University of Washington – College of Engineering

Spring 2023 Instructor: Justin Hsia 2023-04-06

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.

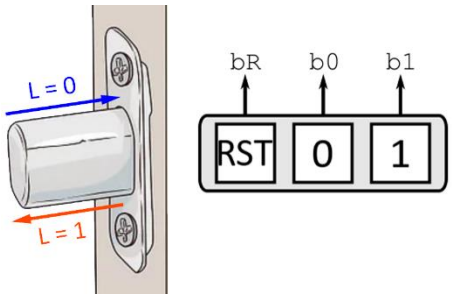
Advice

- 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 (`bR`)**, **0 (`b0`)**, and **1 (`b1`)** – and 1 output signal **lock (`L`)**. When `L` = 1, the deadbolt will go to the locked position; when `L` = 0, the deadbolt will go to the unlocked position.

- The combination for this lock is **1-1-0-0**.
- For added security, we will include a "dead" state for when the user has entered an incorrect combination, which can only be escaped via a **reset**.
- The user can lock the door at any time by pressing **reset**.



(A) Draw out a state diagram (Moore or Mealy) of this system. [16 pts]
- Each state should be given an appropriate **name** but you do not need binary encodings.
- As `bR` is the reset signal, explicit transitions from each state for `bR` do not need to be shown; transitions only need to be indicated for combinations of `b0` and `b1`.
- "Always" transitions should be labeled with an asterisk (`*`).

(B) Describe how your FSM from Part A handles a user pressing both `b0` and `b1` simultaneously. *Briefly* explain your decision. [6 pts]

(C) Describe what you decided to do when your system receives b0 or b1 when in the unlocked state. *Briefly* explain your decision. [6 pts]