

[CS M51A FALL 18] SOLUTION TO QUIZ 3

Duration: 30 minutes

11/16/2018

Problem 1 (10 points)

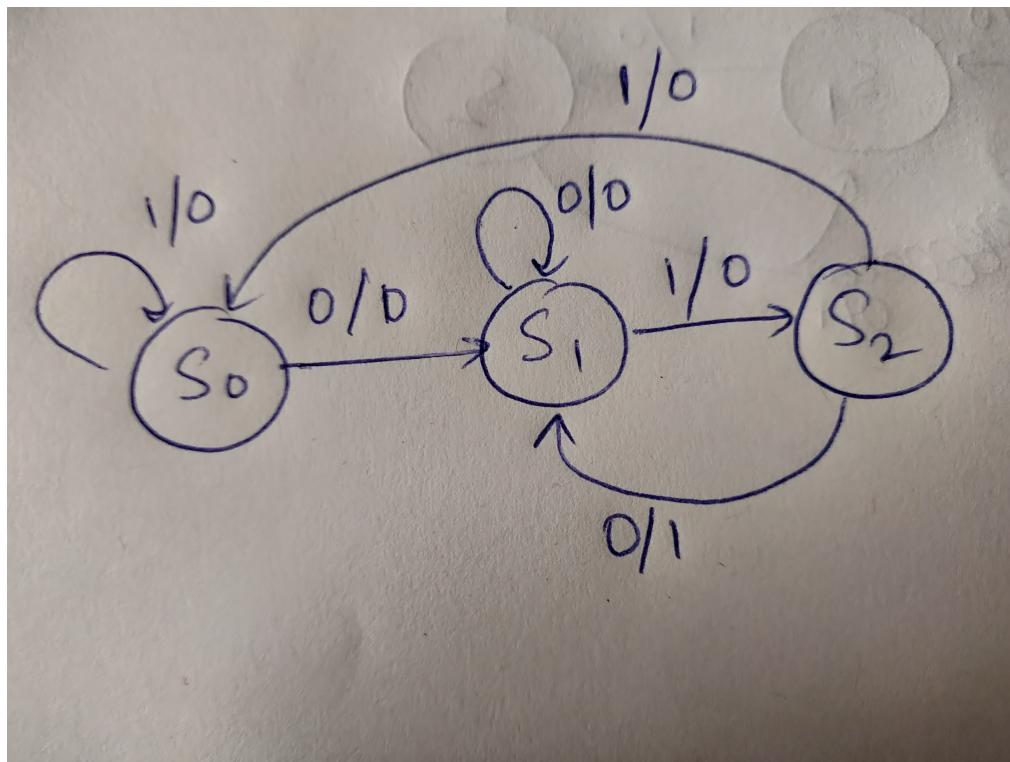
Draw the state diagram for a pattern detector that recognizes the pattern : "010", that is :

$$z(t)=1 \text{ if } x(t-2,t)=010$$

$$z(t)=0 \text{ otherwise}$$

Overlapping allowed

Solution



Problem 2 (15 points)

Given the state table below, determine if it is minimal.

PS	Input			
	$x = a$	$x = b$	$x = c$	$x = d$
A	G, 1	E, 0	G, 1	C, 0
B	D, 0	G, 0	E, 0	F, 1
C	E, 1	G, 0	F, 1	A, 0
D	E, 1	G, 0	F, 1	C, 0
E	C, 0	G, 0	E, 0	F, 1
F	C, 1	B, 1	A, 0	B, 1
G	C, 0	E, 0	G, 0	F, 1
H	G, 1	E, 0	F, 1	A, 0

