Control & Automation Engineering Department

KON309E Microcontroller Systems

Experiment 4

Aim: Finite state machine design and coding for traffic light control application using external and timer interrupts.

In this experiment, participants are expected to achieve tasks given below.

1. Construct a circuit consisting of 5 LEDs (2 red, 2 green, 1 yellow) and a button as shown in Figure 1.
   - **In addition** to the 3 LEDs used as traffic lights for cars in previous experiments, build another traffic light for pedestrians using 1 red and 1 green LEDs.
2. Design a finite state machine(FSM) according to given instructions.
   - When the button is **NOT** pressed, the **cars'** traffic lights operate in the sequence:

     10 seconds red -> 2 seconds yellow -> 10 seconds green -> 2 seconds yellow …

     Meanwhile the **pedestrian** traffic lights operate in the sequence:

     10 seconds green -> 14 seconds red -> 10 seconds green …
   - If the cars' traffic light is green, the light jumps to yellow and continues to operate in the given sequence **two seconds after** a pedestrian presses the button.
   - While the traffic light of **cars** is **red**, pedestrians' traffic light should be **green**.
   - While the traffic light of **cars** is green or yellow, pedestrians' traffic light should be **red**.
   - Pressing the button when the cars' traffic light is yellow or red has no effect.

3. Control your circuit by coding your FSM design.

Please pay attention to the following:

- Use external interrupt for the button pressed event.
- Use timer interrupts instead of delays.
- Use switch case structure for coding the state machine.

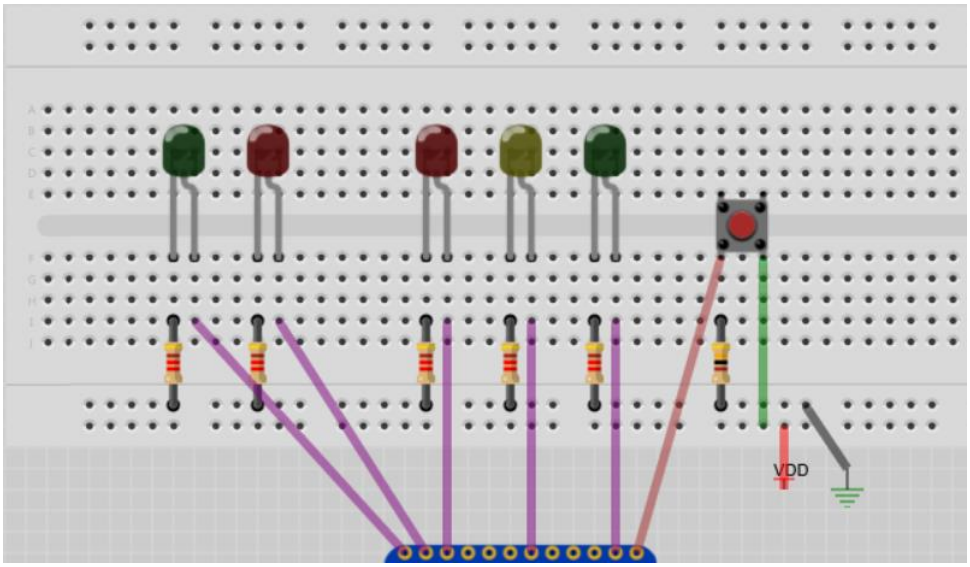

Figure 1: Circuit diagram for LEDs and button.

The deadline for the report is **08.12.2020**.

Please consider the following steps when preparing your reports.

1. Describe the experiment **in your own words**.
2. Include your FSM diagram and explain the states and events.
3. Add your main codes as screen shots.
   - Don't forget to comment your codes **in your own words** explaining how each line of code works.
4. Add a photo of your whole circuit.
5. Take a video of your system while running, upload it on YouTube, Drive, etc. and include the link on your report.