**98 CHAPTER 2 • MACHINE INSTRUCTIONS AND PROGRAMS**

**PROBLEMS (Cap. 4 - Istruzioni macchina)**

* 1. Represent the decimal values 5, 2, 14, 10, 26, 19, 51, and 43, as signed, 7-bit numbers in the following binary formats:

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* + 1. Sign-and-magnitude (*b*) 1’s-complement

(*c*) 2’s-complement

(See Appendix E for decimal-to-binary integer conversion.)

* 1. (*a*) Convert the following pairs of decimal numbers to 5-bit, signed, 2’s-complement, binary numbers and add them. State whether or not overflow occurs in each case.
     1. 5 and 10
     2. 7 and 13
     3. −14 and 11
     4. −5 and 7
     5. −3 and −8

( *f* ) −10 and −13

(*b*) Repeat Part *a* for the subtract operation, where the second number of each pair is to be subtracted from the first number. State whether or not overflow occurs in each case.

**PROBLEMS 99**

* 1. Given a binary pattern in some memory location, is it possible to tell whether this pattern represents a machine instruction or a number?
  2. A memory byte location contains the pattern 00101100. What does this pattern represent when interpreted as a binary number? What does it represent as an ASCII code?
  3. Consider a computer that has a byte-addressable memory organized in 32-bit words according to the big-endian scheme. A program reads ASCII characters entered at a keyboard and stores them in successive byte locations, starting at location 1000. Show the contents of the two memory words at locations 1000 and 1004 after the name “Johnson” has been entered.
  4. Repeat Problem 2.5 for the little-endian scheme.
  5. A program reads ASCII characters representing the digits of a decimal number as they are entered at a keyboard and stores the characters in successive memory bytes. Examine the ASCII code in Appendix E and indicate what operation is needed to convert each character into an equivalent binary number.
  6. Write a program that can evaluate the expression

*A* × *B* + *C* × *D*

in a single-accumulator processor. Assume that the processor has Load, Store, Multiply, and Add instructions, and that all values fit in the accumulator.