Pre Lab 4

ELG 4159

March 21, 2018

Nikhil Peri 7723699
Manit Ginoya 7704610
Paul Buzuloiu 7748020
Group 16

Part 1: SFR Values

We want to generate an analog signal given by:

$$v = A(\cos(n\omega + f) + 1)$$

where:

$$A = 2.49V, n = 16, \omega = \frac{3\pi}{37}rad, f = \frac{pi}{12}rad$$

This results in:

$$v = 2,49(\cos(16 * \frac{3\pi}{37} + \frac{pi}{12}) + 1)$$
$$\approx 1.577V$$

This results in a duty cycle of:

$$\frac{1.577}{5} \approx 0.315592$$

$$dutycycle = 0.315592 = \frac{CCPR2L, CCP2CON < 5:4 >}{4(PR2 + 1)}$$

Using $PR2 = 255$ for maximum PWM resolution, we find the value of $CCPR2L, CCP2CON < 5:4 >$

$$0.315592 * 4(255 + 1) = (CCPR2L, CCP2CON < 5:4 >)_{10} \approx 323.166_{10}$$

We need an integer value, so we round 323.166_{10} to 323_{10}

$$323_{10} = 0101000011_2 \rightarrow CCPR2L = 01010000_2$$

And

$$CCP2CON < 5:4 >= 11_2$$

We select an internal oscillator frequency of 8MHz and a timer 2 prescaler of 1, because no requirements or constraints regarding the PWM period were given.

$$InternalOscillatorFrequency = 8MHz$$
$$OSCCON = (01110000)_2$$
$$PR2 = (255)_{10}$$
$$Timer2Prescaler = (1)_{10}$$
$$CCPR2L = (01010000)_2$$
$$CCP2CON < 5:4 >= (11)_2$$

Part 2: Error Associated with PWM

By rounding the value of CCPR2L,CCP2CON<5:4> to 323 from 323.16, we introduced an error of:

$$error_{duty\ cycle} = \frac{323.166}{1024} - \frac{323}{1024} \approx 0.00016199$$

This results in a voltage error of :

$$error_{voltage} = 1.577V - \frac{323}{1024} * 5V \approx 0.000148V$$