Practical No: 04

Title: Develop a traffic light controller using AVR microcontroller.

Introduction:

This practical is aimed to develop a traffic light control system based on AVR for a crossroad junction and a pedestrian crossing.

Task 01: Study internal and external interrupts.

(a) Generate accurate 1 Hz delay using a timer in interrupt mode.

- Write a program in C to create a counter that counts from 0 to 255 at a rate of 1Hz by using interrupt from built-in timers.
- Write the counter values to one of the ports of the ATmega328P microcontroller.
- Simulate the compiled file in the Proteus software by visualizing the port value with LEDs.

(b) Add two buttons to control the counter.

- Re-implement the counter such a way that the counter should also be able to start, stop, and change direction based on the two added buttons.
- Simulate the developed program in Proteus.

(c) Incorporate External Hardware Interrupts to the two buttons.

- Re-write the program to use External Hardware Interrupts connected to the two buttons that used to start, stop, and change the direction of the counter.
- Simulate the developed program in Proteus.

Task 02: Implementation of a traffic light control system for a crossroad junction.

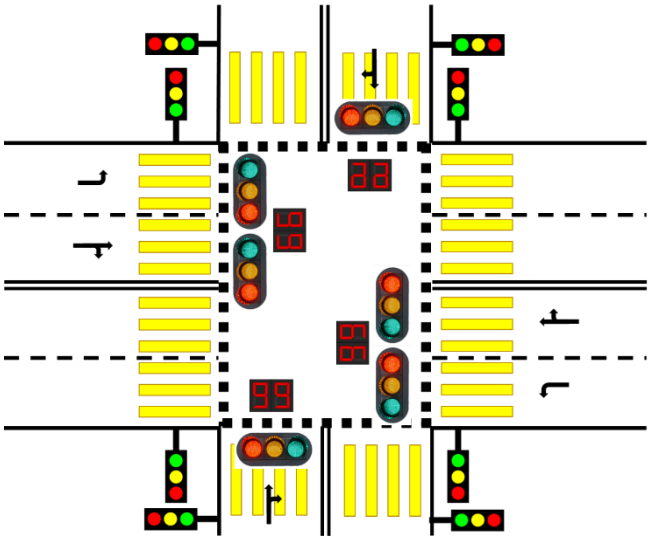

Figure 01: Crossroad traffic light system.

- Write a C/C++ code for an ATmega328P microcontroller to accurately generate 1 Hz delay using a timer in interrupt mode.
- Write a C/C++ code for an ATmega328P microcontroller to drive two 7- segment displays connected to I/O ports of the microcontroller using the multiplexing technique.
- Using the above codes, implement a C/C++ code for an ATmega328P microcontroller to control the crossroad traffic light system, shown in Figure 01 (implement only for one track).
- Construct the system on the Proteus simulation software using 7- segment displays, LEDs, etc. , and test the implemented code.

Task 03: Implementation of a pedestrian crossing traffic light control system.

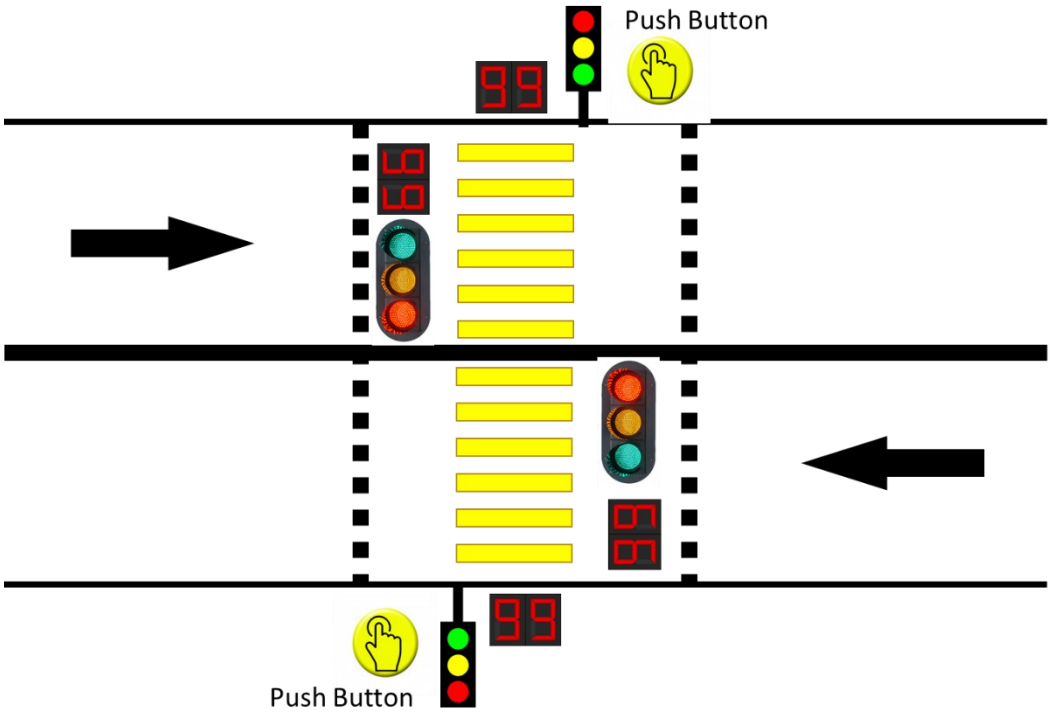

Figure 02: Pedestrian crossing traffic light system.

- By incorporating External Hardware Interrupts to the two push buttons of the pedestrian crossing traffic light system shown in Figure 02, write a C/C++ code for an ATmega328P microcontroller to control the system.
- Construct the system on the Proteus simulation software using 7- segment displays, LEDs, push buttons, etc. , and test the implemented code.

***