

ECE124: Discussion

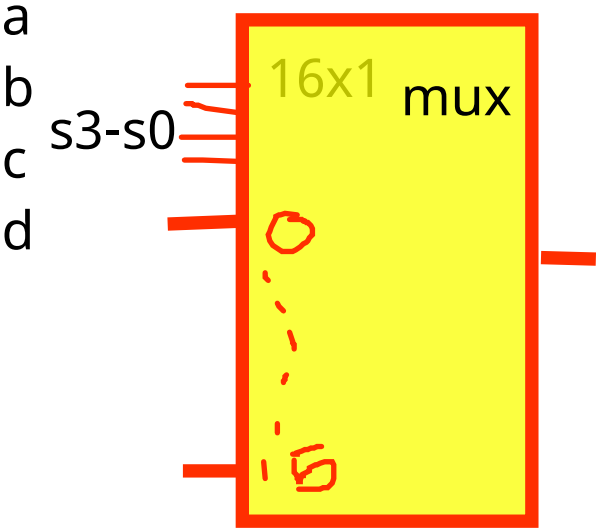
Discussion #11

Yeonsik Noh, PhD

* Implement the following Boolean function with a multiplexer.

$F(A, B, C, D) = \pi(2, 3, 6, 7, 10, 12, 13, 14)$

Input				F
A	B	C	D	
0	0	0	0	1
0	0	0	1	
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	1
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1



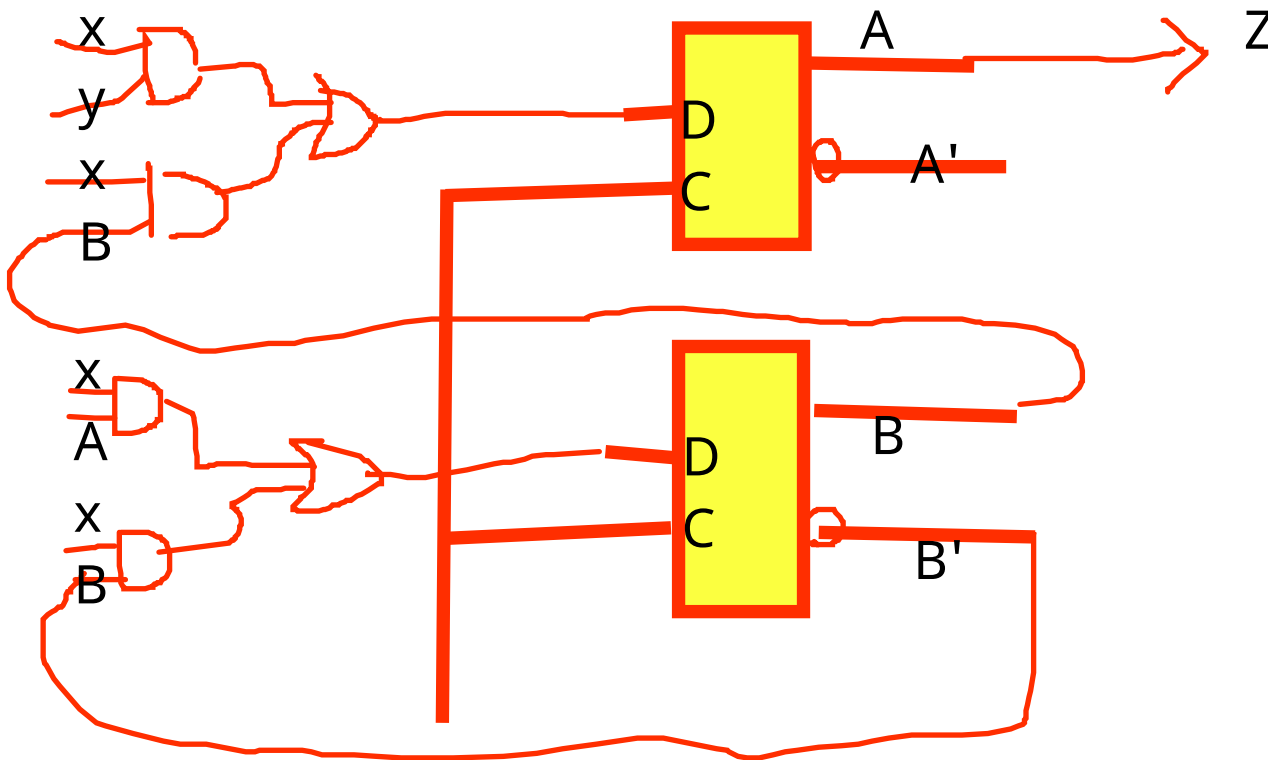
5.6 A sequential circuit with two D flip-flops A and B, two inputs, x and y; and one output z is specified by the following next-state and output equations.

