

## 3.11 CHAPTER PROBLEMS

### Fundamental

1. Explain the function of an assembler.
2. What are the files generated by a Freescale HC12/S12 assembler?
3. List three programming constructs used to write any program.
4. What advantages do we have for drawing a flowchart before writing a program?
5. Why do the authors insist on initializing the stack pointer with the address of the last RAM memory location plus one?
6. If a subroutine comment says “Destroys A, B, and Y,” what instructions must be used before and after the subroutine is executed to preserve the initial values of the accumulators and register?

### Advanced

1. What are the differences among a high-level language program, an assembly language program, and a machine language program?
2. What criteria should one use to select one of the two parameter passing methods when sending or receiving parameter values from a subroutine?

3. Write a program using a subroutine to copy a table from one location to another. A partially completed program is given next. Write a program by filling in locations where only comments appear.

\* Copying a table using a subroutine

```

Data Section
      ORG          $0000
TAB1  FDB          $D100      ; address of the first table
TAB2  FDB          $D300      ; address of the second table
TABL  FCB          $FF        ; table length
* main program
      ORG          $C100
      LDS          #$8000      ; initialize the stack pointer
                                   ; load the table length to acc A
                                   ; load table 1 address to X
                                   ; load table 2 address to Y
      JSR          COPYT      ; call the subroutine
      SWI          ; stop subroutine
      ORG          $4500
COPYT ; save the CPU registers onto the stack
AGAIN TSTA          ; check the counter value
      BEQ          DONE      ; if zero jump to the end
      LDAB         1,X+      ; note the use of accumulator B
      STAB         1,Y+      ; adjust the counter and target addresses
                                   ; continue the loop
      DONE        ; restore the CPU registers
      RTS          ; IMPORTANT!!!!!!!
      END

```

4. Suppose you started with the following CPU register contents.

P-C007 Y-7892 X-FF00 A-44 B-70 SP-C04A

Note that P stands for the program counter, Y and X the index registers, A and B the accumulators, and SP the stack pointer. What address is in the stack pointer and exactly what is in the stack after the following instruction sequence is executed?

```

PSHA
PSHB
PSHY

```

## Challenging

1. Write a subroutine to copy data one byte at a time from memory location \$5000 to memory location \$6000 until a byte with \$FF is detected.

2. For the following assembly language program, hand assemble the program to gain machine language code using the hexadecimal number representation.

```

                ORG        $C200
                LDAB       #COUNT
                LDAA       #NUM1
MORE            ADDA       #NUM1
                STAA       RESULT
                DECB
                BNE        MORE
                SWI
COUNT        EQU        $04
NUM1          EQU        $10
RESULT        RMB        $01
                END
```

3. Is the asterisk legal at the beginning of a program line?
4. Can a semicolon appear in the middle of a program line?
5. Can we use an asterisk in the middle of a program line?
6. If we replace the EQU directives with the FCB directives in the program of Problem 2 (and still have the program perform the same way), what must be changed in the assembly language program? Why might we want to do such a thing?
7. At what address is the RESULT stored for the program in problem 2?
8. Write an instruction sequence to load the contents of the element in the top of the stack onto accumulator A and the third element from the top of the stack onto accumulator B.