

計結 CH5

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$$1.(1) \text{ block size} = 2^{12} \text{ (byte)} = 4 \text{ (KB)}$$

$$(2) \# \text{ of block} = 2^{10} = 1024$$

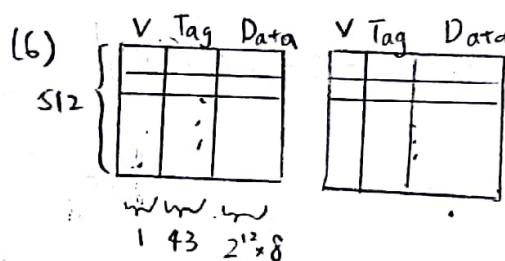
$$(3) \quad 4KB \times 1024 = 4096 \text{ (KB)}$$

$$(4) \quad (2^{12} \times 8 + 42 + 1 + 1) \times \frac{1}{8} \times 1024 = 4199936 \text{ (byte)}$$

(5) miss, hit, hit, miss, miss

miss, miss, hit, hit, hit,

miss, miss, hit, miss, hit



(1) miss, hit, hit, miss, miss,

miss, hit, hit, hit, hit,

miss, hit, hit, hit, hit

2

$$(1) \quad CPI = 2 \Rightarrow IPC = \frac{1}{2} = 0.5$$

$$(2) \text{ write bandwidth} = 0.5 \times \frac{100}{1000} \times 4 = 0.2 \text{ (bytes/cycle)}$$

3.

$$(1) 1.5 + \frac{7}{100} \times 200 = 15.5$$

$$(2) 1.5 + \frac{7}{100} \times 12 + \frac{7}{100} \times \frac{3.5}{100} \times 200 = 2.83$$

$$(3) 1.5 + \frac{7}{100} \times 28 + \frac{7}{100} \times \frac{1.5}{100} \times 200 = 3.67$$

$$(4) 1.5 + \frac{7}{100} \times 12 + \frac{7}{100} \times \frac{3.5}{100} \times 50 + \frac{7}{100} \times \frac{3.5}{100} \times \frac{1.3}{100} \times 200 = 2.46887$$

$$(5) 1.5 + \frac{7}{100} \times 28 + \frac{7}{100} \times \frac{1.5}{100} \times 50 + \frac{7}{100} \times \frac{1.5}{100} \times \frac{1.3}{100} \times 200 = 3.51523$$

4. LRU replacement policy

	tag	index	offset	hit/miss
0	00	00	0	miss
1	00	00	1	hit
2	00	01	0	miss
3	00	01	1	hit
4	00	10	0	miss
5	00	10	1	hit
6	00	11	0	miss
7	00	11	1	hit
4	00	10	0	hit
5	00	10	1	hit
6	00	11	0	hit
7	00	11	1	hit
8	01	00	0	miss
9	01	00	1	hit
10	01	01	0	miss
11	01	01	1	hit
16	10	00	0	miss
17	10	00	1	hit

cache

index	dirty bit	valid bit	tag	LRU	block0	block1
0	0	1	10	0	mem [16]	mem [17]
	0	1	01	1	mem [8]	mem [9]
1	0	1	00	1	mem [2]	mem [3]
	0	1	01	0	mem [10]	mem [11]
2	0	1	00	0	mem [4]	mem [5]
	0	0		1		
3	0	1	00	0	mem [6]	mem [7]
	0	0		1		

LRU 代表該 way 是否為 least-recently used，若 $LRU=1$ ，代表等一下如果這個 index 下的兩個 way 都滿了卻還有人要塞進這個 index 下，就把 $LRU=1$ 這個 way 更新成新的值，並將此 index 下另一個 way 的 LRU 變成 1，新進來的資料 $LRU=0$ 。

5.

$$(1) (2^{19} \times 4) \times 5 = 10485760 \text{ (byte)} = 10.5 \text{ (MB)}$$

$$(2) \# \text{ of P2 needed} = \left\lceil \frac{100 \text{ MB}}{2^{24}} \right\rceil = 7$$

$$\text{Size of P2 table} = (2^{11} \times 4) \times 7 = 56 \text{ (KB)}$$

$$\text{Size of P1 table} = 4 \times 2^8 = 1 \text{ (KB)}$$

$$\text{total size} = (56+1) \times 5 = 285 \text{ (KB)}$$