

Homework #2

Due 11:59pm March 12th, 2019

Please follow the name convention to name your **folders and files**: `DES_<lastName>_HW<#>.zip`, `DES_<lastName>_HW<#>.pdf`. **Your HW will not be graded if you do not follow this name convention.** And electronically submit your HW to des09468@gmail.com

1. A washing machine starts when a coin is deposited. It then sequences through the following stages: soak, wash, rinse, and spin. There is “double wash” switch, which, if turned on, causes a second wash and rinse to occur. There is one timer and four stages: soak, wash, rinse, and spin take fixed amount of times t_1 - t_4 , respectively. Note that t_i is a function of the last 4-digit of your Rowan ID. $t_i = 10 +$ the i -th of the last 4-digit of your Rowan student ID for $i = 1, 2, 3,$ and 4 . The timer begins ticking as soon as the coin is deposited, generates T1-T4 signals at the end of each above-mentioned time period, and then resets itself and starts again. If the lid is raised during any stage, the machine stops that stage until the lid is closed. You may assume that the timer suspends ticking while the lid is raised. Identify your inputs, outputs and states and design finite state machine and its diagram.

2. A traffic control system needs to be designed to control the lights in Fig. 1. Two sensors are E and L. When $E=1$, there is a vehicle toward the east direction; when $L=1$, there is a vehicle to turn from South to West (left turn). The lights are shown in Fig. 1:

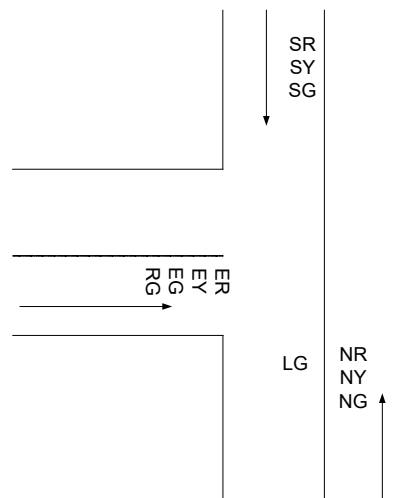


Figure 1: A T-intersection with notation: N-North, E-East, S-South, LG-Left-turn green, RG-Right-turn-only Green, G-Green, Y-Yellow and R-Red.

The detailed light notations are: East green (EG), East yellow (EY), East red (ER), and Right-turn-only Green (RG); North green (NG), North yellow (NY), North red (NR), and Left-turn-Green (LG); and South green (SG), South yellow (SY), South red (SR).

Initially, East green, North red and South red lights are on and others off. After $m=20$ Sec., East green is off and East Yellow will be on for a short period $d=10$ Sec.. East Red is on while East yellow is off. Meanwhile, if $L=0$, both North and South green lights turn on until $M=60$ Sec. elapses and there is a vehicle from West (or $E=1$); and if $L=1$, South Red remains on. But Left-turn green, North green, and East right-turn-only Green lights turn on until $L=0$. Next, Left-turn green and Right-turn-only Green lights turn off (no yellow lights between two stages) while North green remains on and South green light turns on until $M=60$ Sec. elapses and there is a vehicle from West (or $E=1$). After that, both North and South yellow light will be on for $d=10$ Sec. before they turn into red. Then it returns to the initial status, i.e., East green, North red and South red lights are on and others off.

A timer can be started when S is high and signals \mathbf{d} , \mathbf{m} and \mathbf{M} will be generated to supply to the controller when the corresponding time 10, 20, and 60 Sec. elapses. Derive the state diagram of this system. You have to follow the code assignment for the following selected states:

States	Codes for the state	Codes for the state
Initial state, EG, NR and SR lights are on and others off.	0 if your 4 th ID number<5	1 if your 4 th ID number>4
ER, NG and SG lights are on, and others off.	2 if your 6 th ID number<5	3 if your 6 th ID number>4
Note: We only take the last 6 digits of your Rowan ID		

You can arbitrarily assign other codes to other non-specified states.