ECE 3724/CS 3124 Quiz #8 – Timers Quiz Solution, Summer 04 - Reese

a. Assuming a oscillator frequency of 40 MHz, configure Timer 2 and the PWM module to produce a square wave with frequency of 10 KHz (just give prescale, PR2 values – I do not want C-code). Choose the prescaler such that the PR2 value is greater than 10.

let Prescale =4, PR2 = [40e6/(10e3 * 4 * 4) ] –1 = 249
let Prescale = 16, PR2 = [40e6/(10e3 * 4 * 16) ] –1 = 61.5 = 61 or 62

b. Assuming TIMER2 is configured for PWM mode, with a value of 0xA0 for the PR2 value. What value for the upper 8 bits would need to be written to the duty cycle register (CCPR1L) to give a duty cycle of 40%?

period is proportional to PR2 (0xA0 = 160. 0.4* 160 = 64 = 0x40 written to CCPR1L.

c. In lab 11, we used a 64 entry table and a tmr2 interrupt to produce a sine wave by reading a value from a lookup table and writing it to the D/A over the I2C bus. Assume that the I2C bus speed is 200 Khz, and that it takes 29 bit times to write a new value to the D/A. Give an approximate value for the highest frequency sine wave frequency that can be generated by this method (give the answer in Hz). Ignore software overhead from the interrupt subroutine.

One I2C bit time = 1/200Khz = 5.0e-6; one period = 5.0e-6 * 29 bit times * 64 entries = 9.28 e-3 s (9.3 ms), so frequency is 1/(9.28e-3) = 108 Hz.

d. Assume Timer2 is configured to produce an interrupt period of X for postscale = 4, prescale =1, and PR2 = 0x7F. If PR2 is changed to 0xFF, postscale changed to 10, and prescale changed to 4, how does the new interrupt period Y relate to the old interrupt period of X?

Y post = 10/4* X post = 2.5 * X post
Y pre = 4 * Xpre
Y pr2 = 2 * X pre

So Y period = 2.5 * 4 *2 Xperiod = 20 * Xperiod

e. Assume an FOSC of 40 MHz, and that timer1 has a prescale value of 4. How many timer1 tics would elapse if you measured a low-true input pulse width from falling edge to rising edge, where the pulse width is 2 ms (milliseconds?).

Timer 1 clocked by Fosc/4 which is then divided by prescale.
Timer 1 frequency = 40 Mhz/(4 *4) = 2.5 MHz.
Timer 1 period = 1/(2.5Mhz) = 4.0 e –7 = 40 us
Time 1 tics = 2 ms/40 us = 2e-3/(40 e-6) = 5000 tics.