

Homework #1

- 1.11** Perform the following division in binary: $111111 \div 101$.
- 1.14** Obtain the 1's and 2's complements of the following binary numbers:
(a) 11110000 (b) 00000000
(c) 11011000 (d) 01010101
- 1.18** Perform subtraction on the given unsigned binary numbers using the 2's complement of the subtrahend. Where the result should be negative, find its 2's complement and affix a minus sign.
(a) $10101 - 10010$ (b) $10010 - 100110$
- 1.20** Convert decimal +56 and +35 to binary, using the signed-2's-complement representation and enough digits to accommodate the numbers. Then perform the binary equivalent of $(+56) + (+35)$, $(+56) + (-35)$, and $(-56) + (+35)$. Convert the answers back to decimal and verify that they are correct.
- 1.23** Represent the unsigned decimal numbers 694 and 538 in BCD, and then show the steps necessary to form their sum.

例 3 餘 = 11165207

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1.11

$$\begin{array}{r} 101 \overline{) 11111} \\ \underline{101} \\ 101 \\ \underline{101} \\ 11 \end{array}$$

商: $(1100)_2 = (12)_{10}$

餘: $(11)_2 = (3)_{10} \neq$

1.14

① 補數 (0, 1 bit 交換)

The 1's complement of (a): 00001111

(b): 11111111

(c): 00100111

(d): 10101010 \neq

② 2 補數 (1 補數 + 1) \neq overflow

The 2's complement of (a) 00010000

(b) ~~1~~ 00000000

(c) 00101000

(d) 10101011 \neq

1.18 (a) 計算減數 10010 的 2 補數

$10010 \rightarrow 01101 \rightarrow 01110$

(1 補數) (2 補數)

2. 相加

$$\begin{array}{r} 10101 \\ + 01110 \\ \hline 100011 \end{array}$$

4. affix a minus sign

$+ 000011 \neq$

3. $\frac{1}{2}$ 100000

$$\begin{array}{r} 100011 \\ - 100000 \text{ (借減)} \\ \hline 000011 \end{array}$$

$$1.18 (b) 100110 \rightarrow 011001 \rightarrow 011010$$

(1補數) (2補數)

$$\begin{array}{r} 10010 \\ + 101010 \\ \hline 101100 \end{array}$$

$$\begin{aligned} ③ 101100 - 1000000 & \text{ (不夠減)} \\ & = -2's \text{ complement of } 101100 \\ & = -010100 \end{aligned}$$

1.20 ① 轉換成二進位 ② 2's complement (含+)

$$(56)_{10} = (111000)_2 \quad \begin{aligned} & 0111000 \rightarrow 1000111 + 1001000 \\ & 0100011 \rightarrow 1011100 \rightarrow 1011101 \end{aligned}$$

$$(35)_{10} = (100011)_2$$

(÷2 試算 10 → 2 進位)

$$(i) (+56) + (+35) \quad (ii) (+56) + (-35) \quad (iii) -56 + (+35)$$

$$\begin{array}{r} 00111000 \\ + 10100011 \\ \hline 01011011 \\ (1011011)_2 \end{array}$$

$$\begin{aligned} & = (64 + 1 + 2 + 8 + 16)_{10} \\ & = (91)_{10} \neq \end{aligned}$$

$$\begin{array}{r} 00111000 \\ 1101101 \\ \hline (1)00010101 \\ (0010101)_2 \end{array}$$

$$\begin{aligned} & = (1 + 4 + 16)_{10} \\ & = (21)_{10} \neq \end{aligned}$$

$$\begin{array}{r} 11001000 \\ 00100011 \\ \hline 11101011 \end{array}$$

從 2 補數取 2 為 10 進位

$$\begin{aligned} & 1101011 \text{ (2補數)} \\ & \downarrow \\ & 1101010 \text{ (1補數)} \end{aligned}$$

$$-(0010101)_2 = (-21)_{10} \neq$$

$$1.23 (694)_{10} = (011010010100)_{BCD}$$

$$(538)_{10} = (010100111000)_{BCD}$$

$$\begin{array}{r} 0110 \\ + 0101 \\ \hline 1100 \\ + 0110 \\ \hline 10010 \end{array}$$

$$\begin{array}{r} 1001 \\ + 1001 \\ \hline 1101 \\ + 0110 \\ \hline 0011 \\ \hline 3 \end{array}$$

$$\begin{array}{r} 0100 \\ + 1000 \\ \hline 1100 \\ + 0110 \\ \hline 0010 \\ \hline 2 \end{array}$$

$$\begin{aligned} & (694)_{10} + (538)_{10} \\ & \Rightarrow (00010010 \\ & \quad 00110010)_{BCD} \\ & = (1232)_{10} \neq \end{aligned}$$