NS, z

If not, show the minimal FSM

Solution

$$P_1 = (ACDH)(BEG)(F)$$

For P_2 :

	g1				g2			g3
	A	C	D	H	B	E	G	F
a	2	2	2	2	1	1	1	
b	2	2	2	2	2	2	2	
c	2	3	3	3	2	2	2	
d	1	1	1	1	3	3	3	

$$P_2 = (A), (C, D, H), (B, E, G), (F)$$

For P_3 :

	g1			g2			g3			g4
	A	C	D	H	B	E	G	F		
a	3	3	3	3	2	2	2			
b	3	3	3	3	3	3	3			
c	4	4	4	4	3	3	3			
d	1	2	1	4	4	4	4			

$$P_3 = (A), (C, H), (D), (B, E, G), (F)$$

For P_4 :

	g1 A	g2 C H	g3 D	g4 B E G	g5 F
a	4 4		3 2 2		
b	4 4		4 4 4		
c	5 5		4 4 4		
d	1 1		5 5 5		

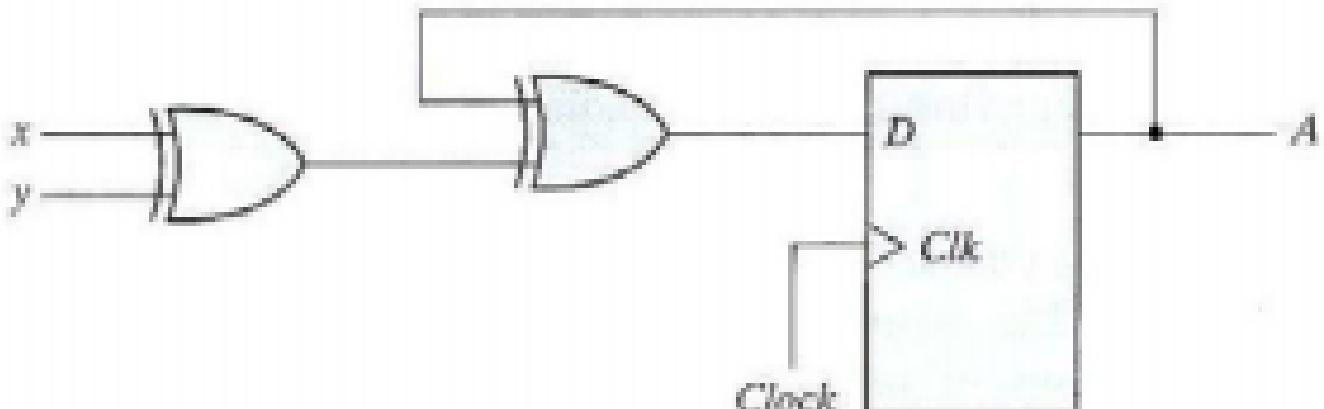
$$P_4 = (A), (C, H), (D), (B), (E, G), (F)$$

For P_5 :

	g1 A	g2 C H	g3 D	g4 B	g5 E G	g6 F
a	5 5			2 2		
b	5 5			5 5		
c	6 6			5 5		
d	1 1			6 6		

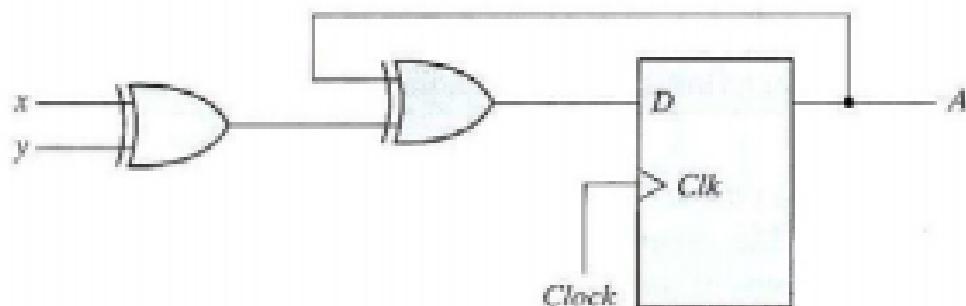
and we can stop here as $P_5 = P_4$.

Problem 3 (15 points) We have a D flip flop circuit below. Provide the state transition table and state transition diagram.



Circuit diagram

Solution:



(a) Circuit diagram

Present state	Inputs	Next state
A	$x \ y$	A
0	0 0	0
0	0 1	1
0	1 0	1
0	1 1	0
1	0 0	1
1	0 1	0
1	1 0	0
1	1 1	1

(b) State table



(c) State diagram