# Embedded Real-Time Systems (AME 3623)
# Homework 4

April 15, 2009

This homework assignment is due on Tuesday, April 28th at 5:00pm. Your work may be handed in electronically (use the **Homework 4** digital dropbox on D2L) or in hardcopy form (in person or to my office).

This assignment must be done individually: do not share/discuss your answers with others or look at the answers of others.

## Question 1

1. (10pts) Briefly explain why *polling* can be undesirable when performing input/output operations.

2. (10pts) Briefly outline what the microprocessor does in response to an interrupt.

# Question 2

Suppose we want to produce a regular interrupt frequency of approximately 30.49 $Hz$. Assume that we are using a 16 $MHz$ crystal for our clock.

1. (5 pts) Which timer should we use?

2. (5 pts) Which prescaler should we use?

# Question 3

Suppose we want to produce a regular interrupt every 512 $\mu s$. Assume that we are using a 16 $MHz$ crystal for our clock.

1. (5 pts) Which timer should we use?

2. (5 pts) Which prescaler should we use?

# Question 4

1. (15pts) Suppose we want a function – called $donow()$ – to be executed once every $0.79s$. Assume a system clock of $16MHz$. What is the timer1 prescaler configuration and the (pseudo)code for the interrupt routine (the code does not need to be syntactically correct)? Also - show the code in your main function that configures the timer.

# Question 5

Consider the following code.

```
volatile uint8_t duration;

ISR(TIMER0_OVF_vect) {
   static uint8_t counter = 0;

   ++counter;
   if(counter == 0) {
     donow1();
   }
   if(duration == counter) {
     donow2();
  };
};

Somewhere in the main program:

// Interrupt occurs every
//     (256*256)/16000000 = 4.096 ms
timer0_config(TIMER0_PRE_256);
// Enable the timer interrupt
timer0_enable();
// Enable global interrupts
sei();

while(1)
{
   <change the value of duration>
}
```

1. (5 pts) What does the ISR do?

2. (5 pts) What does the main program do (in the while() loop)?

## Question 6

How much time did you spend on this assignment?