

# HW 01

$$1. \quad 101001_2 = 1 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 1 \\ = 32 + 8 + 1 = 41$$

this match the result of continuously division

$$2. \quad (0.1011)_2 = 0 + 1 \times 2^{-1} + 0 \times 2^{-2} + 1 \times 2^{-3} + 1 \times 2^{-4} \\ = 0.5 + 0.125 + 0.0625 = 0.6875$$

this match the result of continuously multiplication

## 3. 2-complements:

① transform  $0 \rightarrow 1; 1 \rightarrow 0$  to get 1-complements

② add 1 at the end to get 2-complements

10-complements

① transform  $n=9-n$  to get 9-complements

② add 1 at the end to get 10-complements

## 4. 4 bits can represent 16 kinds of number (from 0000 to 1111).

however, in BCD forms, we only want 4 bits represent 10 numbers (from 0000 to 1001), the number exceed 10 should goes to another 4 bits, so we have to add 6 (16 - 10) to adjust.

$$1.9 \quad (a) \quad 1 \times 2^4 + 1 \times 2^2 + 1 \times 2^1 + 1 \times 10^{-2} + 1 \times 10^{-4} \\ = 16 + 4 + 2 + 0.25 + 0.0625$$

$$= 22.3125$$

$$(b) \quad 1 \times 16^1 + 6 + 5 \times 16^{-1} \\ = 16 + 6 + 0.3125$$

$$= 22.3125$$

$$(c) \quad 2 \times 8^1 + 6 + 2 \times 8^{-1} + 4 \times 8^{-2} \\ = 16 + 6 + 0.25 + 0.0625$$

$$= 22.3125$$

$$(d) \quad 13 \times 16^3 + 10 \times 16^2 + 11 \times 16 + 10 + 11 \times 16^{-1} \\ = 53248 + 2560 + 176 + 10 + 0.6875$$

$$= 55994.6875$$

$$(e) \quad 1 \times 2^3 + 1 \times 2 + 1 + 1 \times 2^{-1} + 1 \times 2^{-4} \\ = 8 + 2 + 1 + 0.5 + 0.0625$$

$$= 11.5625$$

$$1.13 \quad (a) \quad \begin{array}{r} 2 | 27 & 1 \\ 2 | 13 & 1 \\ 2 | 6 & 0 \\ 2 | 3 & 1 \\ \hline & 1 \end{array} \quad 27 = (11011)_2$$

$$0.315 \times 2 = 0.63 = 0 + 0.63$$

$$0.63 \times 2 = 1.26 = 1 + 0.26$$

$$0.26 \times 2 = 0.52 = 0 + 0.52$$

$$0.52 \times 2 = 1.04 = 1 + 0.04$$

$$0.04 \times 2^4 = 0.64 < 1$$

$$\therefore 27.315 = (11011.01010000)_2$$

$$(b) \frac{2}{3} \times 2 = \frac{4}{3} = 1 + \frac{1}{3}$$

$$\frac{1}{3} \times 2 = \frac{2}{3} = 0 + \frac{2}{3}$$

$$\frac{2}{3} \times 2 = \frac{4}{3} = 1 + \frac{1}{3}$$

.....

$$\frac{2}{3} \approx (0.10101010)_2$$

$$(0.10101010)_2 = 1 \times 2^{-1} + 1 \times 2^{-3} + 1 \times 2^{-5} + 1 \times 2^{-7} \\ = 0.6640625$$

$$\frac{2}{3} \approx 0.666666$$

$$\Delta = 0.666666 - 0.6640625 = 0.002640416$$

$$(c) 1010 = 10$$

$$(0.10101010)_2 = 0.AA = 0.6640625$$

the answer is same

1.15 9-complements

$$(a) 74521963$$

$$74521964$$

$$(b) 36674399$$

$$36674400$$

$$(c) 74999999$$

$$75000000$$

$$(d) 99999999$$

$$100000000$$

$$1.18 (a) 10011 - 10010$$

$$= 10011 + 1101+1 = 10011 + 1110$$

$$= 100001$$

$$= 00001$$

$$(b) 100010 - 100110$$

$$= 100010 + 011001+1$$

$$= 111100$$

$$2\text{-complement } 000011+1 = 000100$$

$$(c) 1001 - 110101$$

$$= 1001 + 001010+1$$

$$= 10100$$

$$2\text{-complements } 101011+1 = 101100$$

$$\therefore -101100$$

$$(d) 101000 - 10101$$

$$= 101000 + 01010+1$$

$$= 110011$$

$$= 10011$$

$$1.19$$

10-complements

$$9286$$

$$90714$$

$$801$$

$$99199$$

1.15 9-complements 10-complements

$$(a) 9286 + 801 = 10087$$

$$(b) 9286 + 99199 = 108485 = 8485$$

$$(c) 90714 + 801 = 91515$$

10-complements: 08485

$$\therefore -9286 + 801 = -8485$$

$$(d) 90714 + 99199 = 189913$$

10-complements : 810067

$$-9286 - 801 = -10067$$

$$1.25 6 = (0110)_2 \quad 4 = (0100)_2$$

$$2 = (0010)_2 \quad 8 = (1000)_2$$

$$(a) 0110 \quad 0100 \quad 0010 \quad 1000$$

$$(b) 1001 \quad 0111 \quad 0101 \quad 1011$$

$$\therefore -000100$$

(c) 1100 0100 0010 1110

(d) 1000 0110 0101 1101

1.30 (a) 73 = 0111 0011 F4 = 1111 0100

E5 = 1110 0101 76 = 0111 0110

E5 = 1110 0101 4A = 0100 1010

EF = 1110 1111 b2 = 0110 0010

73 = 0111 0011

ASCII : steveJobs

(b) odd parity