EE 308 – Homework 2

Due Jan. 31, 2005

1. Consider the following 8-bit hexadecimal numbers as unsigned. Find their decimal equivalents:

   (a) `0xA2`
   (b) `0x85`
   (c) `0x6C`
   (d) `0x1E`

2. Repeat Problem 1, considering the numbers as signed.

   (a) `0xA2`
   (b) `0x85`
   (c) `0x6C`
   (d) `0x1E`

3. Do the operations indicated below. The operations are performed in an 8-bit accumulator. Find the 8-bit results for the operations. Indicate the state of the N, Z, C and V bits after each operation.

   (a) `0x4C + 0x53`
   (b) `0x93 + 0x8A`
   (c) `0x8E + 0x72`
   (d) `0x4C - 0x53`
   (e) `0x53 - 0x4C`

4. Write an instruction sequence to subtract the 8-bit number stored in address $2010 from the 8-bit number stored in $2000, and store the 8-bit difference in $2005.

5. Write an instruction sequence which adds the contents of accumuator B to the 16-bit number stored at locations $2000 and $2001, and stores the 16-bit result in addresses $2002 and $2003. Treat the value stored in B as a signed number. (Hint: use the `SEX` instruction.)

6. Consider the program below:

```
prog:   equ     $1000
CODE:   section .text
        org     prog

        ldaa    #22
        movb    #53,$2002
loop:   ldab    #127
        sba
        std     $2000
        beq     $loop
        swi
```

(a) Hand assemble the program. Determine the hex numbers which will be generated when this program is assembled, and at what locations they will be stored in the HC12. For example, the `ldaa #22` instruction will result in

mnemonic	addr	code	Addressing Mode
ldaa #22	$1000	$86	Immediate
	$1001	$16	

(b) Determine the values of the N, Z, C, and V bits after each instruction in the above program. (Assume that all the bits are 0 before the execution of the first instruction.)

7. How many instruction cycles will it take the HCS12 to execute the following program? (Do not consider the `swi` instruction.) How many microseconds will this take the HCS12 with an 24 Mhz E-clock?

```
prog:     equ         $1000
CODE:     section     .text
          org         prog
          ldy         #20
loop1:    ldx         #500
loop2:    dex
          bne         loop2     ;Conditional Branch to loop2
          dey
          bne         loop1     ;Conditional branch to loop1
          swi
```

8. An HCS12 has the following data in its memory:

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
20D0	10	23	3B	7C	10	04	86	80	B7	10	25	3B	FC	10	18	F3
20E0	20	F5	FD	10	18	86	40	B7	10	23	3B	FC	10	12	DD	02
20F0	86	02	B7	10	23	3B	7C	10	03	86	40	B7	10	25	3B	86

Determine the contents of the A register after executing the following code fragments. List the value in hexadecimal.

(a)
```
ldaa #37
```

(b)
```
ldaa $20E7
```

(c)
```
ldx $20E0
ldaa -2,X
```

(d)
```
ldx #$20E0
ldaa -2,X
```

(e)
```
ldx #$20E0
ldaa 2,+X
```

(f)
```
ldx #$20E0
ldaa 2,X+
```