

NPTEL - WEL Summer Workshop on Micro Controller

Exercise Problems on Timers

Tuesday 6th July, 2021

1. Write a program to generate square wave of on time 3 seconds and off time 7 seconds on pin 1.4. You should use timer interrupt.(you may use embedded c)

One way to do this is as follow:

- you can keep a status bit, which is 1 when pin is high and 0 when pin is low.
 - if k reaches a count value corresponding to that of 'high' duration and status is 1, then you clear the led pin, set status to 0 and reload k to 0;
 - similarly if k reaches a count value corresponding to that of 'low' duration and status is 0, then you set the led pin, set status to 1 and reload k to 0;
 - otherwise keep on incrementing k, without changing status bit and led pin's state.
- Note:- All these things should be done in ISR and make sure that you reload appropriate values to the timer registers (THx:TLx).Refer to the code explained in class to know what k is.

2. You will configure the timer T0 to generate a pulse width modulated (PWM) signal whose duty cycle is controlled by the user. Figure 1 shows typical PWM signals. Read the switches P1.0-P1.2 to accept the duty cycle from the user. Write a program to generate a PWM with the duty cycle corresponding to the switch positions as indicated in Table 1.Set the frequency of PWM signal be 0.5 Hz and use the LEDs P1.4-P1.7 (though one is sufficient) to monitor the generated output. The PWM information has also to be written out on the LCD in the following format. First row of the LCD should display the duty cycle in percent as Duty cycle: xx ; where xx depends on the switch value. Second row should display the pulse width as Pulse width: tttt; where tttt represents $tttt \times 10^{-3}s$.

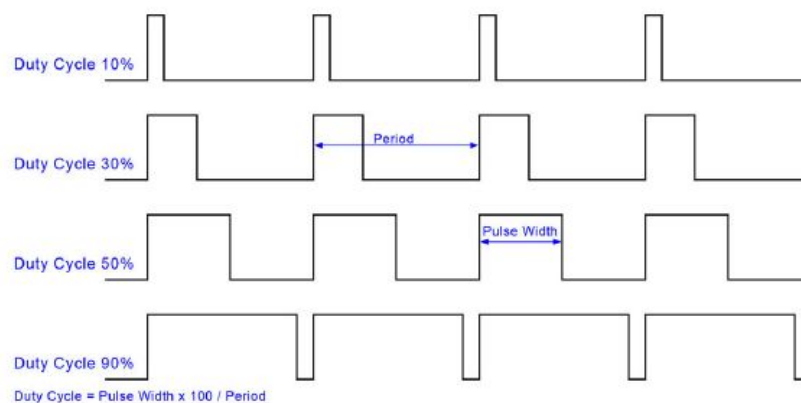


Figure 1: Pulse width modulation

P1.0-2	Duty Cycle(%)
000	20%
001	30%
010	40%
011	50%
100	60%
101	70%
110	80%
111	90%

Table 1: Mapping of switch positions to duty cycle.