ECE 331 Spring 2012 **Homework 5**

Due Wed Feb 15 at the beginning of class.

1. For each of the ASM instructions below, identify the address mode.
   a. STAA $2101
   b. CMPB #255
   c. EORA #E9
   d. STD $C4,X
   e. SUBD $1000

2. For each of the ASM instructions in Problem 1, briefly explain their operation in your own words. Be specific regarding data values and memory locations.

3. For each of the ASM instructions in Problem 1, use the Instruction Charts on the next page to show the contents of CPU registers and Memory after each instruction is executed. Assume the Initial Values shown at the top of the page for each instruction, and assume $1001 (not shown) holds $00. You only need to show values that change, including CCR bits.

4. Consider the instruction: LDAA $E237
   a. What does this instruction accomplish?
   b. What address mode does this instruction use?
   c. What machine code bytes will be stored in program memory to represent this instruction?
   d. Describe each step in sequence of the instruction execution cycle for this instruction.

5. Address mode examples. Write complete instructions, with operands when necessary.
   a. Write an example instruction that uses *inherent* address mode.
   b. Using *immediate* address mode, write an instruction to load the value $F30 into index register Y.
   c. Using *direct* address mode, write an instruction to store the contents in accumulator B into memory at $004B
   d. Using *extended* address modes, write an instruction to store the contents of the accumulator D into memory at $00C4 & $00C5.
   e. Using *indexed* address mode with $1000 in index Y, store the value in accumulator A to memory at location $1055.

6. Write a complete ASM instruction to implement each of the following operations:
   a. Load accumulator D with the 16-bit value located in memory addresses $3EFF-3F00.
   b. Copy the contents of the CCR to accumulator_A.
   c. Decrement the contents in accumulator_B by 1.
   d. OR the contents of accumulator_B with the value $C6.
   e. Add the contents of accumulator_B to the contents of index_register_X.
   f. Compare the contents in index_register_Y to the value stored at es $3EFF-3F00.

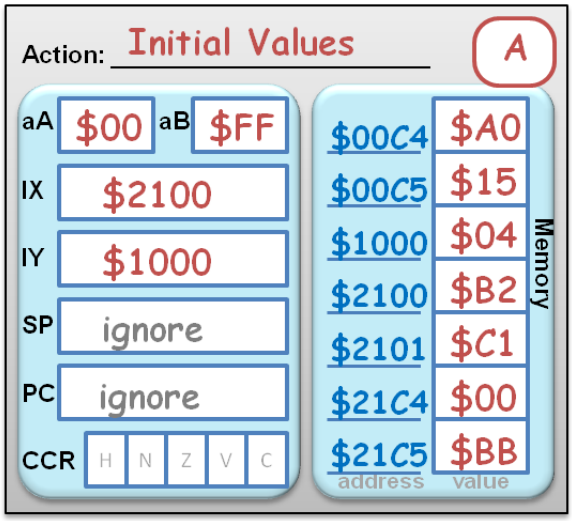
7. Indexed Addressing: Describe the results for each of the following ASM instructions when performed in sequence. Specify all relevant (modified) register and memory values in hexadecimal.

```
LDAA   #10
LDY    #$01FB
STAA   $1A,X
```

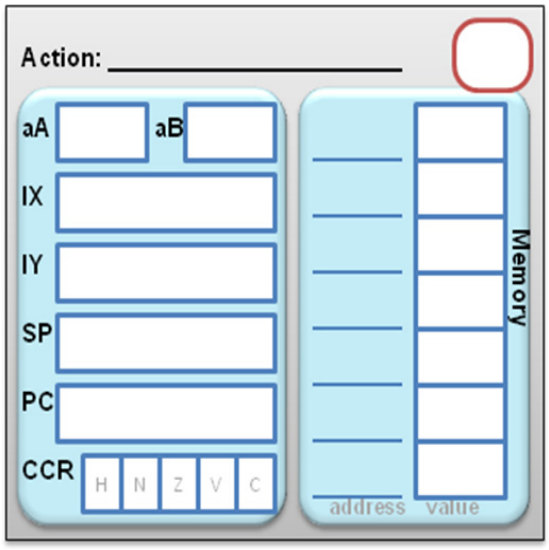
As described in the PC Lab 1 slides, you can access an ASM simulator in several ways including DECS labs, programs off the internet (see class website for links), or the software in the back of your textbook. Please ensure that you have good access to an ASM simulation program because you will be writing/simulation several programs for homework in this course.

