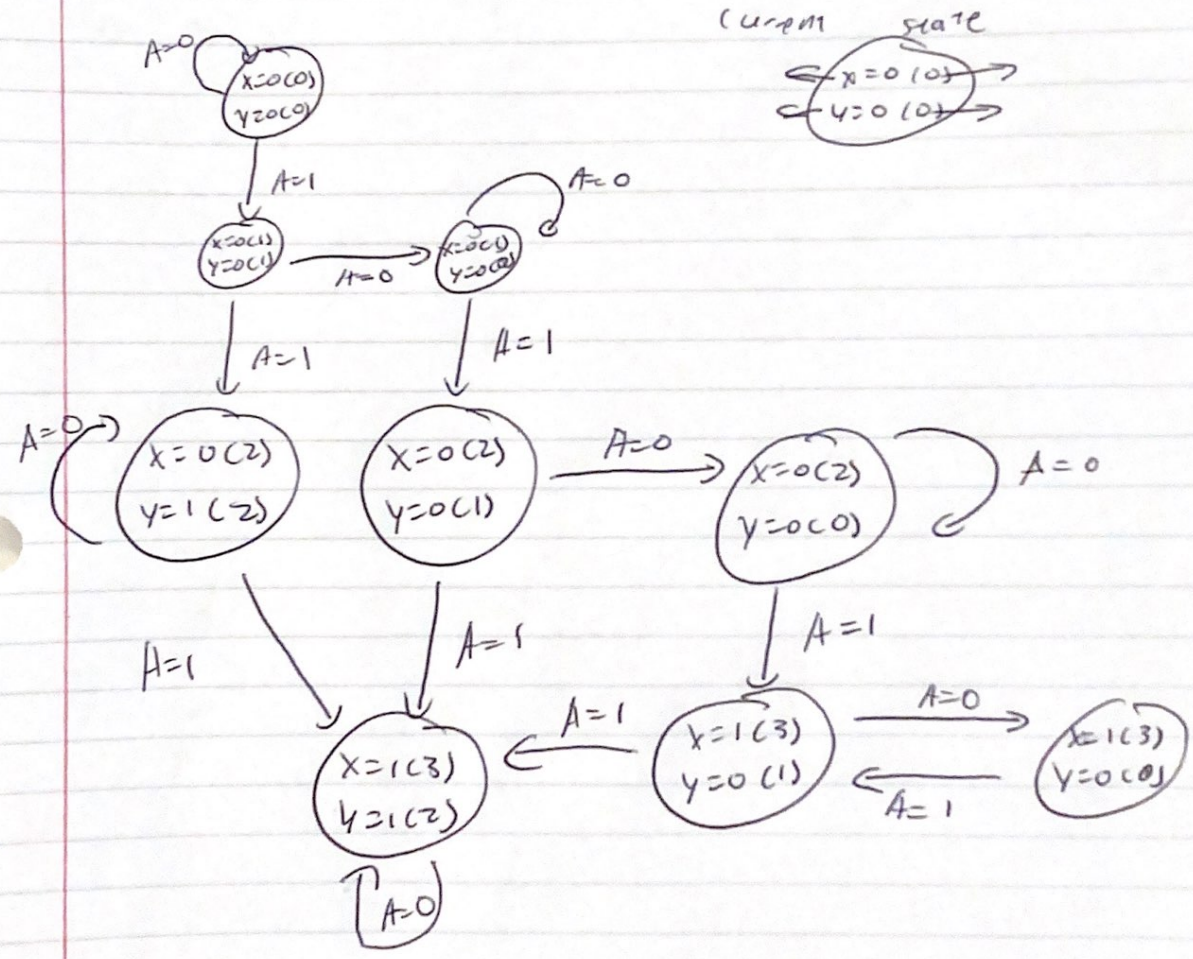
ECSE HW #10

1) Input A Output x & y

Initial state = $\begin{cases} x=0 \\ y=0 \end{cases}$



2. Excitation Equations: $D_1 = Q_1' + Q_2$ $D_2 = Q_1' \cdot x$

D1:

x \ Q_2Q_1	00	01	11	10
0	1	0	1	1
1	1	0	1	1

Q_2, Q_1', Q_2

D2:

x \ Q_2Q_1	00	01	11	10
0	0	0	0	0
1	1	1	0	0

$Q_2' \cdot x$, Q_2'

