EE 308 – Homework 4

Due Feb. 11, 2002

1. Find the values of the N, Z, C, and V bits of the CCR register after execution of each of the following instructions, given that (A) = $43 and the condition flags are N=1, C=0, Z=0, and V=1. (Assume these are the values before each instruction starts – e.g., do not use the flag state resulting from the instruction in part (a) as the initial state for part (b).)

   (a) `TSTA`

   (b) `ADDA #$67`

   (c) `ADDA #$27`

   (d) `ASRA`

   (e) `CMPA #$60`

   (f) `SUBA #$40`

   (g) `ASRA`

2. Problem 4 from Page 116 of the text.

3. Below are some data in the HC12 memory:

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0900	D6	05	35	CF	E0	00	FE	08	20	A6	00	47	6A	05	08	53
0910	26	F7	34	C6	C8	CD	9C	40	03	26	FD	53	26	F7	3D	3F
0920	07	C2	3A	68	F3	09	C2	67	9A	0F	AA	55	08	40	CD	CF

   Indicate the values in the registers after the HC12 executes the following instructions. Also write down the number of cycles needed to execute each instruction. Show what will be in the registers (in hex) after each of the instructions. If the instruction does not change a register, you may leave that entry blank. Note that the first instruction is located at address `0x0800`.

Instruction	D		X	Y	SP	N	Z	V	C	Addr Mode	Effective Address
	A	B									
	AA	25	0910	0900	0A00	1	0	1	0		
`lds #$0920`											
`anda 2,x-`											
`tap`											
`puly`											
`staa $01`											
`bita $0913`											

4. Below is the listing from the Cosmic Assembler after assembling a simple program. Because of a bad printer, a few of the entries are blank. There is sufficient information in the listing to determine what the missing information is. Fill in the blanks with the correct values.

```
 1                      ; Sample Program
 2
 3       00000800       prog:       equ     $0800
 4       00000800       data:       equ     $0800
 5       00000a00       stack:      equ     _____
 6       00000000       PORTA:      equ     $0000
 7       00000002       DDRA:       equ     $0002
 8
 9
10                      CODE:       section .text
11  0800                            org     prog
12
13  0800 cf0a00                     lds     #stack
14  0803 86ff                       ldaa    ______
15  0805 5a02                       staa    DDRA
16  0807 ______         l1:         ldx     #table
17  080a a630           l2:         ldaa    1,x+
18  ____ 5a00                       staa    PORTA
19  080e 160818                     jsr     delay
20  0811 8e0808                     _____   #table_end
21  0814 23f4                       bls     l2
22
23  0816 ______                     bra     l1
24
25  0818 36             delay:      psha
26  0819 34                         pshx
27  081a 86fa                       ldaa    #250
28  081c ce0320         loop2:      ldx     #800
29  ____ 09             loop1:      dex
30  0820 26fd                       bne     loop1
31  0822 43                         ____
32  0823 26f7                       bne     ______
33  0825 ______                     pulx
34  0826 32                         pula
35  0827 3d                         rts
36
37                      DATA:       section .data
38  0800                            org     data
39  0800 0080c0e0f0f8   table:      dc.b    $00,$80,$C0,$E0,$F0,$F8,$FC,$FE
40  ____ ff             table_end:  dc.b    $FF
41
42
```

5. Write a program fragment which will make Bits 6, 4, 2, and 1 of Port A output, and the other bits of Port A input.

6. Write the program for Lab 4. Include a flow chart. Make sure you use top-down design, and document your program with comments. This program should be in assembly language.