8. At the end of this homework, attach a printout of your final Example 2 program from PC Lab 1. Include answers to the questions at the bottom of page 9 in PC Lab 1 slides.

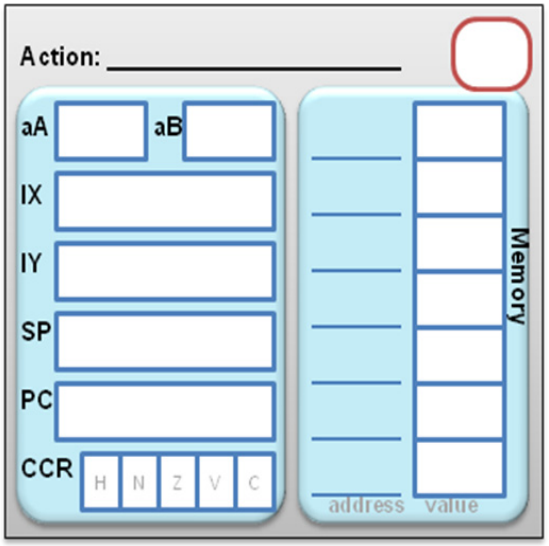
Instruction Charts for Problem 3



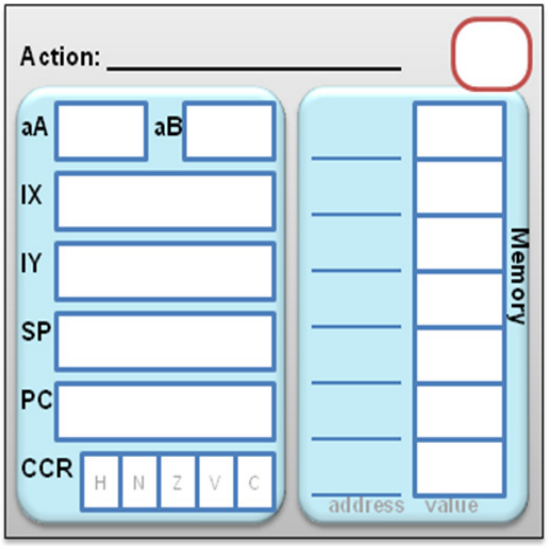
Initial Values



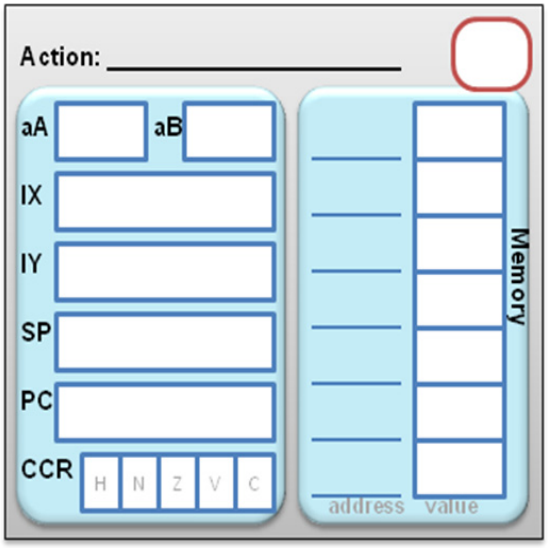
(a)



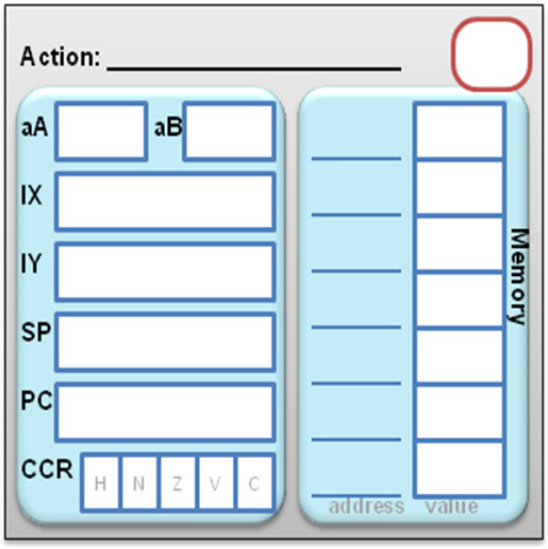
(b)



(c)



(d)



(e)