Homework #3 – Due 2/05/20
Please submit in the Dropbox in MyCourses

DataSheet Reading: Timers/Counters – Sections 19-22 (2016 datasheet)

Assignment:

1. Read the homework policy posted in MyCourses. Complete group contract.

The following tasks should be completed AS A GROUP (i.e. in person).

2. Create a team expectations contract. The purpose of this contract is for your use and your benefit. The more thorough you are, the better the chance for success. Things to consider are:
    - Expectations for preparation. For example, do you expect each member to try the assignment on their own before meeting as a group, etc.
    - Expectations for attendance
    - Expectations for participation
    - Expectations for communication

Please take this assignment seriously. If you do not put much effort into it, you may be asked to do it again. You can google "team contract" or "team agreement" to get example contracts.

Each group member must sign the contract to indicate their agreement with the expectations.

3. Consider the controller of a traffic light. This traffic light is at the intersection of a little used farm road and a busy highway. Detector C detects a car on the farm road. The light remains green for the highway until a car is detected on the farm road.
    - Once a car is detected on the farm road, the highway light goes from green to yellow for 5 seconds and then from yellow to red.
    - Both lights will be red for 5 seconds and then the farm road light will go green

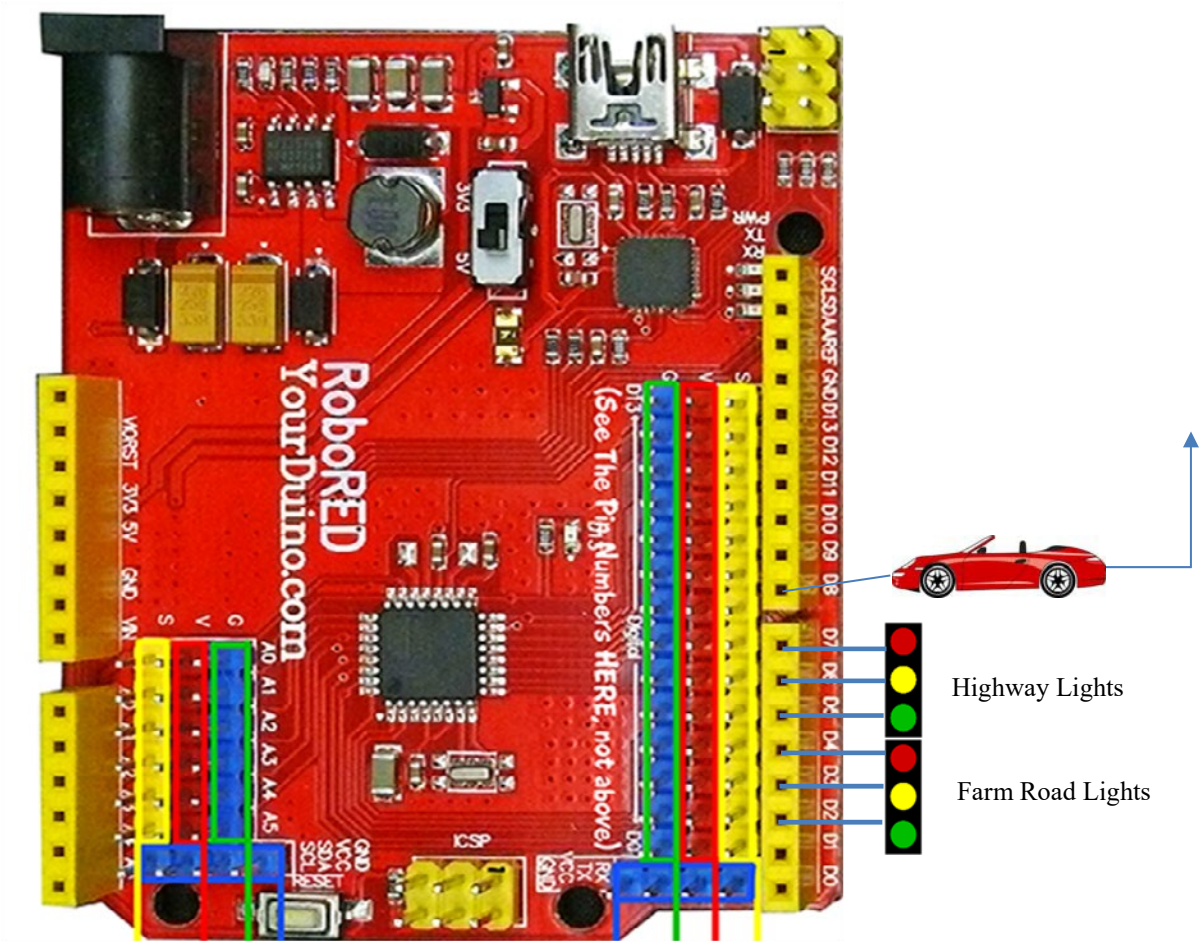
The farm road light stays green until no more cars are detected, or 40 seconds has passed

- When the farm road light transitions, it goes to yellow for 5 seconds and then to red
- Both lights will be red for 5 seconds and then the highway light will go green
- Once the highway goes green, it stays there at least 40 seconds, even if another car is detected on the farm road

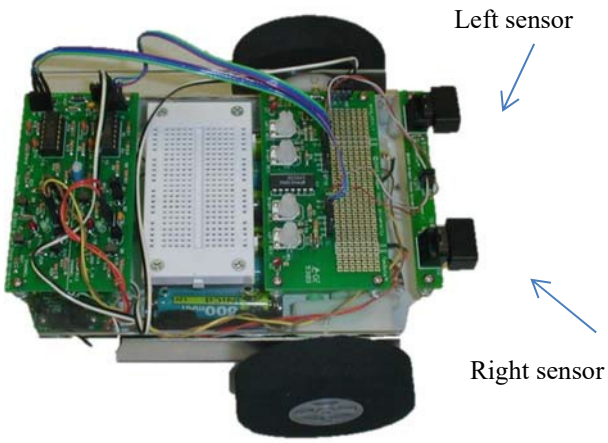
Create a state transition diagram for the traffic light controller. Submit the diagram.

Write the C code for the traffic light state machine. You may only use Arduino code for the delay functions.

- Use the format in the Mustang blinker example as a guide to the format
- Assume the set up below



4. Consider the autonomous vehicle on the right. This autonomous vehicle contains a state machine to control its movement. The vehicle has two front sensors (Left_Sensor and Right_Sensor). It defaults to moving forward; if the left sensor hits an obstacle, the vehicle backs up for ½ second and then turns right for ½ second and then proceeds to move forward. If the right sensor hits and object, it backs up for ½ second, turns left for ½ second and then proceeds forward. If both sensors hit at the same time, the sequence for the right sensor is followed.



The sensors and wheel motors are connected to Port D on the Atmega328 board as follows:

Device	Pin
Left_sensor	PD0
Right_sensor	PD1
Left_wheel	PD6
Right_wheel	PD7

The wheels operate as follows:

Direction	Right_wheel	Left_wheel
Forward	1	1
Backward	0	0
Turn right	0	1
Turn left	1	0

Create a state transition diagram for the operation of the autonomous vehicle. Submit this diagram.

Write the C code (using registers) to control the autonomous vehicle. You can only use Arduino code for timing.