

Name Theodore Yin Start Time _____ End Time _____

ME430 - Mechatronics
Examination IV - Paper Part
Summer 2022

Problem	Score
1	/ 25
2	/ 15
Picosoft	/ 60
Total	/ 100

For the written portion of the exam, you may use only:

- One sheet of paper notes. Front and back of an 8.5" by 11" paper (2 sides total), typed or handwritten (any font size is fine). The notes page must be made by you not someone else.
- A calculator. Maple, Excel, or Chrome **may** be used as a calculator.

In addition to those materials, for the **computer** part of the exam, you may also use:

- Your computer. Mainly for Picosoft.
- Any paper notes (such as notes on the videos), so long as those notes were written by you or provided as course materials.
- Any electronic notes or code residing on your local (C:) hard drive, so long as those notes/code were written by you or your lab partner.
- The course website and Moodle. These are the only approved websites allowed during the exam.

Anything not specifically allowed is prohibited. In particular, you may not use notes or code written by someone outside your lab group.

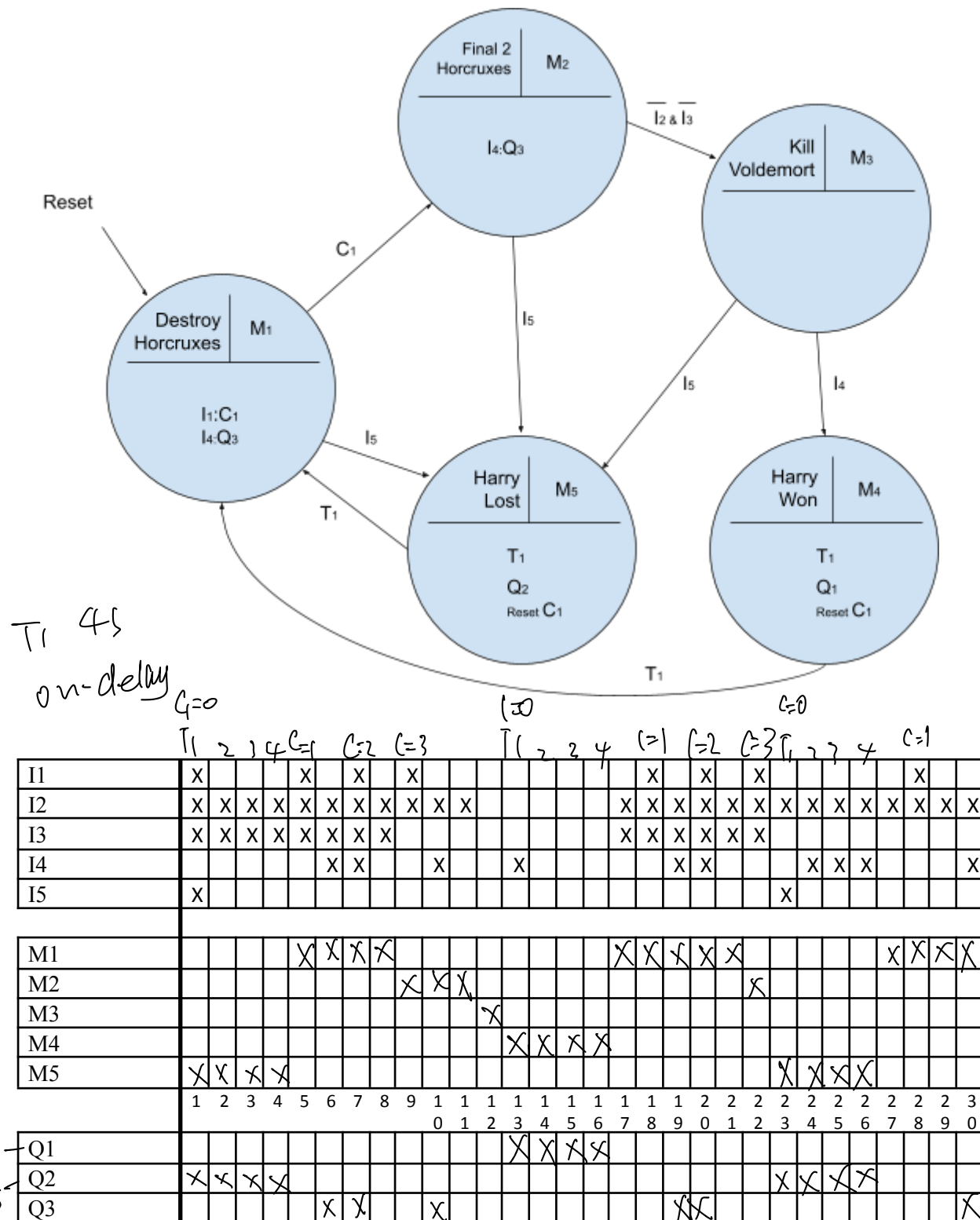
Problem 1 – FSM to Timing Chart

Consider the FSM below (i.e on the next page). Complete the Outputs for the given inputs. Put an X in blocks when the Q or M is on (made). Details

Input	Title	Type	Simple Description
1	Horcrux destruction	momentary normally open	Press is a killed horcrux (loket, cup, or diadem)
2	Horcrux that is in Harry	position normally closed	made (the default) means that the horcrux is alive, broken means that this horcrux is destroyed
3	Horcrux that is in Nagin	position normally closed	made (the default) means that the horcrux is alive, broken means that this horcrux is destroyed
4	Voldemort death	momentary normally open	Press is a death (but if there are Horcruxes, he'll just come back)
5	Harry death	momentary normally open	A press is a real Harry death (i.e. Voldemort wins if I5 is pressed)

- Timer 1 is a 4 second On-Delay timer. It represents how long until you decide to read the book again.
- Counter 1 has a set point of 3. It represents the 3 horcruxes (loket, cup, diadem)

Outputs	Title
1	Harry Wins! Voldemort is really dead (i.e. Voldemort died and there are no horcruxes)
2	Harry Loses :(Voldemort wins!
3	Voldemort is annoyed (i.e. he died, but he'll come back)

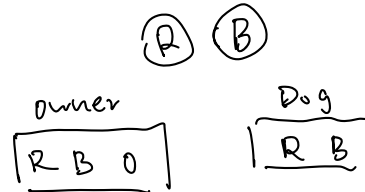


Problem 2 – Building a FSM

For this problem you will be building a finite state machine for a dog training machine that is testing for color blindness in dogs. There are 2 lights (red and blue), 3 control buttons used by the owner (a button to turn on the red light, a button to turn on the blue light, and a button to turn off all lights), and 2 dog buttons (red and blue). Treats are dispensed for 2 seconds if the dog is successful and presses the matching color button when a light is active (red dog button when the owner has the red light on, blue dog button when the owner has the blue light on). Additional details: At most, 1 light is on at a time. No lights are on when treats are being given and owner control buttons are ignored during the treat dispensing time. The system starts with no lights on.

Inputs (all momentary normally open inputs):

- Owner's turn red light on control button (I1)
- Owner's turn blue light on control button (I2)
- Owner's turn off all lights control button (I3)
- Big button for the dog that is red (I4)
- Big button for the dog that is blue (I5)



Outputs:

- Red light (Q1)
- Blue light (Q2)
- Treat dispenser (Q3)

Sketch your machine finite state machine in the space below. If you use a timer, state if it is an On-Delay or Off-Delay and how long. Use I's, Q's, M's, and T's as if you were going to implement this design in Picosoft.

