Chapter 5

5.2

5.2.1

Word Address	Binary Address	Tag	Index	Hit/Miss
0x03	0000 0011	0	3	M
0xb4	1011 0100	b	4	M
0x2b	0010 1011	2	b	M
0x02	0000 0010	0	2	M
0xbf	1011 1111	b	f	M
0x58	0101 1000	5	8	M
0xbe	1011 1110	b	e	M
0x0e	0000 1110	0	e	M
0xb5	1011 0101	b	5	M
0x2c	0010 1100	2	c	M
0xba	1011 1010	b	a	M
0xfd	1111 1101	f	d	M

5.2.2

Word Address	Binary Address	Tag	Index		Hit/Miss
0x03	0000 0011	0	1	1	M
0xb4	1011 0100	b	2	0	M
0x2b	0010 1011	2	5	1	M
0x02	0000 0010	0	1	0	H
0xbf	1011 1111	b	7	1	M
0x58	0101 1000	5	4	0	M
0xbe	1011 1110	b	6	0	H
0x0e	0000 1110	0	7	0	M
0xb5	1011 0101	b	2	1	H
0x2c	0010 1100	2	6	0	M
0xba	1011 1010	b	5	0	M
0xfd	1111 1101	f	6	1	M

5.2.3

Word Address	Binary Address	Tag	Cache 1 index	Cache 1 hit/miss	Cache 2 index	Cache 2 hit/miss	Cache 3 index	Cache 3 hit/miss
0x03	0000 0011	0x00	3	M	1	M	0	M
0xb4	1011 0100	0x16	4	M	2	M	1	M
0x2b	0010 1011	0x05	3	M	1	M	0	M
0x02	0000 0010	0x00	2	M	1	M	0	M
0xbf	1011 1111	0x17	7	M	3	M	1	M
0x58	0101 1000	0x0b	0	M	0	M	0	M
0xbe	1011 1110	0x17	6	M	3	H	1	H
0x0e	0000 1110	0x01	6	M	3	M	1	M
0xb5	1011 0101	0x16	5	M	2	H	1	M
0x2c	0010 1100	0x05	4	M	2	M	1	M
0xba	1011 1010	0x17	2	M	1	M	0	M
0xfd	1111 1101	0x1F	5	M	2	M	1	M

Cache 1 miss rate = 100%

Cache 1 total cycles = 324

Cache 2 miss rate = 83%

Cache 2 total cycles = 286

Cache 3 miss rate = 92%

Cache 3 total cycles = 335

Cache 2 provides the best performance.

5.5

5.5.1

4 words

5.5.2

32 lines in the cache

5.5.3

The ratio is 1.21

5.5.4

Byte Address	Binary Address	Tag	Index	Offset	Hit/Miss	Bytes Replaced
0x00	0000 0000 0000	0x0	0x00	0x00	M	
0x04	0000 0000 0100	0x0	0x00	0x04	H	
0x10	0000 0001 0000	0x0	0x00	0x10	H	
0x84	0000 1000 0100	0x0	0x04	0x04	M	
0xe8	0000 1110 1000	0x0	0x07	0x08	M	
0xa0	0000 1010 0000	0x0	0x05	0x00	M	
0x400	0100 0000 0000	0x1	0x00	0x00	M	0x00-0x1F
0x1e	0000 0001 1110	0x0	0x00	0x1e	M	0x400-0x41F
0x8c	0000 1000 1100	0x0	0x04	0x0c	H	
0xc1c	1100 0001 1100	0x3	0x00	0x1c	M	0x00-0x1F
0xb4	0000 1011 0100	0x0	0x05	0x14	H	
0x884	1000 1000 0100	0x2	0x04	0x04	M	0x80-0x9f

5.5.5

33%

5.5.6

< index, tag, data >

< 0, 3, Mem[0xC00]-Mem[0xC1F] >

< 4, 2, Mem[0x880]-Mem[0x89f] >

< 5, 0, Mem[0x0A0]-Mem[0x0Bf] >

< 7, 0, Mem[0x0e0]-Mem[0x0ff] >

5.13

5.13.1

3 years and 1 day, 1096 days, 26,304 hours

5.13.2

99.90875912%