

# EE/CSE 371 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 place your final answers in the provided boxes, where applicable.
- 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

Morse code is an encoded representation of the alphabet composed of dots and dashes (e.g., 'A' is •–, 'B' is –•••). We will send Morse code sequentially over a 1-bit wire.

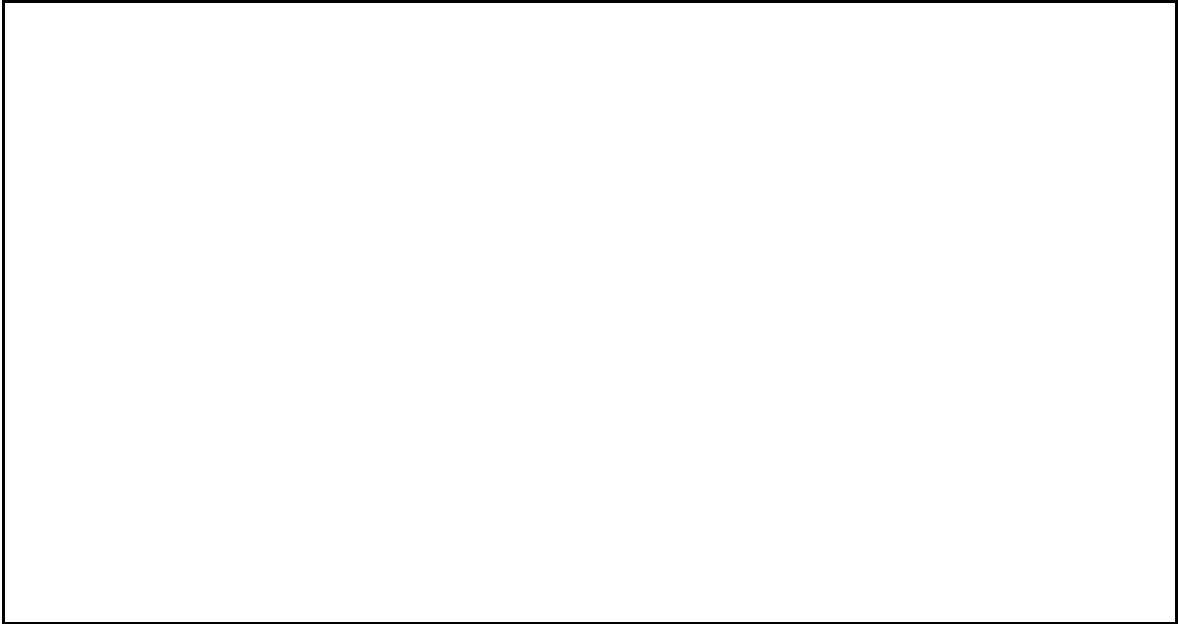
- The system idles in the low/0 state and takes a **reset (R)** signal.
- The system will have three output signals: **dot (T)**, **dash (H)**, and **letter done (L)**.
- A dot (•) will be represented by 1 high input followed by 1 low input (i.e.,  $\uparrow\downarrow$ ), and a dash (–) will be represented by 3 high inputs followed by a 1 low input (i.e.,  $\uparrow\uparrow\uparrow\downarrow$ ).
- Within a letter, dots and dashes are consecutive (e.g., "S" = ••• =  $\uparrow\downarrow\uparrow\downarrow\uparrow\downarrow$ ); each letter is separated by at least 2 low inputs (including the end of the last symbol of the letter).
- **L** should be asserted for one clock cycle per letter.

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- (A) Convert the following waveform to dots and dashes, assuming the system starts in the idle state. Place a vertical line between letters. [2 pts]



- (B) **Draw out a state diagram** (Moore or Mealy) of a Morse code recognition system. [12 pts]
- Each state should be given an appropriate **name** but you do not need binary encodings.
  - You may omit the output signals (T, H, L) from your state diagram when not asserted.
  - As R is the reset signal, explicit transitions from each state for R do not need to be shown.
  - "Always" transitions should be labeled with an asterisk (\*).

- (C) Describe what your FSM from Part B does after seeing **two consecutive high inputs followed by a low input**. *Briefly* explain your decision. [6 pts]



- (D) Describe what your FSM from Part B does after seeing **more than three consecutive high inputs followed by a low input**. *Briefly* explain your decision. [6 pts]

