[컴퓨터구조] Home work 4

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Chap 5.

Review questions

5.3) SRAM is used for cache memory and DRAM is used for main memory.

5.4) SRAM has faster access times than DRAM.
DRAM is less expensive and smaller than SRAM.

Problems

5.10) The word 001101001111 is stored.
The error : C8, Fetched word : 001111 001111

position	12	11	10	9	8	7	6	5	4	3	2	1
Bits	D8	D7	D6	D5	C8	D4	D3	D2	C4	D1	C2	C1
Block	0	0	1	1	1	1	0	0	1	1	1	1
Code			1010	1001		0111				0011		

Position	Code
Hamming	1111
10	1010
9	1001
7	0111
3	0011
XOR=syndrome	1000

The nonzero result detects and error and indicates that the error is in bit position 8, which is check bit C8.

5.11) Data bits with value 1 are in bit positions 12, 11, 5, 4, 2, 1.

Position	12	11	10	9	8	7	6	5	4	3	2	1
Bits	D8	D7	D6	D5	C8	D4	D3	D2	C4	D1	C2	C1
Block	1	1	0	0		0	0	1		0		
Codes	1100	1011						0101				

The check bits are in bit numbers 8, 4, 2, 1.
Check bit 8 calculated by values in bit numbers : 12, 11, 10, 9
Check bit 4 calculated by values in bit numbers : 12, 7, 6, 5
Check bit 2 calculated by values in bit numbers : 11, 10, 7, 6, 3
Check bit 1 calculated by values in bit numbers : 11, 9, 7, 5, 3
∴ Check bits : 0 0 1 0

5.12) The Hamming word initially calculated

bit number :	12	11	10	9	8	7	6	5	4	3	2	1
	0	0	1	0	1	0	0	0	0	1	1	1

Doing an exedusive-OR of 1001 and 0101 yields 1100 indicating an error in bit 11 of the Hamming word.
Thus, the data word read from memory was 01100001

5.13) $1024 + K \leq 2^K - 1$ (K : check bits)
The minimum value of $K = 11$

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5.14) 5 check bits are needed for an SEC code for 16-bit data words.

Bit Position	Position Number	Check Bits	Data Bits
21	10101		M16
20	10100		M15
19	10011		M14
18	10010		M13
17	10001		M12
16	10000	C16	
15	01111		M11
14	01110		M10
13	01101		M9
12	01100		M8
11	01011		M7
10	01010		M6
9	01001		M5
8	01000	C8	
7	00111		M4
6	00110		M3
5	00101		M2
4	00100	C4	
3	00011		M1
2	00010	C2	
1	00001	C1	

C16	C8	C4	C2	C1
1	1	1	1	0
1	0	1	1	1
0	1	0	0	1

∴ Error identified in bit position 9, which is Data bit 5.

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