CS 362: Homework 6

Due on April 5, 2024 at 11:59pm

Professor Troy 11:00am

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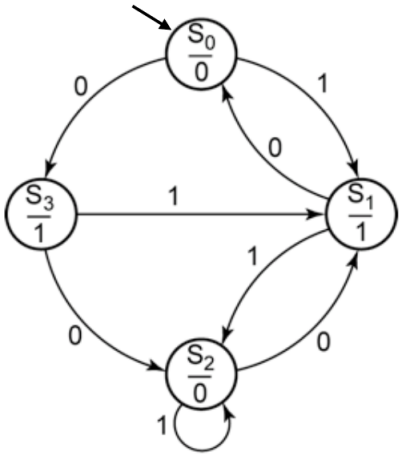
Problem 1

Consider the following Finite State Machine. Start State: S0
Output value is under the line below the State number.



Solution

1. Is the above FSM a Moore machine or a Mealy Machine?
   Mealy Machine.

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2. What is output by the above FSM for the:
   Input:
   1 0 1 1 0 0 0 1 0 0 1 1
   Output:
   0 1 0 1 0 1 0 1 1 0 1 1 0

---

3. Create the truth table to the above FSM. Encode the states using 2 bit binary values:
   S0 $\rightarrow$ 0 0, S1 $\rightarrow$ 0 1, S2 $\rightarrow$ 1 0, S3 $\rightarrow$ 1 1

$p1$	$p0$	b	y	$n1$	$n0$
0	0	0	0	1	1
0	0	1	0	0	1
0	1	0	1	0	0
0	1	1	1	1	0
1	0	0	0	0	1
1	0	1	0	1	0
1	1	0	1	1	0
1	1	1	1	0	1

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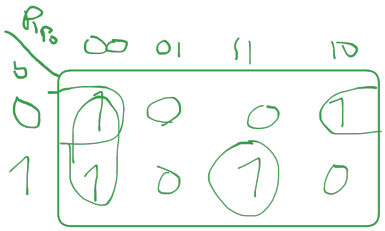
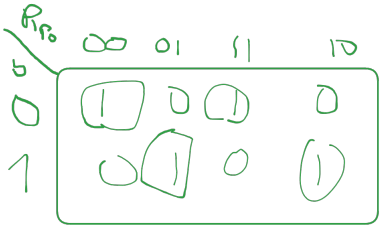
4. Write out the simplified expressions for the next state and output values. You can use K-maps or boolean algebra to determine simplified expression.

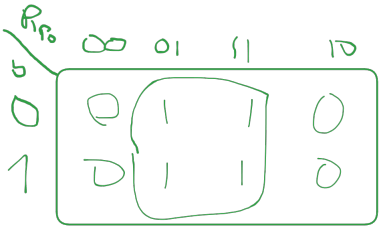
$$n0 = p1p0b + p1p0'b' + p1'p0'b + p1'p0'b'$$
$$n1 = p1'p0'b' + p1p0'b + p1'p0b + p1p0b'$$



