Homework #11

7.8* (a) How many 64K × 8 RAM chips are needed to provide a memory capacity of 512K bytes?
(b) How many lines of the address must be used to access 512K bytes? How many of these lines are connected to the address inputs of all chips?
(c) How many lines must be decoded for the chip select inputs? Specify the size of the decoder.

7.12* A 13-bit Hamming code word containing 9 bits of data and 4 parity bits is read from memory. What was the original 9-bit data word that was written into memory if the 13-bit word read out is as follows: (a) 0 1110 0101 0100 (b) 1 1110 1010 0111

7.13* How many parity check bits must be included with the data word to achieve single-error correction and double-error detection when the data word contains (a) 25 bits. (b) 55 bits.

7.18* Specify the size of a ROM (number of words and number of bits per word) that will accommodate the truth table for the following combinational circuit components:
(a) a binary multiplier that multiplies two 5-bit binary words, (b) a 5-bit adder–subtractor,

7.19 Tabulate the PLA programming table for the four Boolean functions listed below. Minimize the numbers of product terms.

$A(x, y, z) = \Sigma(0, 2, 3, 7)$ $C(x, y, z) = \Sigma(0, 1, 5, 7)$

$B(x, y, z) = \Sigma(1, 2, 4, 5, 6)$ $D(x, y, z) = \Sigma(0, 2, 3, 4, 6)$

7.8(a) 512K byte $= 512 \times 2^3$ K bits

$$N = \frac{512K}{64K} = 8(個)$$

7.8(b) ① $512K = 2^9 \times 2^{10}$

⇒ (19 lines)

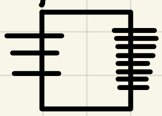
② $64K = 2^6 \times 2^{10} = 2^{16}$

⇒ 16 lines)

7.8(c) we require 8 chips.

⇒ $\log_2 8 = 3$: select inputs to 8 output

⇒ size of decoder $= 3 \times 8 = 24$



7.12 共 $9+4=13$ 個 bits

$C_1 = C_1 \oplus C_3 \oplus C_5 \oplus C_7 \oplus C_9 \oplus C_{11} \oplus C_{13}$

$C_2 = C_2 \oplus C_3 \oplus C_6 \oplus C_7 \oplus C_{10} \oplus C_{11}$

$C_4 = C_4 \oplus C_5 \oplus C_6 \oplus C_7 \oplus C_{12} \oplus C_{13}$

$C_8 = C_8 \oplus C_9 \oplus C_{10} \oplus C_{11} \oplus C_{12} \oplus C_{13}$

(a)

C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}	C_{12}	C_{13}
0	1	1	1	0	0	1	0	1	0	1	0	0

$C_1 = 0$

$C_2 = 0$

$C_4 = 0$ ⇒ 沒有錯 ⇒ orignal: 100 110 100

$C_8 = 0$

(b)

C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}	C_{12}	C_{13}
1	1	1	1	0	1	0	1	0	0	1	1	1

$C_1 = 0$

$C_2 = 0$ ⇒ no error ⇒ original: 101000111

$C_4 = 0$

$C_8 = 0$

7.13 $2^k - 1 \geq n + k$, k: check bits

$2^k - 1 \geq 25 + k$

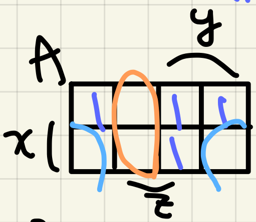
(a) min $k = 5$, 需 $5+1=6$ bits

(b) min $k = 6$, 需 $6+1=7$ bits

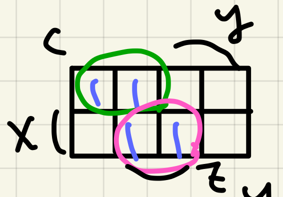
7.18 (b) $2^{5+5+1} \times (5+1) = 2^{11} \times 6$ (a) $2^{5+5} \times (5+5) = 2^{10} \times 10$

add/substract　6 bits

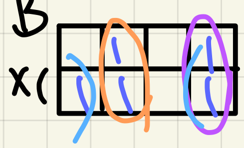
7.19



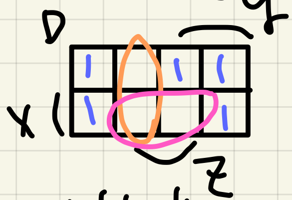
$A = (y'z + xz')'$



$C = x'y' + xz$



$B = y'z + xz' + yz'$



$D = (y'z + xz)'$

Product term		input			output			
		x	y	z	A (C)	B (T)	C (T)	D (C)
1	$y'z$	–	0	1	1	–	1	1
2	xz'	1	–	0	1	1	–	–
3	yz'	–	1	0	–	1	–	–
4	$x'y'$	0	–	0	–	–	1	–
5	xz	1	–	1	–	–	1	1