**EENG 3040 Microprocessors**

**In Class Exercise 5**

**To be done during the lecture period on September 11, 2015**

* For each of the following commands, complete the table with the number of clock cycles it takes to run and the number of seconds that takes with a 4MHz clock

|  |  |  |
| --- | --- | --- |
| Command | Clock Cycles | Time |
| MOVLW 0x0F | 1 | 1 microsecond |
| GOTO Loop | 2 | 2 microseconds |
| RETURN | 2 | 2 microseconds |
| ADDLW 5 | 1 | 1 microsecond |
| DECFSZ COUNT, 1 | 1 or 2 depending on value of COUNT | 1 or 2 microseconds depending on value of COUNT |

* Determine the total number of clock cycles the following code takes to run

MySub CLRF PORTB 1

INCF PORTB, 1 1  
 ADDLW 0x17 1

RETURN 2

Total Clock Cycles: 5

* Assuming you have properly declared a variable named COUNTER, determine how many clock cycles the following code takes to run. Be sure to include the clock cycles necessary to call the subroutine:

CALL DELAY 2

DELAY MOVLW 0x20 1

MOVWF COUNTER 1

NOP 1

LOOP NOP 32

DECFSZ COUNTER, 1 31 + 2

GOTO LOOP 62

RETURN 2

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* Write a delay subroutine that lasts for 0.01s
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    1. |
    2. |
    3. V

;Delay subroutine that lasts approximately 0.01 seconds

CALL WAIT ;2

WAIT

MOVLW 0DH

MOVWF OCOUNT

MOVLW 0FFH

MOVWF ICOUNT ;4

OLOOP

NOP ;13

NOP ;13

ILOOP

DECFSZ ICOUNT ;(254+2)\*13

GOTO ILOOP ;(254\*2)\*13

DECFSZ OCOUNT ;12+2

GOTO OLOOP ;12\*2

RETURN ;2

;which adds up to 10,004 clock cycles

;I could have removed a NOP from the outer loop and put 9 NOPs outside the loop, but this is slightly prettier