**EET 240 Microcontroller I**

**Assignment: Calculating Delay Loop Time**

**Introduction:** How much time has elapsed is crucial when developing programming code that will work with external circuits. Signals must be viable and be timely for control circuits to work correctly. Regardless if we are talking about a signal being on a port pin for a length of time.

1. Find the time delay for the delay subroutine shown below if the system has an AVR with a frequency of 16.0MHz:

ldi r16, 250

ldi r18, 10

BACK: nop 1 \*10 \*250

HERE: nop 1 \*10 \*250

dec r18 1 \*10 \*250

brne HERE ½ \*10 \*250

dec r16 1 \*250

brne BACK 1/2 \*250

1/16.0MHz (2500+2500+2500+4750+250+499) = 0.812ms

2. Find the time delay for the delay subroutine shown below if the system has an AVR with a frequency of 16.0MHz:

ldi r20, 175

ldi r22, 150

BACK: nop 1 \*150 \*175

HERE: nop 1 \*150 \*175

Nop 1 \*150 \*175

dec r22 1 \*150 \*175

brne HERE ½ \*150 \*175

dec r20 1 \*150

brne BACK ½ \*150

1/16.0MHz (26250+26250+26250+26250+52325+150+299) = 9.8ms

**Assignment Submission:**

1. Document the instruction cycles for each command and the total amount of delay time for each loop.
2. Type up your results for each program and attach your work to the submission box for this assignment.