

## EE 308 – Homework 7

Due Mar. 9, 2012

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 0xC5A6. When the second rising edge is captured, the TC1 register has a value of 0x2794.
  - (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?
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 some C code to set up the MC9S12 to capture the time of a falling edge on Bit 2 of Port T, and to generate an interrupt when the capture occurs. Set the interrupt vector to point to the function `tic2_isr`. Set the timer overflow interrupt rate to about 350 ms. In the interrupt service routine, clear Bit 2 of Port E, and save the time of the edge in a global variable `time_2`.
6. Write an interrupt service routine in C called `toc4_isr` which generates a 10 Hz square wave to Bit 4 of Port T.