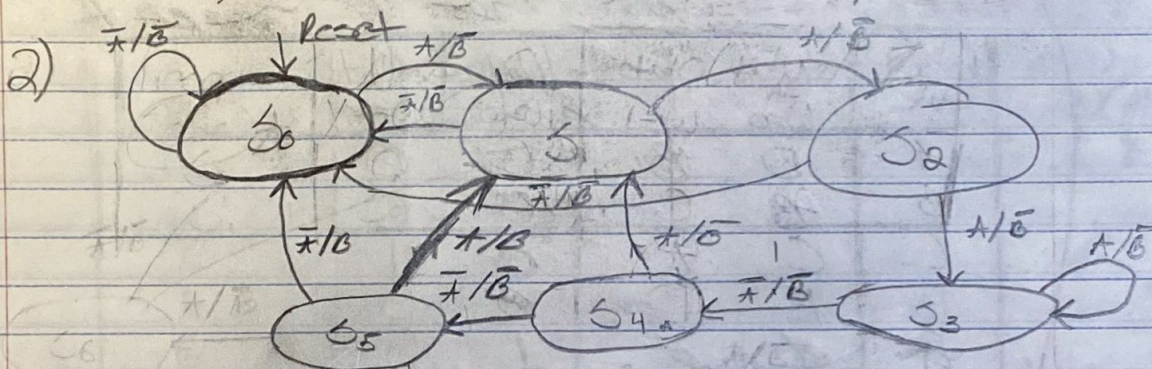Brian [signature]
04/17/22

Homework 9

1) • Mealy machines - a FSM whose output values are determined by both its current state & current inputs.
  • asynchronous
• Moore machines - a FSM whose output values are only determined by its current state.
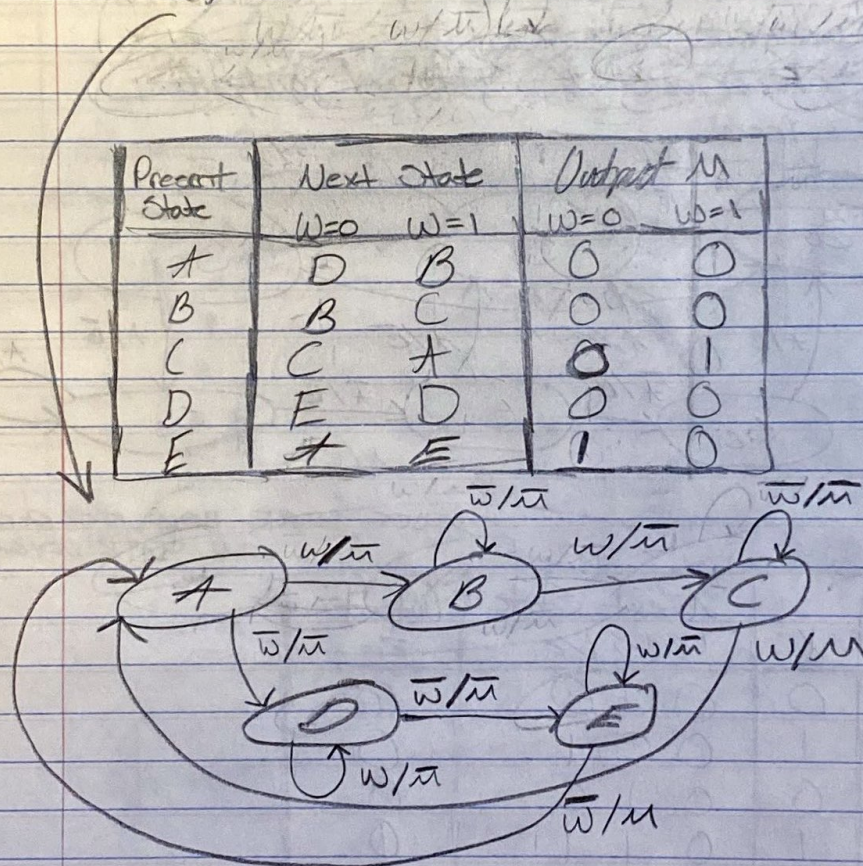 • synchronous & delayed output

