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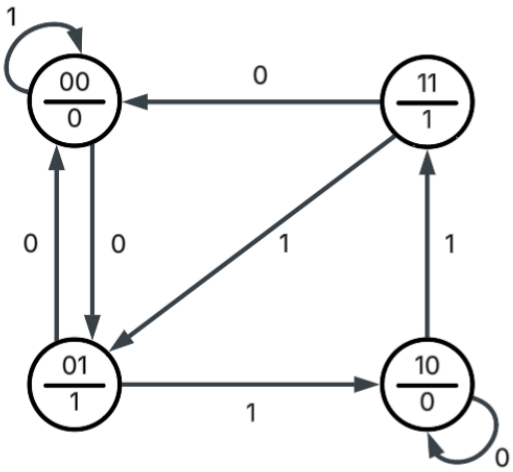
EEL3701C - Fall 2025

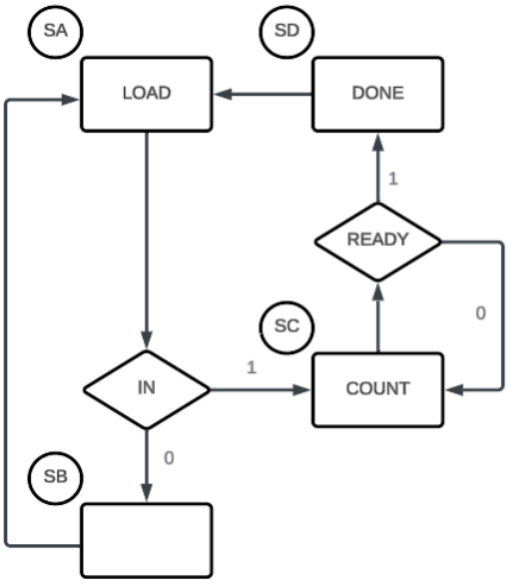
HW5: State Machine Behavior

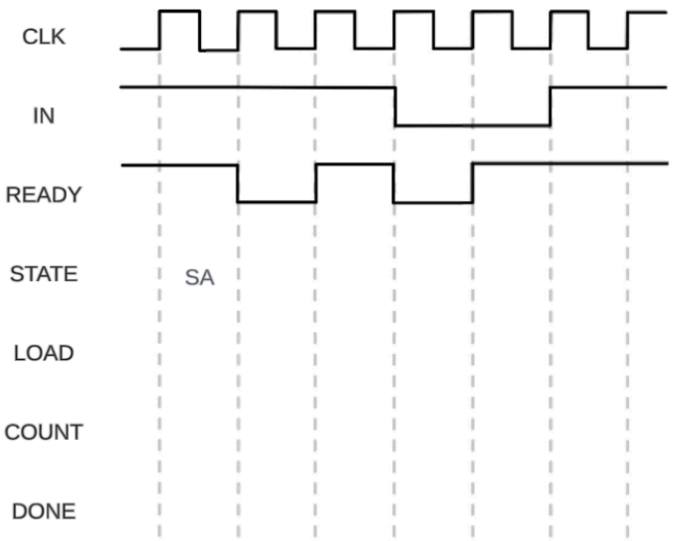
1. Complete the next state truth table for the following FSM diagram. Begin at 00.