Truth tables

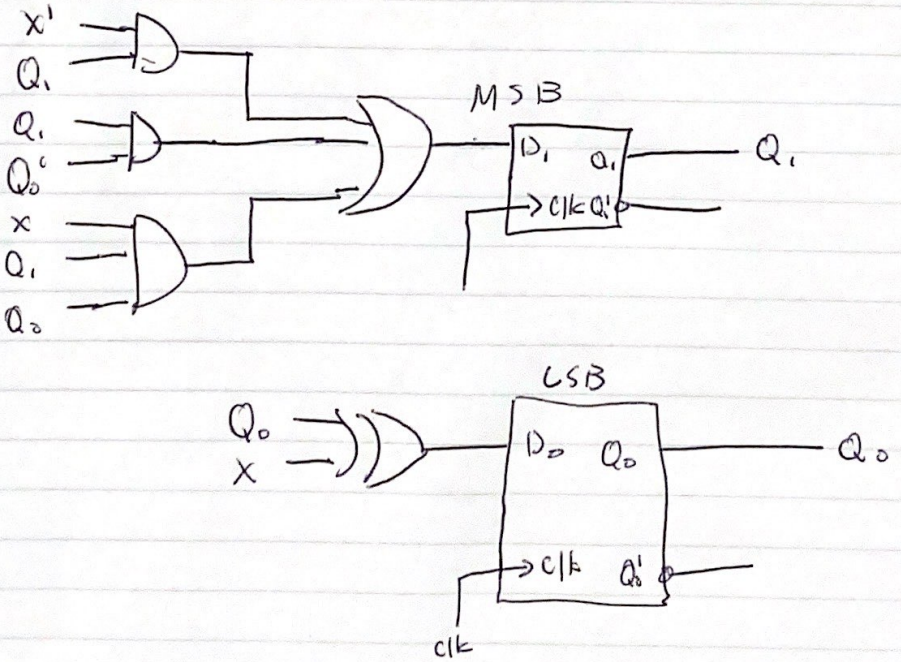
2. Continued

Output Equation $z = Q_1 + Q_2'$

Transition Table → Output Table

State	Input X		
$Q_2\ Q_1$	0	1	Output z
0 0	0 1	1 1	1
0 1	0 0	1 0	1
1 0	0 1	0 1	0
1 1	0 1	0 1	1

3. Input: X Output states: Q_1 & Q_0



4. ~~X ⊕ B~~ [in textbook $F = X \oplus Y = x'y + xy'$]

$A \oplus B = AB' + A'B$

$= A[AB]' + B[AB]'$

[in textbook

$F = x \oplus y = x'y + xy'$

$[x \cdot (xy)']'$

$F = X \oplus Y$

$[xy' \; y]'$ NOR gates ← '

So inputs are

$X[xy]'$ &

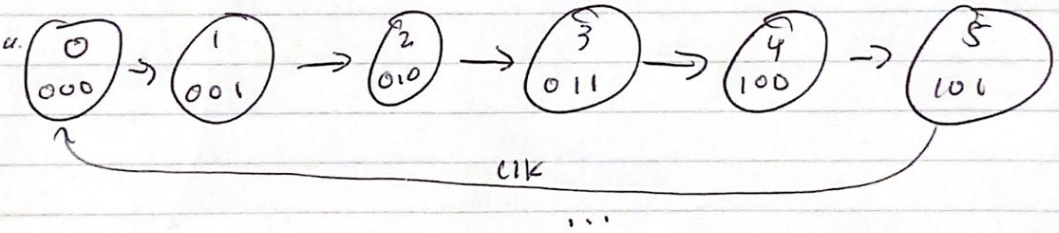
$[xy]' Y$

which equals

$A[AB]'$

$[AB]'B$

5. a.



...

6 states

State variable: 3 bits

Q_2

Q_1

Q_0

b. state transition table

$Q_2 Q_1 Q_0$		$Q_2^+ \; Q_1^+ \; Q_0^+$
0 0 0		0 0 1
0 0 1		0 1 0
0 1 0		0 1 1
0 1 1		1 0 0
1 0 0		1 0 1
1 0 1		0 0 0

5c. Excitation Equation & State Transition

D2':

Q_0 \ Q_2Q_1	00	01	11	10
0	0	0		1
1	0	1		0

$D_2 = Q_2 Q_1' Q_0' + Q_2' Q_1 Q_0$

D2:

Q_0 \ Q_2Q_1	00	01	11	10
0	0	0	X	1
1	0	1	X	0

$$\boxed{D_2 = Q_2 Q_0' + Q_1 Q_0}$$

D1:

Q_0 \ Q_2Q_1	00	01	11	10
0	0	1		1
1	1	0		0

$D_1 = Q_2' Q_1 Q_0' + Q_2' Q_1' Q_0$

D1:

Q_0 \ Q_2Q_1	00	01	11	10
0	0	1	X	0
1	1	0	X	0

$$\boxed{D_1 = Q_1 Q_0' + Q_2' Q_1' Q_0}$$

D0':

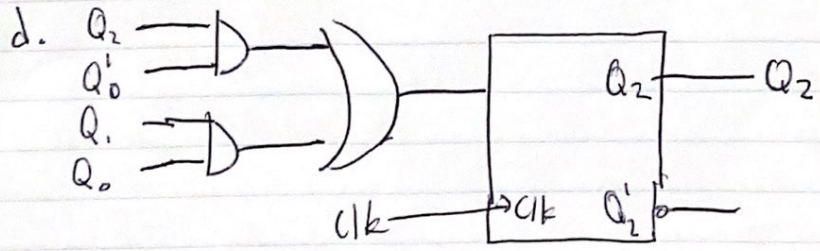
Q_0 \ Q_2Q_1	00	01	11	10
0	1	1		1
1	0	0		0

$D_0 =$

Q_0 \ Q_2Q_1	00	01	11	10
0	1	1	X	1
1	0	0	X	0

$$\boxed{D_0 = Q_0'}$$

d.



d. continued