Computer Architectures
Exam of 12/02/2025

A1

Question 2 (6 points)

Consider a processor connected to 128 KB of memory and equipped with a set-associative cache consisting of 8 sets of 4 lines each, for a total of 32 different lines, each of 32 bytes. Assuming that:

- The cache is initially not empty, and its configuration is reported in the Cache table.
- The adopted replacing algorithm is the Least Recently Used (LRU). In the Cache table, blocks are marked with an ascending label indicating when they were inserted or accessed. Specifically, the most recently used block is marked with 0, while the least recently used block is marked with 3.

Given the sequence of memory accesses shown in the Accesses table, determine the corresponding set and line being accessed. Use the Cache table to help you calculate the line involved in each operation. This way, you will get the final cache status. Finish by providing the total number of hits and misses that occurred.

Accesses

Block	Block (Binary)	Accessed Set	Accessed Line	H/M
4056	1111 1101 1000			
2246	1000 1100 0110			
2698	1010 1000 1010			
458	0001 1100 1010			
582	0010 0100 0110			
677	0010 1010 0101			
1475	0101 1100 0011			
3093	1100 0001 0101			
1359	0101 0100 1111			
3	0000 0000 0011			
4007	1111 1010 0111			
1876	0111 0101 0100			
350	0001 0101 1110			
818	0011 0011 0010			
953	0011 1011 1001			
4056	1111 1101 1000			
1492	0101 1101 0100			
1111	0100 0101 0111			
3385	1101 0011 1001			
1475	0101 1100 0011			

Cache

	Set 0			Set 2			Set 4			Set 6	
Line 0	3520	2	***Line 8***	2698	1	***Line 16***	380	3	***Line 24***	2398	1
Line 1	1000	0	***Line 9***	3594	3	***Line 17***	1492	1	***Line 25***	854	3
Line 2	2784	3	***Line 10***	4050	2	***Line 18***	3924	2	***Line 26***	2246	0
Line 3	1368	1	***Line 11***	458	0	***Line 19***	388	0	***Line 27***	582	2

	Set 1			Set 3			Set 5			Set 7	
Line 4	769	0	***Line 12***	3	3	***Line 20***	45	2	***Line 28***	4007	1
Line 5	345	2	***Line 13***	3923	1	***Line 21***	3877	3	***Line 29***	1359	0
Line 6	2569	1	***Line 14***	1475	0	***Line 22***	117	1	***Line 30***	879	2
Line 7	1297	3	***Line 15***	3675	2	***Line 23***	3093	0	***Line 31***	3703	3

Number of hits: ____ Number of misses: ____