**EENG 3040 Microprocessors**

**In Class Exercise 7**

**Timers**

**To be done during the lecture period on September 16, 2015**

* What is the main advantage of a 16-bit timer compared to an 8-bit timer.

Using a 16-bit timer allows you to extend the amount of time it takes before the timer overflows which could be useful depending on what you're doing.

* What is the advantage of using a timer compared with writing a delay loop to last a separate period of time?

If you're using a timer, you can execute other code while the timer is running. Otherwise, you're left staring at the oven.

* What settings will need to be made in INTCON in order to setup a timer0 interrupt? You may assume no other interrupts are enabled.

|  |  |  |
| --- | --- | --- |
| Bit | Value | Purpose |
| 7 | 1 | Global Interrupt Enable bit |
| 6 | 0 | Peripheral Interrupt Enable bit |
| 5 | 1 | Timer0 Overflow Interrupt Enable bit |
| 4 | 0 | INT External Interrupt Enable bit |
| 3 | 0 | PORTB Change Interrupt Enable bit |
| 2 | 0 | Timer0 Overflow Interrupt Flag bit |
| 1 | X | INT External Interrupt Flag bit |
| 0 | X | PORTB Change Interrupt Flag bit |

* What is the difference between using timer0 as a counter vs a timer?

When used as a counter, the Timer0 register will increment on every rising or falling edge of the TOCKI pin

The incrementing edge is determined by the ROSE bit of the OPTION register.

Counter mode is selected by setting the TOCS bit of the OPTION register to 1.

* Use the datasheet for the PIC16F887 to determine what values should be in the following registers in order to enable an interrupt on timer0, setup timer0 to respond to the internal instruction clock, a prescaler rate of 1:128 assigned to timer0,

|  |  |
| --- | --- |
| OPTION\_REG | XX0X 0110 |
| INTCON | 1010 0000 |

* Write code in assembly that will set a timer for 0.01s using timer 0. Use the same settings as described in Problem 5.

ORG 000H

GOTO INIT

ORG 004H

GOTO TMR0ISR

INIT

WCOPY EQU 70H ;Since the upper 16 bytes of all GPR banks are common in the PIC16F882/883/884/886/887,

STATCOPY EQU 71H ;temporary holding registers, W\_TEMP and STATUS\_TEMP, should be placed in here.

;These 16 locations do not require banking and therefore, make it easier to context save and restore.

BCF STATUS,RP1

BSF STATUS,RP0 ;move to bank 1 where INTCON and OPTION\_REG are

MOVLW b'1010 0000'

MOVWF INTCON

MOVLW b'0000 0110'

MOVWF OPTION\_REG

GOTO MAIN

MAIN

NOP

NOP

NOP

GOTO MAIN

BCF STATUS,RP0

MOVLW 0B2H

MOVWF TMR0

TMR0ISR

MOVWF WCOPY

SWAPF STATUS,W

MOVWF STATCOPY

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MOVLW 0B2H

MOVWF TMR0

BCF INTCON,2

SWAPF STATCOPY,W

MOVWF STATUS

SWAPF WCOPY,F

SWAPF WCOPY,W

RETFIE