$$n0 = p1'p0' + p1p0b + b'p0'$$

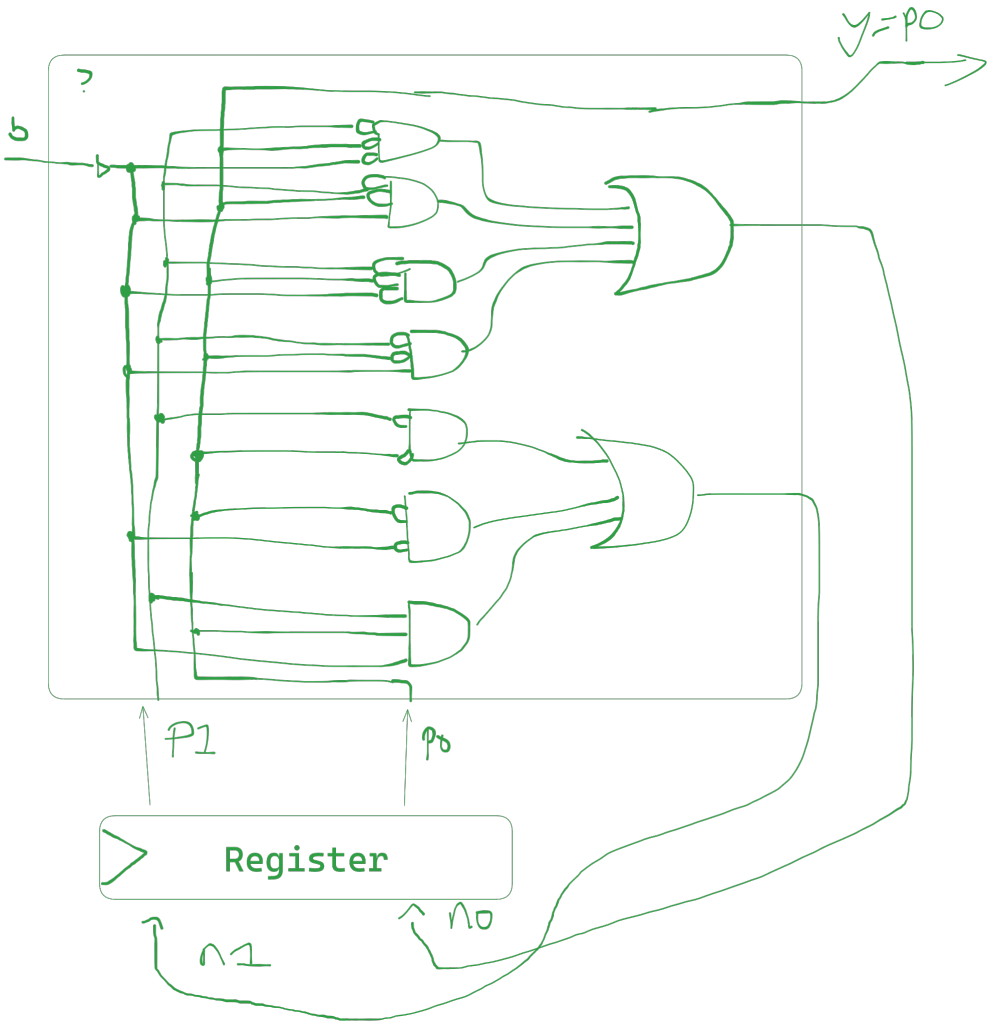


$$n1 = p1'p0'b' + p1p0b' + p1'p0b + p1p0'b$$



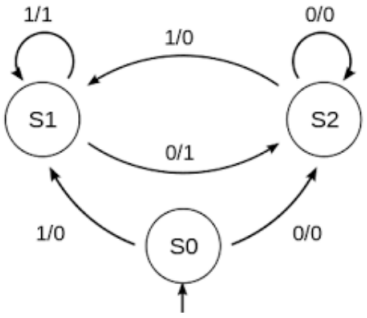
$$y = p0$$

5. Draw the circuit diagram for the Finite State Machine. Use the format as shown in class and in the zyBooks (and in Q3 below) that contain a state register and a combination logic block.



Problem 2

Consider the following Finite State Machine. Start State: S0.
Inputs are listed before the slash on each transition.
Outputs are listed after the slash on each transistion.



