EE 308 - Exam 1

February 17, 1997

Name: _____

You may use any of the Motorola data books. No calculators allowed. Show all work. Partial credit will be given. No credit will be given if an answer appears with no supporting work.

1. Do the following conversions:
   (a) $D7_{16}$ = _____$_2$
   (b) $D7_{16}$ = _____$_{10}$ (assuming $D7_{16}$ is signed)
   (c) $D7_{16}$ = _____$_{10}$ (assuming $D7_{16}$ is unsigned)
2. Do the following arithmetic operations:
   (a) Add the two eight-bit numbers `0x6E + 0x92`.

   Answer: _____ N: _____ Z: _____ V: _____ C: _____
   (b) Add the two eight-bit numbers `0x6A + 0xD2`.

   Answer: _____ N: _____ Z: _____ V: _____ C: _____
   (c) Add the two eight-bit numbers `0x6A + 0x62`.

   Answer: _____ N: _____ Z: _____ V: _____ C: _____
   (d) Subtract the two eight-bit numbers `0x58 - 0x86`.

   Answer: _____ N: _____ Z: _____ V: _____ C: _____
   (e) Subtract the two eight-bit numbers `0x6A - 0x5F`.

   Answer: _____ N: _____ Z: _____ V: _____ C: _____

3. The following tables show the values of an HC11's registers and some of its memory. Write down the values in the registers and memory as you trace through 3 instructions. You only need to fill in a number when that value changes.

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000	14	00	B7	23	B4	67	30	18	8F	FE	22	02	5C	E7	03	26
0010	0F	CC	A6	04	1B	9D	3F	12	20	EC	02	BD	00	1E	3C	96
0020	00	08	1A	94	10	6E	38	39	A2	38	9A	05	F2	20	A5	ED

Reg	-	-	-	-
---	N	Z	V	C
CCR	0	1	1	1
A:B	A3		92	
X	0021			
Y	12F7			
SP	002D			
PC	0012			

(a) Instruction: _____ Bytes: _____ Cycles: _____

Reg	-	-	-	-		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
---	N	Z	V	C	0000																
CCR					0010																
A:B					0020																
X																					
Y																					
SP																					
PC																					

(b) Instruction: _____ Bytes: _____ Cycles: _____

Reg	-	-	-	-		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
---	N	Z	V	C	0000																
CCR					0010																
A:B					0020																
X																					
Y																					
SP																					
PC																					

(c) Instruction: _____ Bytes: _____ Cycles: _____

Reg	-	-	-	-		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
---	N	Z	V	C	0000																
CCR					0010																
A:B					0020																
X																					
Y																					
SP																					
PC																					

4. Consider the following code fragment:

```
        .area CODE (ABS)
        .org  0x100

        ldx   #0xe000 ; (a)
loop:   ldaa  0,x     ; (b)
        staa  *12     ; (c)
        inx           ; (d)
        jmp   loop    ; (e)
```

   Fill in the following for each of the five lines of the code:

   (a) Op Code: _____ Addressing Mode: _____ Bytes: _____ Cycles: _____

   (b) Op Code: _____ Addressing Mode: _____ Bytes: _____ Cycles: _____

   (c) Op Code: _____ Addressing Mode: _____ Bytes: _____ Cycles: _____

   (d) Op Code: _____ Addressing Mode: _____ Bytes: _____ Cycles: _____

   (e) Op Code: _____ Addressing Mode: _____ Bytes: _____ Cycles: _____

5. Write an assembly language subroutine which will read the value of the eight-bit number in memory location 0x102F, takes its complement, and write the result to Port B. Include this subroutine in a program which is an infinite loop which repeated calls the subroutine. The main program loop is (where the subroutine name is `com_102F`):

```
loop:   jsr   com_102F
        bra   loop
```

   Be sure to include everything which is needed to make this program work – `.org` statements, etc.