Q1	Q0	IN	D1	D0	OUT

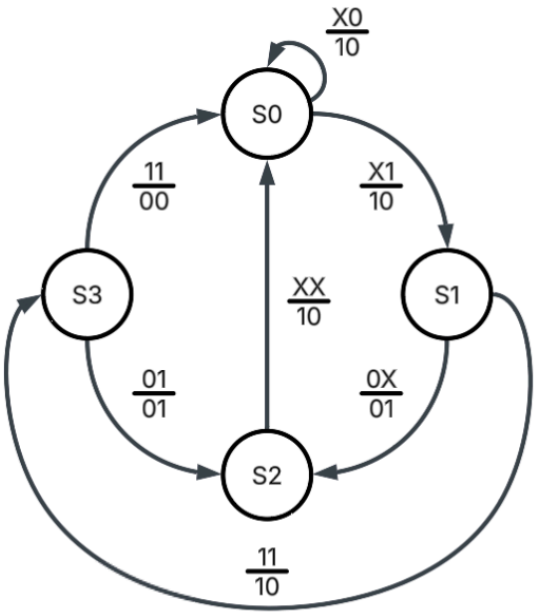


2. Given the ASM chart, complete the corresponding timing diagram.

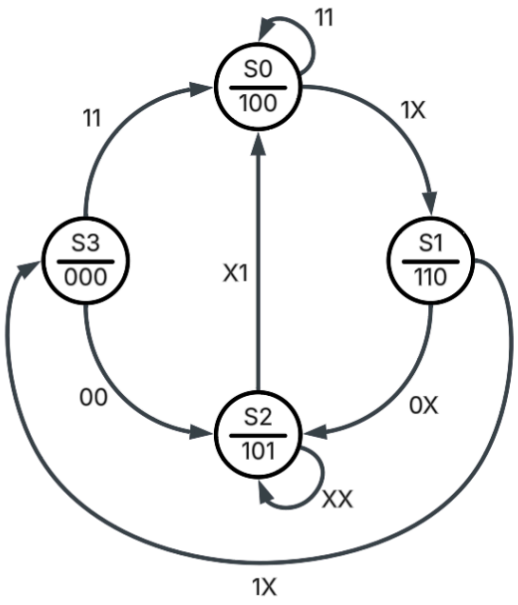




3. Convert the Mealy state graph into an ASM chart given the following:
    - Inputs: X1, X2
    - Outputs: Y1, Y2



4. Convert the Moore state graph into an ASM chart given the following:
    - Inputs: X1, X2
    - Outputs: Y1, Y2, Y3



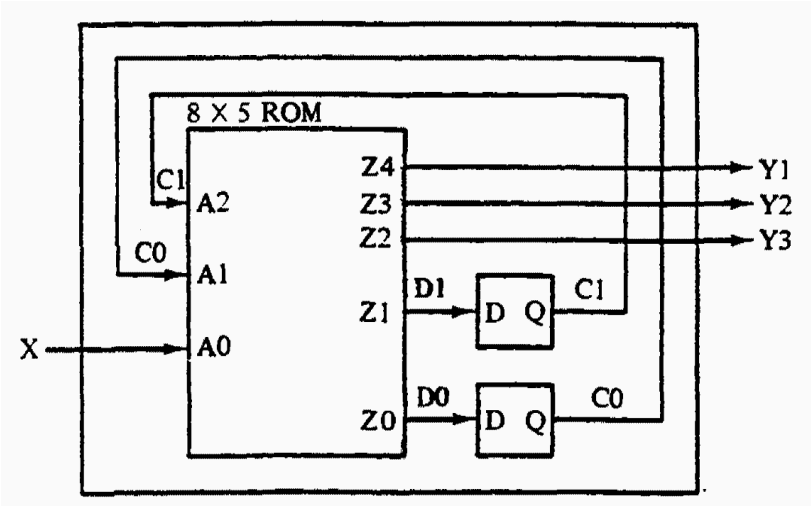
5. A lock is controlled by a Mealy FSM and unlocks when a code is entered in the correct sequence. The system uses the following inputs and outputs:
   - Inputs: A, B, C
   - Outputs: U, R (U = 1 means the safe unlocks, R = 1 means the sequence is invalid)

   If at any point the sequence is incorrect, the FSM will reset and output to X to indicate an invalid code. The safe unlocks when the buttons A, B, C are pressed in that exact order.
   a. Calculate the total ROM size.

   b. How many flip-flops are required for the register?

   c. Design the corresponding Mealy FSM.

6. Given the block diagram design of a controller based on the ROM method and with D flip-flops, derive the corresponding ASM chart.



Contents of the ROM

Location	Contents
0	11H
1	11H
2	16H
3	0FH
4	00H
5	00H
6	04H
7	04H