Solution

1. Is the above FSM a Moore machine or a Mealy machine?
   Mealy Machine

---

2. What is output by the above FSM for:
   Input: 1 0 1 1 0 0 0 1 0 0 1 1
   Output: 0 1 0 1 1 0 0 0 1 0 0 1

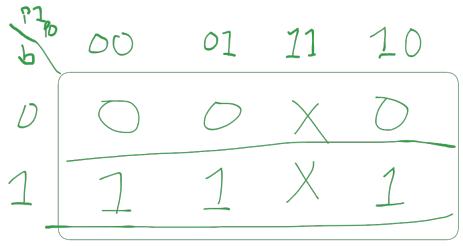
---

3. Create the truth table to the above FSM. Encode the states using 2 bit binary values:
   S0 $\rightarrow$ 0 0, S1 $\rightarrow$ 0 1, S2 $\rightarrow$ 1 0

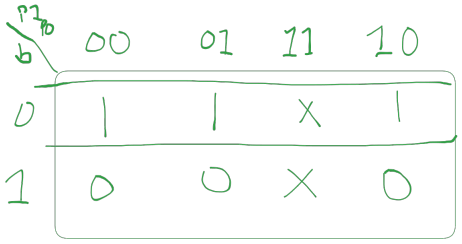
$p1$	$p0$	b	y	$n1$	$n0$
0	0	0	0	1	0
0	0	1	0	0	1
0	1	0	1	1	0
0	1	1	1	0	1
1	0	0	0	1	0
1	0	1	0	0	1
1	1	0	x	x	x
1	1	1	x	x	x

Problem 2 continued on next page...

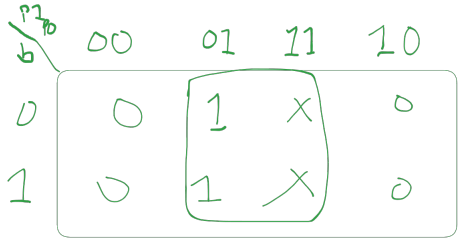
4. Write out the simplified expressions for the next state and output values. You can use K-maps or boolean algebra to determine simplified expressions.



$$n0 = b$$



$$n1 = b'$$



$$y = b$$

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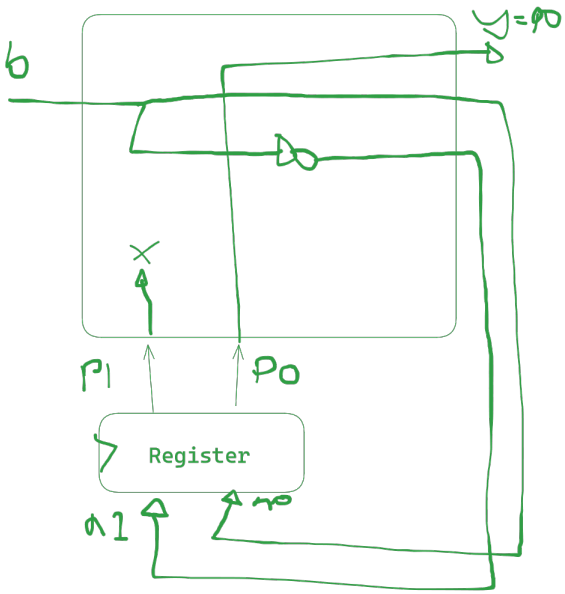
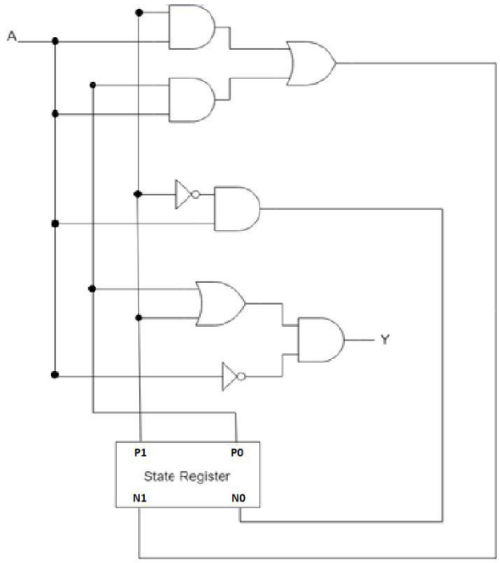
5. Draw the circuit diagram for the Finite State Machine. Use the format as shown in class and in the zyBooks (and in Q3 below) that contain a state register and a combination logic block.



