- **What are two ways of representing zero in 1's complement form?**
- **Zero is represented in 1's complement as all 0's (for +0) or all 1's (for −0).**
- **How is zero represented in 2's complement form?**
- **Zero is represented by all 0's only in 2's complement.**
- **Determine the 1's complement of binary number:**

  10101010

- **Determine the 2's complement of each binary number using either method:**

  1001

- **Take 1's complement and add 1   0110 + 1 = 0111**
- **Express each decimal number in binary as an 8-bit sign-magnitude number:**

  (a) +29

  Magnitude of 29 = 0011101
  + 29 = 00011101

  (b) -85

  Magnitude of 85 = 1010101
  −85 = 11010101

- **Express each decimal number as an 8-bit number in the 2's complement form:**

  (a)-68

  Magnitude of 68 = 1000100

  −68 = 10111100

  (b) +101

  Magnitude of 10110 = 1100101
  +10110 = 0110010

- **Determine the decimal value of each signed binary number in the 2's complement form:**

  (a) 10011001

  10011001 = −(1100111) = −103

  (b) 01110100

  01110100 = +(1110100) = +116

- **Determine the values of the following single-precision floating-point numbers:**

(a) 1 10000001 01001001110001000000000

11000000101001001110001000000000
Sign = 1
Exponent = 10000001 = 129 − 127 = 2
Mantissa = 1.01001001110001 × 22 = 101.001001110001
−101.001001110001 = −5.15258789

(b) 0 11001100 10000111110100100000000

01100110010000111110100100000000
Sign = 0
Exponent = 11001100 = 204 − 127 = 77
Mantissa = 1.100001111101001
1.100001111101001 × 277

- **Perform each addition in the 2's complement form**

(a) 10001100 + 00111001

10001100
\+ 00111001
____
11000101

(b) 11011001 + 11100111

11011001
\+ 11100111
____
11000000

- **Multiply 01101010 by 11110001 in the 2's complement form.**

```
   01101010
 × 00001111
_______________
    01101010
  01101010
_____________
  100111110
  01101010
_____________
 1011100110
```

01101010

11000110110

Changing to 2's complement with sign: 100111001010

- Convert each of the BCD numbers to decimal:

(a) 00011001

0001 1001 = 19

(b) 00110010

0011 0010 = 32

- Convert each Gray code to binary:

(a) 1010

1 0 1 0 Gray
1 1 0 0 Binary

(b) 00010

0 0 0 1 0 Gray
1 1 0 0 Binary

(c) 11000010001

1 1 0 0 0 0 1 0 0 0 1 Gray
1 0 0 0 0 0 1 1 1 1 0 Binary

- Convert each of the following decimal numbers to ASCII. Refer to Table 2–7.

(a) 1

1 → 00110001

(b) 3

3 → 00110011

(c) 6

6 → 00110110

(d) 10

10 → 0011000100110000

(e) 18

18 → 0011000100111000

(f) 29

29 → 0011001000111001

(g) 56

56 → 0011010100110110

(h) 75

75 → 0011011100110101

(i) 107

107 → 001100010011000000110111

- **Determine each ASCII character. Refer to Table 2–7.**

(a) 0011000

0011000 → CAN

(b) 1001010

1001010 → J

- **Determine which of the following even parity codes are in error:**

(b) 011101010

Code (b) 011101010 has five 1s, so it is in error

- **Attach the proper even parity bit to each of the following bytes of data:**

(a) 10100100

1 10100100

(b) 00001001

0 00001001

(c) 11111110

1 11111110