

CSE 369 QUIZ 2

(VERSION A)

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Please do not turn the page until 12:20.

Instructions

- This quiz contains 6 pages, including this cover page. You may use the backs of the pages for scratch work.
- Please clearly indicate (box, circle) your final answer.
- The quiz is closed book and closed notes.
- Please silence and put away all cell phones and other mobile or noise-making devices.
- Remove all hats, headphones, smart glasses, watches, and other digital wearables.
- You have 30 (+5) minutes to complete this quiz.

Advice

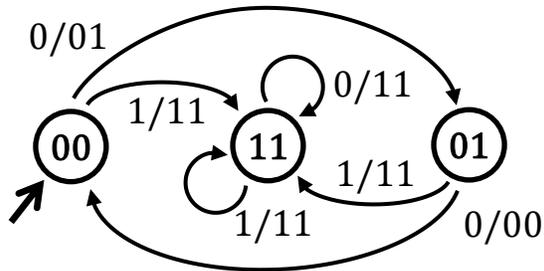
- Read questions carefully before starting. Read *all* questions first and start where you feel the most confident to maximize the use of your time.
- There may be partial credit for incomplete answers; please show your work.
- Relax. If you've been practicing, you got this. If you haven't, you'll learn something now.

Question	Points	Score
(1) SL & Timing	9	
(2) FSM Implementation	14	
(3) FSM Design	7	
Total:	30	

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Question 2: Finite State Machine Implementation [14 pts]

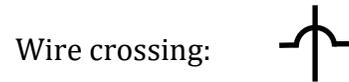
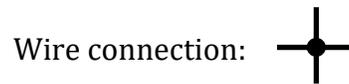
(A) Fill in the provided truth table based on the FSM shown. [8 pts]



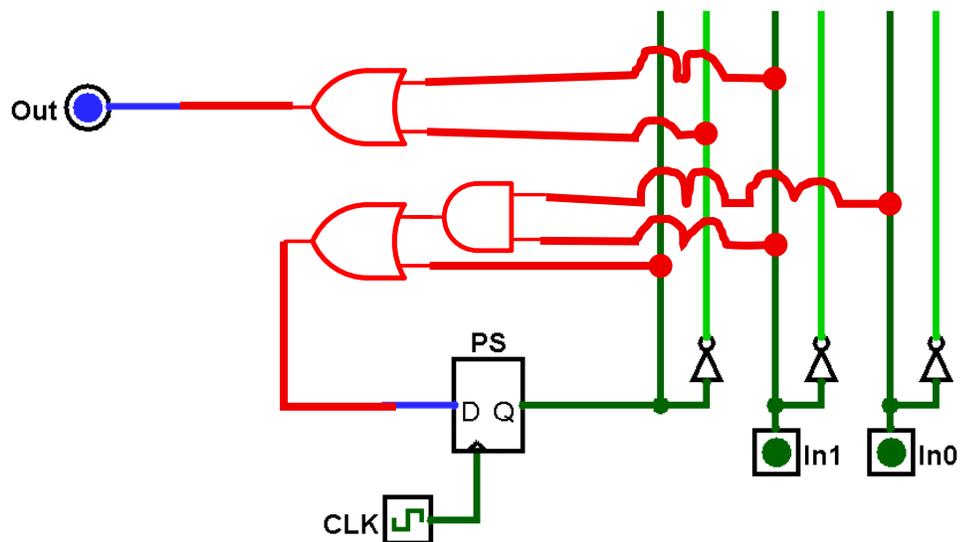
PS ₁	PS ₀	In	NS ₁	NS ₀	Out ₁	Out ₀
0	0	0	0	1	0	1
0	0	1	1	1	1	1
0	1	0	0	0	0	0
0	1	1	1	1	1	1
1	0	0	x	x	x	x
1	0	1	x	x	x	x
1	1	0	1	1	1	1
1	1	1	1	1	1	1

(B) Complete the circuit diagram below using *minimal logic* based on the truth table shown below. Use only 2-input logic gates. [6 pts]

PS	In ₁	In ₀	NS	Out
0	0	0	x	x
0	0	1	0	1
0	1	0	0	1
0	1	1	1	1
1	0	0	1	0
1	0	1	1	0
1	1	0	1	1
1	1	1	1	1

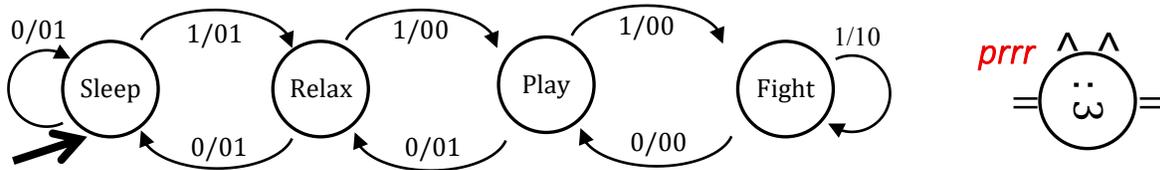


		NS				Out					
PS\In		00	01	11	10	PS\In		00	01	11	10
0		x	0	1	0	0		x	1	1	1
1		1	1	1	1	1		0	0	1	1



Question 3: Finite State Machine Design [7 pts]

We've built an FSM representing what will happen if we pet Danni the Cat at various times. The input bit represents the presence of your hand petting her. The output bits represent her state of {claws_out, purring}



- (A) How many total rows are in the truth table for this FSM? How many of the rows are filled with Don't Cares? [2 pts]

2 bits for state code, 1 input bit = 3 bits total. $2^3 = 8$.
All states and transitions are accounted for in the diagram, so none are don't-care

Rows: 8	Don't Care Rows: 0
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- (B) Complete the test bench `initial` block to *thoroughly* test the FSM by filling in all bolded blanks. You may fill out the comments to track the state, but these won't be graded. [4 pts]

```

initial begin
    In <= 0;           // state: sleep
    @(posedge clk); In <= 0;           // state: sleep
    @(posedge clk); In <= 1;         // state: sleep
    @(posedge clk); In <= 1;           // state: relax
    @(posedge clk); In <= 1;           // state: play
    @(posedge clk); In <= 1;         // state: fight
    @(posedge clk); In <= 0;           // state: fight
    @(posedge clk); In <= 0;         // state: play
    @(posedge clk); In <= 0;         // state: relax
    @(posedge clk);           // state: sleep
    $stop();
end
  
```

- (C) Based on the two outputs of this FSM alone, what advice would you give to someone who wanted to pet Danni but not get scratched by her claws? [1pt]

It's only safe to pet her when she's purring. Stop as soon as she isn't!

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Result of a poorly implemented state machine:



Remember, you got this 🤝 😊

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