1. (number systems) Problem 1–2, text book, p. 24

Answer:
(a) 48k bits = \(48 \times 2^{10} = 3 \times 2^{14}\) bits
(b) 256M bits = \(256 \times 2^{20} = 2^{28}\) bits
(c) 2G bits = \(2 \times 2^{30} = 2^{31}\) bits

2. (base conversion) *Problem 1–4, text book, p. 24
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(1776)\(_{10}\) to (\(N\))\(_{2}\). Answer: (11011110000)\(_{2}\)
(1812)\(_{10}\) to (\(N\))\(_{2}\). Answer: (11100010100)\(_{2}\)
(1969)\(_{10}\) to (\(N\))\(_{2}\). Answer: (11110110001)\(_{2}\)
(2000)\(_{10}\) to (\(N\))\(_{2}\). Answer: (11111010000)\(_{2}\)

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5. (base conversion) Perform the following conversions without executing actual divisions and multiplications:
(10110101.1101)\(_{2}\) to (\(N\))\(_{8}\). Answer: (265.64)\(_{8}\)
(27643.35)\(_{8}\) to (\(N\))\(_{2}\). Answer: (0101111110100011.0111101)\(_{2}\)
(1010010110.101011)\(_{2}\) to (\(N\))\(_{16}\). Answer: (296.AC)\(_{16}\)
\((ABADABA.D0)_{16}\) to (\(N\))\(_{2}\) to (\(N\))\(_{8}\). Answer:
\((ABADABA.D0)_{16} = (101010111011010110111010110101101)_{2} = (1256555272.64)_{8}\). Answer:
\((76421.65)_{8}\) to (\(N\))\(_{16}\). Answer: (11110100010001.110101)\(_{2}\) = (7D11.D4)\(_{16}\).

6. (base conversion) Find the base r for which the following relationship holds:
\((A1)_{r} \times (B2)_{r} = (8852)_{r}\)
where \(A = (10)_{10}\) and \(B = (11)_{10}\).
Answer: \(A1_{r} = 10r + 1, B2_{r} = 11r + 2\). Hence
\((10r + 1)(11r + 2) = 8r^{3} + 8r^{2} + 5r + 2\)
or, after simplification, \(8r^3 - 102r^2 - 26r = 0\). Or, \((4r + 1)(r - 13)r = 0\). Since \(r\) must be a positive integer, and in this problem, \(r > 11\) (why?), the only solution is \(r = 13\).


\[(3459)_{10} = (0011010001011001)_{BCD}\]

When a component of a BCD number is greater than 9(1001), 6(0110) is added to it to obtain the correct value with a carry of 1 always being generated.

So, subtract 6 from the rightmost position and the second from the leftmost position with the appended 1 that was carried. The results are the component sums of the BCD addition.

8. (binary code) Assuming \(A\) is a 32-bit unsigned binary number. How many different positive integers can be represented by \(A\)?

**Answer:** For a 32-bit unsigned binary numbers, there are \(2^{32} - 1\) different positive numbers can be represented (0 is not a positive number).

9. (binary code) Let \(B\) be encoded with 32 bit unsigned BCD code. How many different positive integers can be represented by \(B\)?

**Answer:** For unsigned BCD code, there are \(32/4 = 8\) BCD digits. Each BCD digits can take 10 different values. Thus the total number of positive integers can be represented by \(B\) is \(10^8 - 1\).

10. (binary code) Show the bit configuration that represents the decimal number \(712_{10}\)

(a) in BCD code:

(b) in ASCII code:

**Answer:**

(a) in BCD code: \(712_{10} = 011100010001\)

(b) in ASCII code: \(712_{10} = 01111000100010010\)

11. (binary code) Calculate the even parity for the following binary numbers:

\(A = 1011100011_2, B = 11111111111_2\)

**Answer:** Even parity of \(A = 0\), of \(B = 1\)


**Answer:**

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<th>Y</th>
<th>Z</th>
<th>(X+YZ)</th>
<th>((X+Y)(X+Z))</th>
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   Solutions available in Prentice Hall companion Website Gallery.

14. (Boolean Algebra/Theorems) Problem 2–4, text book, pp. 84.
   Given: \( A \cdot B = 0, \ A + B = 1 \)
   Prove: \( AC + \bar{A}B + BC = B + C \)
   \[
   AC + \bar{A}B + BC = C(A + B) + \bar{A}B \\
   = C(1) + \bar{A}B \\
   = C + \bar{A}B + 0 \\
   = C + \bar{A}B + AB \\
   = C + B(A + \bar{A}) \\
   = B + C
   \]

15. (Algebraic Simplification) Problem 2–6(b),(d), text book, pp. 84.
   (b) \((\bar{A} + B)(\bar{A} + B) = \bar{A}B(\bar{A} + B) = AB \)
   (d) \(BC + B(AD + A\bar{D}) = BC + ABD + AB\bar{D} = BC + AB(D + \bar{D}) = AB + BC \)

    Solutions available in Prentice Hall companion Website Gallery.

17. (Sum of Minterms, Product of Maxterms) Problem 2–10(b), text book, pp. 85.
    Solutions available in Prentice Hall companion Website Gallery.