EE 308 – Homework 7

1.   An engineer is using the MC9S12 to determine the speed of a motor in RPM. A pulse is generated on Bit 1 of PORTT 16 times every revolution of the motor. Bit 1 of PORTT is set up for input capture mode, and captures the time of the rising edge. The prescaler bits PR2:0 are set to 101. It is known that the time between pulses is less than the timer overflow time. When the first edge is captured, the TC1 register has a value of 0xB516. When the second rising edge is captured, the TC1 register has a value of 0x174F.

(a) What it the length of time between the two rising edges?

(b) How long does it take the motor to make one revolution?

(c) What is the motor speed in RPM?

2.   What setup do you need to do to have the MC9S12 clear bit 4 of PORTT on a successful output compare? Write some C code to do this.

3.   What setup do you need to do to have the MC9S12 capture the time of a falling edge on bit 0 of PORTT? Write some C code to do this.

4.   Write some C code to set up the MC9S12 to capture the time of a falling edge on Bit 0 of Port T, and to generate an interrupt when the capture occurs. Set the interrupt vector to point to the function tic0_isr. Set the timer overflow interrupt rate to about 350 ms. In the interrupt service routine, set Bit 2 of Port E, and save the time of the edge in a global variable called time_1.

5. Write an interrupt service routine in C called toc4_isr which generates a 10 Hz square wave to Bit 4 of Port T.

6. Which programming class did you use as a prerequisite for EE308: CSE111/CSE113, EE289, or other? If other, please specify which class and the topics covered.