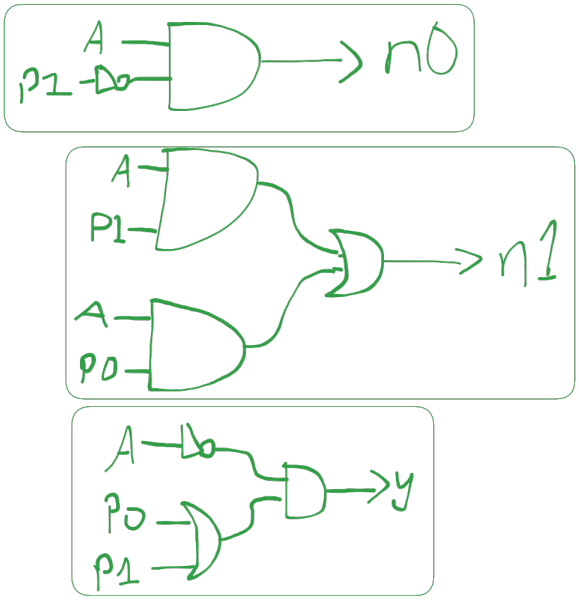
Problem 3

Consider the following circuit:



Solution

1. Write the equations for the for the next state and output values from the above controller.



$$n0 = p1'a$$
$$n1 = p1a + p0a$$
$$y = A' \cdot (p0 + p1)$$

---

2. Create the truth table for the above circuit:

$p1$	$p0$	A	Y	$n1$	$n0$
0	0	0	0	0	0
0	0	1	0	0	1
0	1	0	1	0	0
0	1	1	0	1	1
1	0	0	1	0	0
1	0	1	0	1	0
1	1	0	1	0	0
1	1	l	0	1	0

---

3. What information needed for drawing a Finite State Machine is not included in the Truth Table and will need to be assumed?
   We need to assume some start state, I will divide the truth table into four states, S_0 will be the first two rows in the table, this will be our start state.

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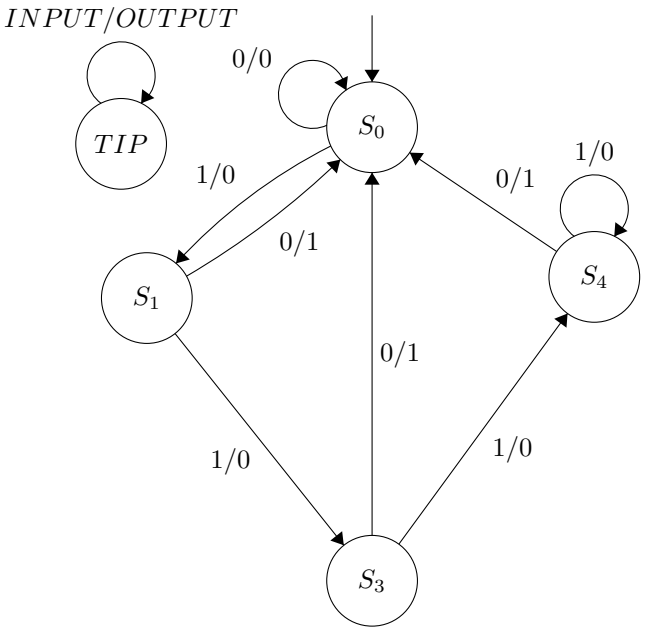
4. Draw the Finite State Machine that is represented by the circuit:



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5. Is the Finite State Machine a Moore machine or a Mealy machine?
   Mealy machine.

---

6. What is output by the above FSM for:
   Input: 1 0 1 1 0 0 0 1 0 0 1 1
   Output: 0 1 0 0 1 0 0 0 1 0 0 0
