Chapter 1

Digital Systems and Binary Information

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§1-2

1. Convert the following numbers with the indicated bases to decimal:

(a) $(132.3)_4$

(b) $(425.3)_6$

EX-2

2

§1-2

2. In each of the following cases, determine the radix ***r***:

(a) $(24)_r = (18)_{10}$

(b) $(231)_r = (91)_{10}$

EX-3

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§1-2

3. Perform the following binary arithmetic operations:

(a) i. 1011 + 0110 ii. 110 × 011

(b) i. 1011001 + 1011010 ii. 01101 × 11011

EX-4

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§1-3 & 1-4

4. Convert the following numbers from the given base to the other three bases listed in the table.

(a)

Decimal	Binary	Octal	Hexadecimal
19.5	?	?	?
?	?	63.75	?

(b)

Decimal	Binary	Octal	Hexadecimal
237.875	?	?	?
?	?	156.375	?

§1-5

5. Obtain the 1's and 2's complements of the following 8-bit binary numbers:
   (a) 01000110, 11011010

   (b) 01010011, 10011000

§1-5

6. (a)
   i. Perform the indicated subtraction with the following unsigned binary numbers by **1's** complement addition:
      11101 – 10001 00101 – 10100
   ii. Perform the indicated subtraction with the following unsigned binary numbers by **2's** complement addition:
      11101 – 10001 00101 – 10100

(b) Repeat (a) for
   i. 10110101 – 01001101, 01001101 – 10110101
   ii. 10110101 – 01001101, 01001101 – 10110101

§1-6

7. (a) The following binary numbers have a sign in the leftmost position and, if negative, are in 2's complement form. Perform the indicated arithmetic operations and indicate if ***overflow*** occurs for each computation. (Hint: Perform subtraction by 2's complement addition.)
   i. 001011 + 100110 ii. 110001 – 010010

(b) Repeat (a) for
   i. 10110101 – 01001101 ii. 01001101 + 10110101

§1-7

8. (a) Represent the decimal numbers 25 and 87 in BCD, and then show the steps necessary to form their sum.

   (b) Represent the decimal numbers 376 and 843 in BCD, and then show the steps necessary to form their sum.

EX-9

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Brief Answers of the Exercises (1/2)

1. (a) 30.75
   (b) 161.5

2. (a) 7
   (b) 6

3. (a) i. 10001 ii. 10010
   (b) i. 10110011 ii. 101011111

4. (a) $(19.5)_{10} = (10011.1)_2 = (23.4)_8 = (13.8)_{16}$
   $(63.75)_8 = (51.953125)_{10} = (110011.111101)_2 = (33.F4)_{16}$
   (b) $(237.875)_{10} = (11101101.111)_2 = (355.7)_8 = (ED.E)_{16}$
   $(156.375)_8 = (110.494140625)_{10} = (1101110.011111101)_2 = (6E.7E8)_{16}$

EX-10

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Brief Answers of the Exercises (2/2)

5. (a) i. 10111001, 10111010 ii. 00100101, 00100110
   (b) i. 10101100, 10101101 ii. 01100111, 01101000

6. (a) i. 01100, -01111 ii. 01100, -01111
   (b) i. 01101000, -01101000 ii. 01101000, -01101000

7. (a) i. 110001 ii. Overflow
   (b) i. overflow ii. 00000010

8. (a) 000100010010_{BCD}
   (b) 0001001000011001_{BCD}

EX-11

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