EMTR-2011: Microcontrollers and Digital Logic
Assignment 3 Reference Solutions

Question 2-36

```
MOVLW 11H
MOVWF 0H
MOVWF 1H
MOVWF 2H
MOVWF 3H
MOVWF 4H
MOVWF 5H
MOVLW 0x00
ADDWF 0H, W
ADDWF 1H, W
ADDWF 2H, W
ADDWF 3H, W
ADDWF 4H, W
ADDWF 5H, F
```

Question 2-51

MYDAT_1 = 55H
MYDAT_2 = 62H
MYDAT_3 = 47H
MYDAT_4 = 50H
MYDAT_5 = C8H
MYDAT_6 = 41H
MYDAT_7 = AAH
MYDAT_8 = FFH
MYDAT_9 = 90H
MYDAT_10 = 7EH
MYDAT_11 = 0AH
MYDAT_12 = 0FH

Question 2-71

For ID number = 13590 we have:

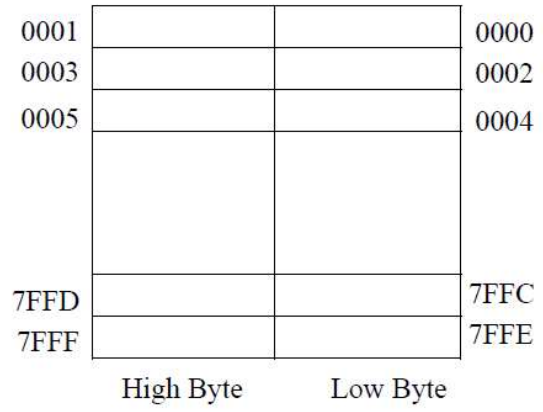
```
                          LOC  OBJECT CODE LINE         SOURCE TEXT

ORG   0                   000000           00001         ORG   0
;(a)                                       00002         ;(a)
MOVLW 1H                  000000 0E01      00003         MOVLW 1H
MOVWF 0H                  000002 6E00      00004         MOVWF 0H
MOVLW 3H                  000004 0E03      00005         MOVLW 3H
MOVWF 1H                  000006 6E01      00006         MOVWF 1H
MOVLW 5H                  000008 0E05      00007         MOVLW 5H
MOVWF 2H                  00000A 6E02      00008         MOVWF 2H
MOVLW 9H                  00000C 0E09      00009         MOVLW 9H
MOVWF 3H                  00000E 6E03      00010         MOVWF 3H
MOVLW 0H                  000010 0E00      00011         MOVLW 0H
MOVWF 4H                  000012 6E04      00012         MOVWF 4H
;(b)                                       00013         ;(b)
MOVLW 0H                  000014 0E00      00014         MOVLW 0H
ADDWF 0H, W               000016 2400      00015         ADDWF 0H, W
ADDWF 1H, W               000018 2401      00016         ADDWF 1H, W
ADDWF 2H, W               00001A 2402      00017         ADDWF 2H, W
ADDWF 3H, W               00001C 2403      00018         ADDWF 3H, W
ADDWF 4H, W               00001E 2404      00019         ADDWF 4H, W
MOVWF 6H                  000020 6E06      00020         MOVWF 6H
HERE  GOTO HERE           000022 EF11 F000 00021 HERE    GOTO HERE
END                                        00022         END
```

Question 2-78

(a) Size of ROM = 4FFFFh+1 = 50000h = 327680 bytes = 320KB
(b) Size of ROM = 3FFFFh+1 = 40000h = 262144 bytes = 256KB
(c) Size of ROM = 5FFFFh+1 = 60000h = 393216 bytes = 384KB
(d) Size of ROM = 7FFFFh+1 = 80000h = 524288 bytes = 512KB
(e) Size of ROM = BFFFFh+1 = C0000h = 786432 bytes = 768KB
(f) Size of ROM = FFFFFh+1 = 100000h = 1048576 bytes = 1024KB
(g) Size of ROM = 17FFFFh+1 = 180000h = 1572864 bytes = 1536KB
(h) Size of ROM = 1FFFFFh+1 = 200000h = 2097152 bytes = 2048KB

Question 2-83



Question 3-12

```
R5     EQU   5
R6     EQU   6

       MOVLW D'10'
       MOVWF R5
BACK   MOVLW D'100'
       MOVWF R6
HERE   NOP
       NOP
       DECF  R6
       BNZ   HERE
       DECF  R5
       BNZ   BACK
```

Question 3-14

The BACK loops is performed 200 times. The HERE loops is performed 100 times and because is located in the BACK loop, is repeated 200 times. So the instructions in the HERE loop is performed 200*100 = 20,000 times.

Question 3-35

Instruction cycle = 400 ns; HERE loop lasts (1+2)*100 – 1 = 299 instruction cycles. Overall delay = [299*200 + (1+1+1+1+1+1+2)*200] * 400 ns = 24.56 ms. Note that the 3 NOPs are outside of the inner loop.