$$A(t+1) = xy' + xB;$$

$$B(t+1) = xA + xB';$$

$$z = A$$

(a) Draw the logic diagram of the circuit



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(b) List the state table for the sequential circuit

Present state		Inputs		A(t+1)		B(t+1)		Next state		output
A	B	x	y	xy'	xB	xA	xB'	A	B	z
0	0	0	0	0	0			0		
0	0	0	1							
0	0	1	0					1		
0	0	1	1							
0	1	0	0							
0	1	0	1							
0	1	1	0					1		
0	1	1	1					1		
1	0	0	0							
1	0	0	1							
1	0	1	0					1		
1	0	1	1							
1	1	0	0							
1	1	0	1							
1	1	1	0					1		
1	1	1	1					1		

$$A(t+1) = xy' + xB$$

$$ABxy' + ABxy$$

0010m2 0110 6
0110m6 0111 7
1010m10 1110 14
1110m14 1111 15

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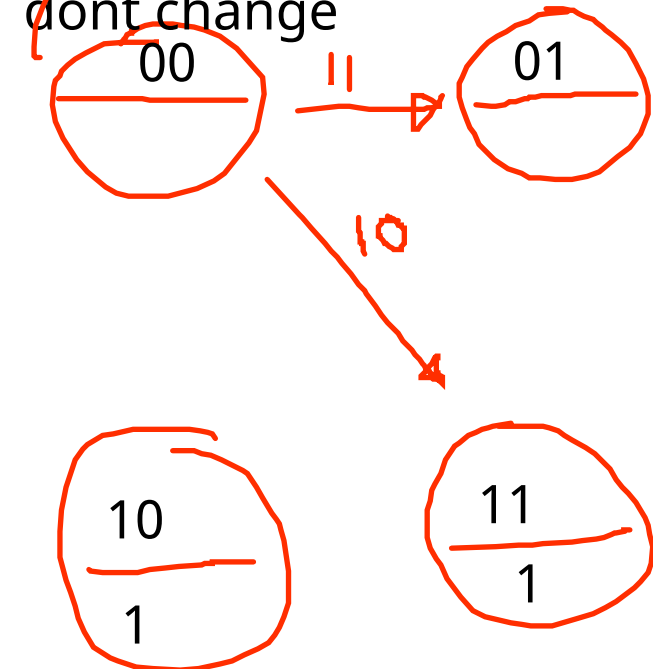
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(c) Draw the corresponding state diagram

Present state		Inputs		A(t+1)		B(t+1)		Next state		output
A	B	x	y	xy'	xB	xA	xB'	A	B	z
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							

