EE 2004
Week 5 Tutorial

1. Loop: Summing 10 numbers in a sequence

Suppose a sequence is defined by the following recurrence relation:

$F_n = F_{n-1} + 0x02$

with seed value

$F_1 = 0x03$, where F_n is the n^{th} number in the sequence.

Write a loop that calculates the sum of the first 10 numbers in the sequence. Assume the sum can be stored in a byte (i.e., sum < = 255).

2. Branching: Relative addressing and absolute addressing

For the following two programs, calculate the relative/absolute addresses (marked by "??"). Demonstrate your calculations and verify the machine code you obtained by building the code and inspecting the .lst file.

```
Program
Memory    Machine            LINE    SOURCE
Address    Code

                          00022         CBLOCK 0x20
                          00023             Binary
                          00024             Tens
                          00025             Units
                          00026         ENDC
                          00027
                          00028              ORG  0x000000
000000 EF?? F???          00029              goto Main
                          00030              ORG  0x000020
000020 0E4D               00031 Main:        movlw d'77'
000022 6E20               00032              movwf Binary, A
000024 6A21               00033 Bin_2_BCD:   clrf Tens, A
000026 6A22               00034              clrf Units, A
000028 5020               00035              movf Binary, W, A
00002A 0FF6               00036 Loop:        addlw -d'10'
00002C E3??               00037              bnc Next
00002E 2A21               00038              incf Tens, F, A
000030 D???               00039              bra Loop
000032 0F0A               00040 Next:        addlw d'10'
000034 6E22               00041              movwf Units, A
                          00042              END
```

```
Program
Memory   Machine          LINE    SOURCE
Address   Code

                          00008                 CBLOCK 0x00
                          00009                 FirstReg
                          00010                 SecondReg
                          00011                 ThirdReg
                          00012                 MaxReg
                          00013                 endc
                          00014
000000                    00015                 org 0x000000
000000 EF?? F???           00016                 goto Main
                          00017 ;-----------------------------------------------
000040                    00018                 org 0x000040
000040 0E2C               00019 Main:           movlw d'44'
000042 6E00               00020                 movwf FirstReg, A
000044 0E3C               00021                 movlw d'60'
000046 6E01               00022                 movwf SecondReg, A
000048 0E37               00023                 movlw d'55'
00004A 6E02               00024                 movwf ThirdReg, A
00004C 5000               00025 Here:           movf FirstReg, W, A
00004E 6E03               00026                 movwf MaxReg, A
000050 6401               00027                 cpfsgt SecondReg, A
000052 D???                00028                 bra Continue
000054 D???                00029                 bra MaxEqSecond
000056 5001               00030 MaxEqSecond:    movf SecondReg, W, A
000058 6E03               00031                 movwf MaxReg, A
00005A 5003               00032 Continue:       movf MaxReg, W, A
00005C 6402               00033                 cpfsgt ThirdReg, A
00005E D???                00034                 bra Over
000060 5002               00035 MaxEqThird:     movf ThirdReg, W, A
000062 6E03               00036                 movwf MaxReg, A
000064 D???                00037 Over:           bra Over
                          00038                 end
```