

State Table

P	PS	NS	X	Y
0	S0	S0	1	0
0	S1	S2	0	1
0	S2	S0	0	0
0	S3	S0	0	1
1	S0	S1	1	0
1	S1	S3	0	0
1	S2	S0	0	0
1	S3	S3	0	1

BR 1/99

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Pick State Encoding, Replace in Table

I choose S0=00, S1=01, S2=10, S3=11

P	PS	NS	X	Y
0	00	00	1	0
0	01	10	0	1
0	10	00	0	0
0	11	00	0	1
1	00	01	1	0
1	01	11	0	0
1	10	00	0	0
1	11	11	0	1

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Write Equations

P	PS		NS		X	Y
	Q1	Q0	D1	D0		
0	0	0	0	0	1	0
0	0	1	1	0	0	1
0	1	0	0	0	0	0
0	1	1	0	0	0	1
1	0	0	0	1	1	0
1	0	1	1	1	0	0
1	1	0	0	0	0	0
1	1	1	1	1	0	1

Need equations for D1, D0, X, Y

D1 Equation

P	PS		NS	
	Q1	Q0	D1	D0
0	0	0	0	0
0	0	1	1	0
0	1	0	0	0
0	1	1	0	0
1	0	0	0	1
1	0	1	1	1
1	1	0	0	0
1	1	1	1	1

$$D1 = P' Q1' Q0 + P Q1' Q0 + P Q1 Q0$$

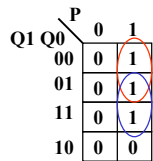
Simplify (algebraically or via K maps)

$$D1 = Q1' Q0 (P' + P) + P Q0 (Q1' + Q1) = Q1' Q0 + P Q0$$

D0 Equation

P	PS		NS	
	Q1	Q0	D1	D0
0	0	0	0	0
0	0	1	1	0
0	1	0	0	0
0	1	1	0	0
1	0	0	0	1
1	0	1	1	1
1	1	0	0	0
1	1	1	1	1

Lets try a K-map for D0



$$D0 = P Q1' + P Q0$$

X Output Equation

P	Q1	Q0	X
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	0

		P	
		0	1
Q1	Q0	00	1 1
		01	0 0
Q1	Q0	11	0 0
		10	0 0

$$X = Q1' Q0'$$

Could have done this by inspection of FSM – X only asserted in State S0, which is 00, which is $Q1' Q0'$

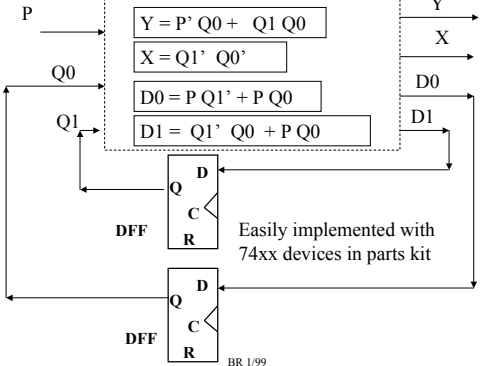
Y Output Equation

P	Q1	Q0	Y
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

		P	
		0	1
Q1	Q0	00	0 0
		01	1 0
Q1	Q0	11	1 1
		10	0 0

$$Y = P' Q0 + Q1 Q0$$

Equation Summary



Debugging Strategy

- Hook up just the D0, D1 equations first and get your state changes correct
 - Use LEDs to monitor the Q1, Q0 values so you know your current state
 - If you have everything hooked up correctly, and state changes do not match ASM chart, then check your equations!!!!!!
- After state changes are working, then concentrate on one output at a time
 - X first perhaps, then Y
