EEEN 3449
Solution for HW # 3 **Due: March. 6, 2009**
Quiz # 3 will be on HW#3

1. With reference to the following subroutine to create a 10 ms delay

```
delay10ms movb   #$90,TSCR1          ; enable TCNT and fast flags clear
          movb   #$06,TSCR2          ; configure prescale factor to 64
          movb   #$01,TIOS           ; enable OC0
          ldd    TCNT
          addd   #3750               ; start an output compare operation
          std    TC0                 ; with 10 ms time delay
wait_lp2  brclr  TFLG1,$01,wait_lp2  ; if equal, C0F in TFLG1 is set to 1
          rts
```

Determine the missing parameters in the following table:
Note: 1 MHz = 10^6 Hz, and 1 ms =10^{-3} s.

	E Clock	Delay Time	Prescale factor	# of counts	Channel
a	24 MHz	40 ms	32	30,000	OC1
b	24 MHz	15 ms	32	11,250	OC2
c	24 MHz	50 ms	64	18,750	OC3
d	24 MHz	30 ms	16	45,000	OC4

Solution:

a) Clock frequency = 24 MHz / 32 Period for each E clock = 32 / 24 μs

# of counts for 40 ms = 40 ms/ period of each E clock cycle $= \frac{40\times10^{-3}}{32}\times24\times10^{6} = 30,000$

b) Clock frequency = 24 MHz / 32 Period for each E clock = 32 / 24 μs

# of counts for 15 ms = 15 ms/ period of each E clock cycle $= \frac{15\times10^{-3}}{32}\times24\times10^{6} = 11,250$

c) Clock frequency = 24 MHz / 64 Period for each E clock = 64 / 24 μs

The delay time for 18,750 counts$= 18,750\times\frac{64}{24}\times10^{-6} = 0.05\,\text{sec} = 50\,\text{ms}$

d) Clock frequency = 24 MHz / 16 Period for each E clock = 16 / 24 μs

The delay time for 45,000 counts$= 45,000\times\frac{16}{24}\times10^{-6} = 0.03\,\text{sec} = 30\,\text{ms}$

2. Provide the subroutine for the specific output compare channel as shown in the table above. That means you have to provide four different subroutines.

Solution:

a) Channel OC1

```
delay10ms movb  #$90,TSCR1          ; enable TCNT and fast flags clear
          movb  #$05,TSCR2          ; configure prescale factor to 32
          movb  #$02,TIOS           ; enable OC1
          ldd   TCNT
          addd  #30000              ; start an output compare operation
          std   TC1                 ; with 40 ms time delay
wait_lp2  brclr TFLG1,$02,wait_lp2  ; if equal, C1F in TFLG1 is set to 1
          rts
```

b) Channel OC2

```
delay10ms movb  #$90,TSCR1          ; enable TCNT and fast flags clear
          movb  #$05,TSCR2          ; configure prescale factor to 32
          movb  #$04,TIOS           ; enable OC2
          ldd   TCNT
          addd  #11250              ; start an output compare operation
          std   TC2                 ; with 15 ms time delay
wait_lp2  brclr TFLG1,$04,wait_lp2  ; if equal, C1F in TFLG1 is set to 1
          rts
```

c) Channel OC3

```
delay10ms movb  #$90,TSCR1          ; enable TCNT and fast flags clear
          movb  #$06,TSCR2          ; configure prescale factor to 64
          movb  #$08,TIOS           ; enable OC3
          ldd   TCNT
          addd  #18750              ; start an output compare operation
          std   TC3                 ; with 50 ms time delay
wait_lp2  brclr TFLG1,$08,wait_lp2  ; if equal, C1F in TFLG1 is set to 1
          rts
```

d) Channel OC4

```
delay10ms movb  #$90,TSCR1          ; enable TCNT and fast flags clear
          movb  #$04,TSCR2          ; configure prescale factor to 16
          movb  #$10,TIOS           ; enable OC4
          ldd   TCNT
          addd  #45000              ; start an output compare operation
          std   TC4                 ; with 30 ms time delay
wait_lp2  brclr TFLG1,$10,wait_lp2  ; if equal, C1F in TFLG1 is set to 1
          rts
```