2)

* NOT SURE HOW TO PUT IN STATE DIAGRAM

3)

Present State $V_2 V_1 V_0$	X	Next State $V_2 V_1 V_0$	Output Z
0 0 0	0	0 0 0	0
0 0 0	1	0 0 1	0
0 0 1	0	0 1 0	0
0 0 1	1	0 1 1	0
0 1 0	0	1 0 0	1
0 1 0	1	1 0 1	1
0 1 1	0	1 1 0	1
0 1 1	1	1 1 1	1
1 0 0	0	0 0 0	0
1 0 0	1	1 0 1	0
1 0 1	0	0 0 0	0
1 0 1	1	0 0 0	
1 1 0	0	0 0 0	
1 1 0	0	0	

4) a) • A: 00001
     • B: 00010
     • C: 00100
     • D: 01000
     • E: 10000

   b)

Present State	Next State		Output M	
	W=0	W=1	W=0	W=1
A	D	B	0	0
B	B	C	0	0
C	C	A	0	1
D	E	D	0	0
E	A	E	1	0

   c)

Present State Y	Next State		Output	
	W=0 Y	W=1 Y	W=0 Z	W=1 Z
A	00001	01000	00010	0	0
B	00010	00010	00100	0	0
C	00100	00100	00001	0	1
D	01000	10000	01000	0	0
E	10000	00001	10000	1	0

d)
- $A = \overline{W}A + WA$
- $B = \overline{W}B + WB$
- $C = \overline{W}C + WC$
- $D = \overline{W}D + WD$
- $E = \overline{W}E + WE$
- $M = WC + \overline{W}E$

e) The particular circuit has the same # of states as it does state variables because it is one hot! encoded.
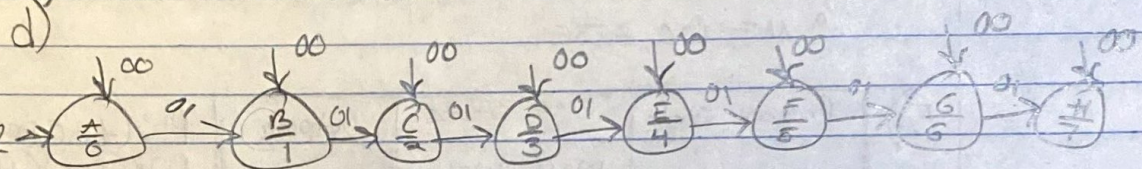
5)

Present State	Next State		Output
	$W=0$	$W=1$	
A	A	B	0
B	A	C	0
C	D	F	0
D	H	E	0
E	B	H	1
F	G	F	0
G	H	E	0
H	A	B	0

P1: (ABCDEGH)(E)
P2: (DG)(ABCFH)(E)
P3: (E)(DG)(CF)(ABH)
P4: (E)(DG)(CF)(B)(AH)
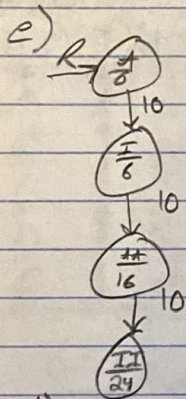
6) a) 8 minimum state variables because of K-successes

b) 3 T.F.F's are required to implement this FSM

c) 96 transitions

d)

R → (A/0) 01→ (B/1) 01→ (C/2) 01→ (D/3) 01→ (E/4) → (F/5) → (G/6) → (H/7)

with 00 self-loops on each state

• 24 states & 80 transitions

e)

R → (*/0)
↓ 10
(I/6)
↓ 10
(H/16)
↓ 10
(II/24)

• 28 states & 92 transitions

f) serial adder & arbiter circuit