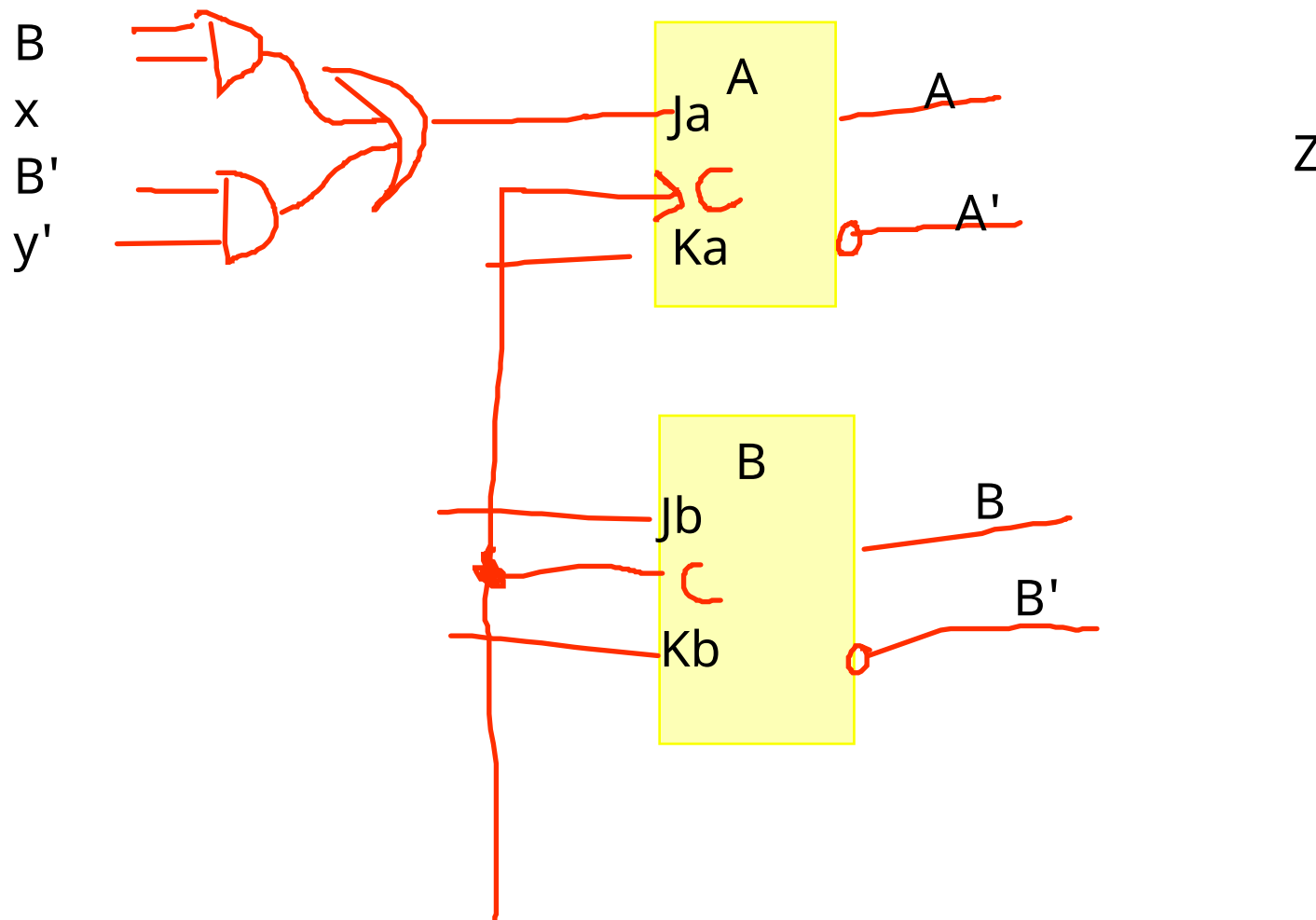
when xy 00, 01
don't change



5.10 A sequential circuit has two JK flip-flops A and B, two inputs, x and y; and one output z. The flip-flop input equations and circuit equation are

$$\begin{aligned} J_A &= Bx + B'y', & J_B &= A'x \\ K_A &= B'xy', & K_B &= A + xy', & Z &= Ax'y' + Bx'y' \end{aligned}$$

(a) Draw the logic diagram of the circuit



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(b) Tabulate the state table

[illegible]

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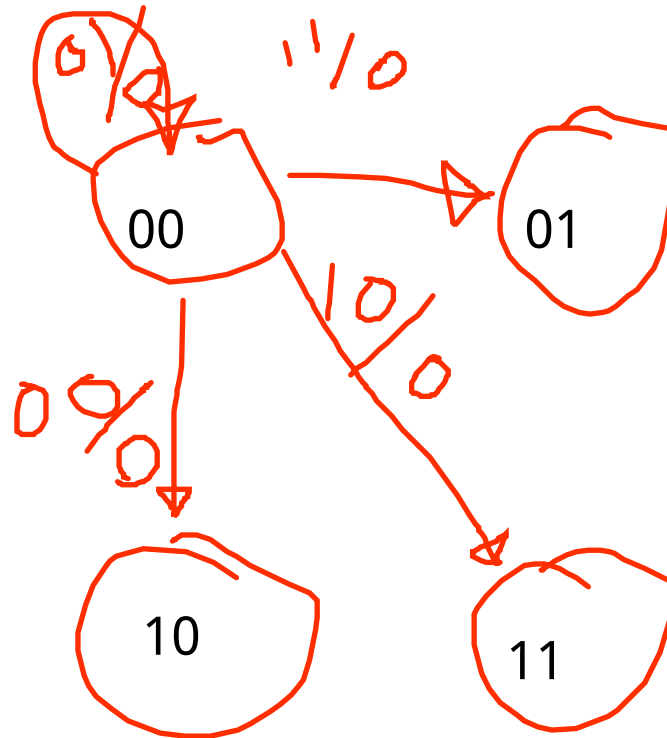
(c) Derive the state equations for A and B

$$Q(t+1) = JQ' + K'Q$$

$$\begin{aligned} A(t+1) &= (Bx + B'y')A' + (B'xy')'A \\ &= A'Bx + A'B'y' + AB + Ax' + Ay \end{aligned}$$

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

(d) Draw the corresponding state diagram



5.16 Design a sequential circuit with two D flip-flops A and B, and on input x_{in} .
 (b) When $x_{in} = 0$, the state of the circuit remains the same. When $x_{in} = 1$, the circuit goes through the state transitions from 00 to 11, to 01, to 10, back to 00, and repeat.

Current State		Input	Next State	
A	B	x	A	B
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

