

ECE 255 – Introduction to Digital Logic Design
Homework Assignment 6
Due December 6

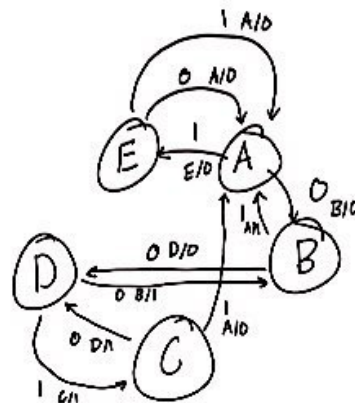
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1. Consider the following state table for a synchronous sequential circuit.

	x		
	0	1	
A	B/0	E/0	has 1 vote
B	D/0	A/1	
C	D/1	A/0	
D	B/1	C/1	
E	A/0	A/0	

moody machine

(a) Sketch a state diagram for this state machine.



(b) Using the assignment guidelines discussed in class, find an optimal state assignment for this machine.

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(c) Provide an updated state table, clearly showing the state assignments. From this updated state table, develop K-maps for next state and output logic to implement a circuit for this state machine.

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(d) Draw by hand or use Logisim to sketch your circuit schematic.

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def

Q1) Part b

Create State table

Create Possible Assignment

$Q_1, Q_0 = 000 \ 001 \ 010 \ 011 \ 100$

use all 3
State assignment
rules

$2^3 = 16$
3 Flip Flops needed

Results of Voting
alpha : 3 votes
beta : 5 votes
gamma : 0 votes
 \therefore beta is the optimal

α	A	B	C	D	E
β	A	B	E	C	D
γ	A	B	D	C	E

Desired Adjacencies
possible adj.

	α	β	γ
G_1			
BC ($x=0$)	✓		
BC ($x=1$)	✓		
AD ($x=0$)		✓	
BE ($x=1$)		✓	
BE		✓	
G_2			
DA		✓	
DA		✓	
BC	✓		
AA			

Assignment table of Beta

P.S	$X=0$	$X=1$	Z
A 000	000/0	011/0	0
B 001	010/0	000/1	0
C 100	010/1	000/0	0
D 010	001/1	100/1	1
E 011	000/0	000/0	0

State table assignment w design

truth table

X, Q_1, Q_0	Q_1^{n+1}	Q_0^{n+1}	Z
000 m_0	0	0	0
001 m_1	1	1	0
100 m_2	1	1	1
010 m_3	1	1	1
011 m_4	0	0	0
000 m_5	1	1	0
001 m_6	0	0	1
100 m_7	0	0	0
010 m_8	1	1	1
011 m_9	0	0	0

2. Consider the following state table for a synchronous sequential circuit.

	x		Output
	0	1	
A	A/0	C/0	00
B	D/1	A/0	10
C	F/0	F/0	00
D	E/1	B/0	10
E	G/1	G/0	10
F	C/0	C/0	00
G	B/1	H/0	10
H	H/0	C/0	00

- (a) Using an implication table, reduce the sequential circuit to one with a minimal number of states. Be sure to show your reduced state table when done.

B	X					
C	A-F C-F	X				
D	X	D-E A-B	X			
E	X	D-6 A-6	X	E-6 B-6		
F	A-6 C-6	X	F-6 F-6	X	X	
G	X	D-B A-H	X	E-B G-H	G-B G-H	X
H	A-H C-6	X	F-H F-6	X	X	X
	A	B	C	D	E	F

- (b) Using the assignment guidelines discussed in class, find an optimal state assignment for this machine.

dnf

3. Consider the following state table for a synchronous sequential circuit.

	<i>x</i>	
	0	1
<i>A</i>	<i>B</i> /0	<i>C</i> /0
<i>B</i>	<i>D</i> /0	<i>E</i> /0
<i>C</i>	<i>F</i> /0	<i>G</i> /0
<i>D</i>	<i>A</i> /1	<i>B</i> /1
<i>E</i>	<i>C</i> /0	<i>D</i> /0
<i>F</i>	<i>F</i> /0	<i>G</i> /0
<i>G</i>	<i>B</i> /0	<i>F</i> /0

- (a) Using an implication table, reduce the sequential circuit to one with a minimal number of states. Be sure to show your reduced state table when done.

dnf

- (b) Using the assignment guidelines discussed in class, find an optimal state assignment for this state machine.

dnf

- (c) Provide an updated state table, clearly showing the state assignments. From this updated state table, develop K-maps for next state and output logic to implement a circuit for this state machine.

dnf

- (d) Draw by hand or use Logisim to sketch your circuit schematic.

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