EL3011 Arsitektur Sistem Komputer

Problems Ch 2 - Computer System A Programmer's Perspective

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1. [Practice Problem 2.1]
   Perform the following number conversions:
   A. 0x39A7F8 to binary
   B. Binary 1100100101111011 to hexadecimal
   C. 0xD5E4C to binary
   D. Binary 1001101110011110110101 to hexadecimal

A. 3 9 A 7 F 8
0011 1001 1010 0111 1111 1000

B. 1100 1001 0111 1011
C 9 7 B

C. D 5 E 4 C
1101 0101 1110 0100 1100

D. 0010 0110 1110 0111 1011 0101
2 6 E 7 B 5

2. [Practice Problem 2.3]
   A single byte can be represented by two hexadecimal digits. Fill in the missing entries in the following table, giving the decimal, binary, and hexadecimal values of different byte patterns:

Decimal	Binary	Hexadecimal
0	0000 0000	0x00
167	1010 0111	A7
62	0011 1110	3E
188	1011 1100	BC
55	0011 0111	37
136	1000 1000	88
243	1111 0011	F3
82	0101 0010	0x52
172	1010 1100	0xAC
231	1110 0111	0xE7

3. [Practice Problem 2.4]
   Without converting the numbers to decimal or binary, try to solve the following arithmetic problems, giving the answers in hexadecimal. **Hint** : just modify the methods you use for performing decimal addition and subtraction to use base 16.

   a. 0x503c + 0x8 =
   b. 0x503c – 0x40 =
   c. 0x503c + 64 =
   d. 0x50ea – 0x503c =

a. 503C + 8 = 5044

b. 503C − 40 = 4FFC

c. 503C + 64 = 5040

d. 50EA − 503C = AE

4. [Practice problem 2.8]

Fill in the following table showing the results of evaluating Boolean operations on bit vectors.

Operation	Result
a b	[01101001] [01010101]
~a ~b	1001 0110 1010 1010
a&b a|b a^b	0100 0001 0111 1101 0011 1100

= 0x69
= 0x55

5. [Practice problem 2.9]

Computers generate color pictures on a video screen or liquid crystal display by mixing three different colors of light: red, green, and blue. Imagine a simple scheme, with three different lights, each of which can be turned on or off, projecting onto a glass screen. We can then create eight different colors based on the absence (0) or presence (1) of light sources R, G, and B.

R G B	Color
0 0 0	Black
0 0 1	Blue
0 1 0	Green
0 1 1	Cyan
1 0 0	Red
1 0 1	Magenta
1 1 0	Yellow
1 1 1	White

a. ~Black = White
~Blue = Yellow
~Green = Magenta
~Cyan = red.

a. The complement of a color is formed by turning off the lights that are on and turning on the lights that are off. What would be the complement of each of the eight colors listed above?

b. Describe the effect of applying Boolean operations on the following colors:

i. Blue | Green = 001 | 010 = 011 = cyan

ii. Yellow & Cyan = 110 & 011 = 010 = Green

iii. Red ^ Magenta = 100 ^ 101 = 001 = Blue

6. [Practice Problem 2.14]
Suppose that x and y have byte value 0x66 and 0x39, respectively. Fill in the following table indicating the byte values of the different C expressions:

Expression	Value	Expression	Value
x & y	0x20	x && y	0x1
x | y	0x7F	x || y	0x1
~x | ~y	0xDF	!x || !y	0x0
x & !y	0x0	x && ~y	0x1

7. [Practice Problem 2.16]
Fill in the table below showing the effects of the different shift operations on single-byte quantities. The best way to think about shift operations is to work with binary representations. Convert the initial value to binary, perform the shifts, and then convert to hexadecimal. Each of the answers should be 8 binary digits or 2 hexadecimal digits.

x		x << 3		x >> 2 (Logical)		x >> 2 (Arithmetic)	
Hex	**Binary**	**Binary**	**Hex**	**Binary**	**Hex**	**Binary**	**Hex**
0xC3	1100 0011	0001 1000	18	0011 0000	30	0011 0000	30
0x75	0111 0101	1010 1000	A8	0001 1101	1D	0001 1101	1D
0x87	1000 0111	0011 1000	38	0010 0001	21	0010 0001	21
0x66	0110 0110	0011 0000	30	0001 1001	19	0001 1001	19

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