

EE/CSE371 QUIZ 1

Name: _____
Student ID
Number: _____

Please do not turn the page until 11:55.

Instructions

- This quiz contains 3 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, and watches.
- You have 25 minutes to complete this quiz.

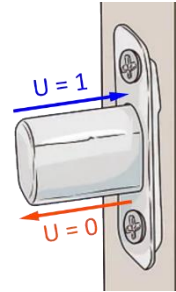
Advice

- 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.

Finite State Machine Design

We are designing an electronic combination lock that has 3 input buttons (and corresponding signals) on a keypad – **reset (R)**, **shift (S)**, and **A/B (L)** – and 1 output signal **unlock (U)**.

- The user can lock the door at any time by pressing **reset**.
- **U** switches the position of the deadbolt between 1/unlocked and 0/locked.
- **L** represents one of two input letters, 0/a or 1/b.
- **S** changes the capitalization of the input letter, *e.g.*, 0/c or 1/C.



- (A) If the combination for this lock is **B-a-b-a**, draw out a state diagram (Moore or Mealy) of this system. [12 pts]
- Each state should be given an appropriate **name** but you do not need binary encodings.
 - As R is the reset signal, explicit transitions from each state for R do not need to be shown; transitions only need to be indicated for combinations of S and L.
 - "Always" transitions should be labeled with an asterisk (*).

- (B) Describe what your FSM from Part A does after a user enters the correct combination. *Briefly* explain your decision. [6 pts]
- (C) Name one drawback of your decision described in Part B. [2 pts]
- (D) Beyond the unlocked behavior (*i.e.*, the situation discussed in Part B), what's problematic about the design of this system from the user's perspective? [2 pts]
- (E) *Briefly* describe a potential fix to the problem mentioned in Part D. No need to redraw your state diagram, but give a rough outline of how the state diagram would need to be modified. [6 pt]