Student Name:_____ Student ID: _____

Problem 1

A section of the main program is running shown below and is in the middle of executing the inx instruction when a RTI periodic interrupt occurs. The ISR is shown in below as well and is a contrived example. Fill out the table describing register and memory values at different points throughout the sequence

MAIN CODE

```
---------------------------------------
inca
inx          <-- IRQ occurs here
ldy   A, X
```

ISR

```
-----------------------------------
rti_isr:  ldy   A, X
          iny
          inca
          sty   A, X
          rti
```

Table 1

Location	Prior to INCA	Just after INX	Just after RTI	Just after LDY
reg A	$0F			
reg B	$08			
reg D				
reg X	$1FF0			
reg Y	$0000			
Mem $2000	$12			
Mem $2001	$34			
Mem $2002	$56			
Mem $2003	$78			

EE3376 – Embedded Systems - Fall 2007 - Exam 2 – MacDonald – Page 2

Student Name:_____ Student ID: _____

Problem 2 (30 pts)

Write an initialization subroutine for the Real Time Interrupt so that it will interrupt approximately every 4 uS. (Hint: RTR values are below and you can find the address in the register section of your class notes.).

Show calculations for any credit. Use actual addresses for registers.

Table 47 RTI Frequency Divide Rates

RTR[3:0]	RTR[6:4] =							
	000 (OFF)	001 (2^{10})	010 (2^{11})	011 (2^{12})	100 (2^{13})	101 (2^{14})	110 (2^{15})	111 (2^{16})
0 (÷1)	OFF*	2^{10}	2^{11}	2^{12}	2^{13}	2^{14}	2^{15}	2^{16}
1 (÷2)	OFF	$2x2^{10}$	$2x2^{11}$	$2x2^{12}$	$2x2^{13}$	$2x2^{14}$	$2x2^{15}$	$2x2^{16}$
2 (÷3)	OFF	$3x2^{10}$	$3x2^{11}$	$3x2^{12}$	$3x2^{13}$	$3x2^{14}$	$3x2^{15}$	$3x2^{16}$
3 (÷4)	OFF	$4x2^{10}$	$4x2^{11}$	$4x2^{12}$	$4x2^{13}$	$4x2^{14}$	$4x2^{15}$	$4x2^{16}$
4 (÷5)	OFF	$5x2^{10}$	$5x2^{11}$	$5x2^{12}$	$5x2^{13}$	$5x2^{14}$	$5x2^{15}$	$5x2^{16}$
5 (÷6)	OFF	$6x2^{10}$	$6x2^{11}$	$6x2^{12}$	$6x2^{13}$	$6x2^{14}$	$6x2^{15}$	$6x2^{16}$
6 (÷7)	OFF	$7x2^{10}$	$7x2^{11}$	$7x2^{12}$	$7x2^{13}$	$7x2^{14}$	$7x2^{15}$	$7x2^{16}$
7 (÷8)	OFF	$8x2^{10}$	$8x2^{11}$	$8x2^{12}$	$8x2^{13}$	$8x2^{14}$	$8x2^{15}$	$8x2^{16}$
8 (÷9)	OFF	$9x2^{10}$	$9x2^{11}$	$9x2^{12}$	$9x2^{13}$	$9x2^{14}$	$9x2^{15}$	$9x2^{16}$
9 (÷10)	OFF	$10x2^{10}$	$10x2^{11}$	$10x2^{12}$	$10x2^{13}$	$10x2^{14}$	$10x2^{15}$	$10x2^{16}$
10 (÷11)	OFF	$11x2^{10}$	$11x2^{11}$	$11x2^{12}$	$11x2^{13}$	$11x2^{14}$	$11x2^{15}$	$11x2^{16}$
11 (÷12)	OFF	$12x2^{10}$	$12x2^{11}$	$12x2^{12}$	$12x2^{13}$	$12x2^{14}$	$12x2^{15}$	$12x2^{16}$
12 (÷13)	OFF	$13x2^{10}$	$13x2^{11}$	$13x2^{12}$	$13x2^{13}$	$13x2^{14}$	$13x2^{15}$	$13x2^{16}$
13 (÷14)	OFF	$14x2^{10}$	$14x2^{11}$	$14x2^{12}$	$14x2^{13}$	$14x2^{14}$	$14x2^{15}$	$14x2^{16}$
14 (÷15)	OFF	$15x2^{10}$	$15x2^{11}$	$15x2^{12}$	$15x2^{13}$	$15x2^{14}$	$15x2^{15}$	$15x2^{16}$
15 (÷16)	OFF	$16x2^{10}$	$16x2^{11}$	$16x2^{12}$	$16x2^{13}$	$16x2^{14}$	$16x2^{15}$	$16x2^{16}$

* Denotes default value out of reset.

Student Name:_____ Student ID: _____

Problem 3 (30 pts)

Write a subroutine to configure channel 4 to 100 Hz with 45% duty cycle (+ / - 1%) and channel 6 to 100 KHz with a duty cycle of 45% (+ / - 1%).

Use the actual extended address for all PWM registers (i.e. don't use EQUs, but rather the actual 16 bit address).

Show calculations for any credit.