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CACHE

CPU generates the following addresses:

57, 61, 40, 46, 168, 170

IS EACH ADDRESS A HIT OR MISS?

ASSUMPTIONS

• 8 BYTES / BLOCK

CACHE

000	001	010	011	100	101	110	111
0	1	2	3	4	5	6	7

RAM	00	0	1	2	3	4	5	6	7
	01	8	9	10	11	12	13	14	15
	10	16	17	18	19	20	21	22	23
	11	24	25	26	27	28	29	30	31

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8 | 57

7

R

1

↓
BLOCK 7 IN RAM

→
BYTE OFFSET

CONVERT 57 TO BINARY

TAKE BLOCK NO. 7 : LOOK IT UP IN TABLE.

00111001

ROW 00 COLUMN 111

ROW	COLUMN	BYTE OFFSET
00	111	001

ADDRESS
57

BINARY
00111001

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WHAT DOES THE CACHE LOOK LIKE NOW?

INDEX	VALID BIT	TAG	DATA
000	0		
001	0		
010	0		
011	0		
100	0		
→ 101	01	00	40 41 42 43 44 45 46 47
110	0		
111	01	00	^{BYTE} 56 57 58 59 60 61 62 63 xxxxxxx

Which bytes are loaded into cache
LINE 111

56	00111:0001
→ 57	00111:0011
58	00111:0101
59	00111:0111
60	00111:1001
→ 61	00111:1011
62	00111:1110
63	00111:1111

(4)

57 : MISS

61 : HIT - WHY?

TAG	INDEX	BYTE OFFSET
00	111	101

~~TO WORK OUT IF MISS OR HIT?~~

57:

00	111	001
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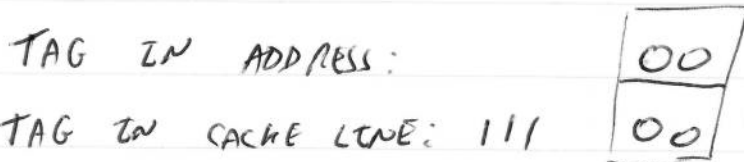
- Look up in cache 111 (Block 7 in cache)
 - SET TAG TO 00
 - DATA : LOAD BYTES 56 THROUGH 63 FROM RAM INTO CACHE.
 - SET VALID BIT ON ^{CACHE} LINE 111 TO 1
- THIS WAS A COMPULSORY MISS FOR 57

(5)

ADDRESS 61:



- Look up cache line 111
- Compare TAG (IN ADDRESS)
WITH TAG (IN CACHE LINE 111)



IF THEY MATCH AND VALID BIT IS 1 \Rightarrow CACHE HIT

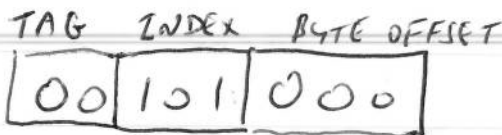
ADDRESS 40: ?

COMPULSORY MISS

8 | 40



00101000



(6)

46: 00|101|110
 ↓
 INDEX

TAGS MATCH & VALID BIT = 1 = HIT

168: 8|168
 21 R 0
 TAG
 10|101|000
 ↓
 INDEX

COMPARE TAGS:

TAG IN ADDRESS 10

TAG IN CACHE 00

THEY DONT MATCH → (EVEN THOUGH
VALID BIT IS 1)

THIS IS A CONFLICT MISS

BLOCK 5 IS IN CACHE

BLOCK 21 NEEDS TO BE COPIED INTO CACHE.

- NEED TO COPY IN BLOCK 21
- EVICT BLOCK 5.