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ASEN 5519

Lab 4

10/11/16

**Warm-up questions**

1. Code follows:

MOVLW UPPER 0x1AF22 ;put upper 5 bits of address in TBLPTR

MOVWF TBLPTRU

MOVLW HIGH 0x1AF22 ;put high byte of address in TBLPTR

MOVWF TBLPTRH

MOVLW LOW 0x1AF22 ;put low byte of address in TBLPTR

MOVWF TBLPTRL

TBLRD\* ;copy data in address loaded to TBLPTR to TABLAT

MOVF TABLAT,W ;copy data in TABLAT to WREG

MOVWF 0x00A ;copy WREG into desired data register

1. Gaonkar 11.8: The 16 bit number 0x676B is 26475 in decimal. Multiplied by the prescaler of 128 yields 3,388,800. Multiply this by the instruction cycle time of 0.1 μs yields the total delay of 0.33888 seconds.

Gaonkar 11.9: The clock frequency is 40 MHz, so the instruction frequency is 10 MHz and each “tick” is 0.1 μs. For a 0.5 second delay, we need 5000000 (5e6) counts, so we use the timer in 16 bit mode. 5e6 divided by 2^16 is 76.3, so we round up to a prescaler of 128. With this prescaler, we need 5e6 / 128 = 39062.5 🡪 39063 counts. We then load TMR0H and TMR0L with the difference between this and 2^16 (65536) so the timer will count up to that and set TMR0IF on overflow. The code is as follows:

Bignum EQU 65536-39063

MOVLW B’00000110’ ;set prescaler

MOVWF T0CON,0

MOVLW high Bignum ;put high byte in TMR0H

MOVWF TMR0H,0

MOVLW low Bignum ;put low byte in TMR0H

MOVWF TMR0L

BSF T0CON,7,0 ;set bit 7 in timer to enable

Loop

BTFSS INTCON,TMR0IF,0 ;loop

BRA Loop

BCF T0CON,7,0 ;disable timer

BCF INTCON,TMR0IF,0 ;clear the IF

**Assignment**

1. The “DB” compiler directive defines a byte. That is, it stores data in the form of an 8 bit number. This is implemented by calling “DB” followed by any number of bytes that are stored in consecutive memory locations.
2. LCDstr is set to the program memory address 0x000140. It is a pointer to the first of the consecutive memory locations containing the 7 bytes on line 304.
3. The lines with the “DB” directives take the argument bytes and write them into consecutive program memory locations starting at the program memory location of the label. The nonsense instructions are the opcodes associated with each pair of argument bytes.
4. I will set up two delay subroutines: one for 10 milliseconds and the other for 0.2 milliseconds. The 10 millisecond delay subroutine will be used for longer waits such as the initial countdown and initializing the LCD, whereas the 0.2 millisecond delay will be used for the pulse width modulation and for the displaying values on the LCD. Both delays are short enough (12500 instruction cycles for the 10ms delay and 250 cycles for the 0.2ms delay) that a prescaler of 2 is sufficient.