

EE 308 – Homework 4

Due Feb. 10, 2006

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) = \$C5 and the condition flags are N=0, C=1, Z=0, and V=0. (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) ADDA #\$7C
- (b) ADCA #\$2F
- (c) LSRA
- (d) CMPA #\$60
- (e) SUBA #\$D7
- (f) ASRA

2. Suppose you started with the following register contents:

P-1007 Y-7892 X-FF00 A-44 B-70 SP-3B7F

What address is in the stack pointer and registers, and exactly what is in the stack after the following instructions sequence is executed:

PSHA
PSHB
PSHY
PULX

3. Write a subroutine to copy data one byte at a time from memory location \$2000 to memory location \$3000 until a byte with \$FF is detected.
4. Below are some data in the HC12 memory:

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 2000 | D6 | 05 | 35 | CF | E0 | 00 | FE | 08 | 20 | A6 | 00 | 47 | 6A | 05 | 08 | 53 |
| 2010 | 26 | F7 | 34 | C6 | C8 | CD | 9C | 40 | 03 | 26 | FD | 53 | 26 | F7 | 3D | 3F |
| 2020 | 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 0x1000.

| Instruction | D | | X | Y | SP | N | Z | V | C | Addressing Mode | Effective Address |
|-------------|----|----|------|------|------|---|---|---|---|-----------------|-------------------|
| | A | B | | | | | | | | | |
| | AA | BB | 2010 | 2020 | 0A00 | 1 | 0 | 1 | 0 | | |
| lds #2018 | | | | | | | | | | | |
| cpd \$2009 | | | | | | | | | | | |
| puly | | | | | | | | | | | |
| aslb | | | | | | | | | | | |
| staa \$2013 | | | | | | | | | | | |
| adda 4,+x | | | | | | | | | | | |

5. Below is the listing from the **as12** 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.

as12, an absolute assembler for Motorola MCU's, version 1.2e

```

1000                prog    equ    $1000
2000                data    equ    $2000
----              DDRH    equ    $0262
0260                PTH    equ    $0260
3c00                STACK  equ    $----

1000                org     prog

1000 cf 3c 00       lds     #STACK
1003 ----- ff 02 62   movb   #$ff,DDRH
1008 ce 20 00       l1: ldx   #table
---- 18 0d 30 02 60   l2: movb  1,x+,PTH
1010 07 07         ----    delay
1012 8e -----      cpx    #table_end
1015 23 f4         bls    -----
1017 20 ef         bra    -----

1019 36            delay: psha
101a 34            -----
101b 86 64         ldaa   #100
101d ce 0c 80     l3: ldx   -----
1020 04 35 fd     l4: dbne  x,l4
1023 -----      dbne  a,l3
1026 30           pulx
1027 32           pula
1028 3d           rts

2000                org     data
2000 3f 5b 66 7d   table: dc.b  $3f,$5b,$66,$7d
----              table_end:
---- 7f           dc.b  $7f

```

```

Executed: Fri Feb 03 16:52:52 2006
Total cycles: 49, Total bytes: 46
Total errors: 0, Total warnings: 0

```

6. Write a program fragment which will make Bits 7, 5, 2, and 0 of Port B output, and the other bits of Port B input.
7. Write a program fragment which will make Port H an output port, and display the letter 'E' on the seven-segment LED display connected to Port H.