Take Home Assignment 03

210598B

Assume there are three small caches, each consisting of four one-word blocks. One cache is fully associative, the second is two-way set associative, and the third is direct mapped. Find the number of misses for each cache organization given the following sequence of block addresses: 2,1,0,5,9 and 8.

Direct Mapping

2	**(2%4) = 2**
1	**(1%4) = 1**
0	**(0%4) = 0**
5	**(5%4) = 1**
9	**(9%4) = 1**
8	**(8%4) = 0**

Now we can fill in the cache contents after each reference, using a blank entry to mean that the block is invalid, colored text to show a new entry added to the cache for the associated reference, and plain text to show an old entry in the cache:

Block Address	Hit/Miss	Content of cache blocks after reference			
		0	1	2	3
2	Miss			Memory[2]	
1	Miss		Memory[1]	Memory[2]	
0	Miss	Memory[0]	Memory[1]	Memory[2]	
5	Miss	Memory[0]	Memory[5]	Memory[2]	
9	Miss	Memory[0]	Memory[9]	Memory[2]	
8	Miss	Memory[8]	Memory[2]	Memory[2]	

The direct mapping cache generates 6 misses for 6 accesses.

2 – way set associative

Block Address	**Cache Block**
2	**(2%2) = 0**
1	**(1%2) = 1**
0	**(0%2) = 0**
5	**(5%2) = 1**
9	**(9%2) = 1**

8	**(8%2) = 0**				
Block Address	Hit/Miss	Content of cache blocks after reference			
		0	0	1	1
2	Miss	Memory[2]			
1	Miss	Memory[2]		Memory[1]	
0	Miss	Memory[2]	Memory[0]		
5	Miss	Memory[2]	Memory[0]	Memory[1]	Memory[5]
9	Miss	Memory[2]	Memory[0]	Memory[9]	Memory[5]
8	Miss	Memory[8]	Memory[0]	Memory[9]	Memory[5]

The 2- way set associative generates 6 misses for 6 accesses.

Fully Associative

Block Address	Hit/Miss	Content of cache blocks after reference			
		0	1	2	3
2	Miss	Memory[2]			
1	Miss	Memory[2]	Memory[1]		
0	Miss	Memory[2]	Memory[1]	Memory[0]	
5	Miss	Memory[2]	Memory[1]	Memory[0]	Memory[5]
9	Miss	Memory[9]	Memory[1]	Memory[0]	Memory[5]
8	Miss	Memory[9]	Memory[8]	Memory[0]	Memory[5]

The fully associative generates 6 misses for 6 accesses.