

**EE 308 – Homework 7**

Due Mar. 4, 2002

For all problems below assume you are using a 68HC912B32 chip with a 16 MHz crystal (which results in an 8 MHz timer clock).

1. What setup do you need to do to have the HC12 generate an interrupt on the falling edge of Input Capture 2? Write some C code to do this.
2. An engineer is using the HC12 to determine the speed of a motor in RPM. A pulse is generated on Bit 1 of PORTT 320 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 010. 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 0xD87A. When the second rising edge is captured, the TC1 register has a value of 0x2A5F.
  - (a) What is 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?
3. What setup do you need to do to have the HC12 toggle bit 3 of PORTT on a successful output compare? Write some C code to do this.
4. You want to generate a 250 Hz square wave using Output Compare 3. What value should you add to TC3 in your `toc3_isr()`? (Assume that the prescaler bits PR2:0 = 101.) What else should you do in your `toc3_isr()`? Write the interrupt service routine `toc3_isr()` to do this.
5. Write a C program that generates a 20 ms delay after an external event (rising edge) happens. Set up Bit 1 of PORTT for input capture of a rising edge, and Bit 2 of PORTT for Output Compare. The HC12 waits for a rising edge on Bit 1 of PORTT. It then generates a rising edge on Bit 2 of PORTT exactly 20 ms after the rising edge is detected on Bit 1.
6. Write the program for Part 6 of Lab 7.