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CS2323 Lab 7
ES20BTECH11029

Q1. Program 1:

L1: (8, 8)						
Lines	Blocks	Ways	Hit Rate	# hits	# misses	Total # accesses
1	2	0	0.7424	49	17	66
2	2	0	0.7424	49	17	66
3	2	0	0.7424	49	17	66
4	2	0	0.7424	49	17	66
5	2	0	0.7424	49	17	66
3	1	0	0.5	33	33	66
3	2	0	0.7424	49	17	66
3	3	0	0.8636	57	9	66
3	4	0	0.9242	61	5	66
3	5	0	0.9545	63	3	66
3	2	0	0.7424	49	17	66
3	2	1	0.7424	49	17	66
3	2	2	0.7424	49	17	66

L1: (8, 16)						
Lines	Blocks	Ways	Hit Rate	# hits	# misses	Total # accesses
1	2	0	0.7462	97	33	130
2	2	0	0.7462	97	33	130
3	2	0	0.7462	97	33	130
4	2	0	0.7462	97	33	130
5	2	0	0.7462	97	33	130
3	1	0	0.5	65	65	130
3	2	0	0.7462	97	33	130
3	3	0	0.8692	113	17	130
3	4	0	0.9308	121	9	130
3	5	0	0.9615	125	5	130
3	2	0	0.7462	97	33	130
3	2	1	0.7462	97	33	130
3	2	2	0.7462	97	33	130

L1: (16, 8)						
Lines	Blocks	Ways	Hit Rate	# hits	# misses	Total # accesses
1	2	0	0.7462	97	33	130
2	2	0	0.7462	97	33	130
3	2	0	0.7462	97	33	130
4	2	0	0.7462	97	33	130
5	2	0	0.7462	97	33	130
3	1	0	0.5	65	65	130
3	2	0	0.7462	97	33	130
3	3	0	0.8692	113	17	130
3	4	0	0.9308	121	9	130
3	5	0	0.9615	125	5	130
3	2	0	0.7462	97	33	130
3	2	1	0.7462	97	33	130
3	2	2	0.7462	97	33	130

L1: (16, 16)						
Lines	Blocks	Ways	Hit Rate	# hits	# misses	Total # accesses
1	2	0	0.7481	193	65	258
2	2	0	0.7481	193	65	258
3	2	0	0.7481	193	65	258
4	2	0	0.7481	193	65	258
5	2	0	0.7481	193	65	258
3	1	0	0.5	129	129	258
3	2	0	0.7481	193	65	258
3	3	0	0.8721	225	33	258
3	4	0	0.9341	241	17	258
3	5	0	0.9651	249	9	258
3	2	0	0.7481	193	65	258
3	2	1	0.7481	193	65	258
3	2	2	0.7481	193	65	258

In P1, hit rate doesn’t change with lines if blocks and ways are fixed nor with ways if lines and blocks are fixed but increases if blocks are increased while lines and ways are kept fixed.

Program 2:

L1: (8, 8)						
Lines	Blocks	Ways	Hit Rate	# hits	# misses	Total # accesses
1	2	0	0.0303	2	64	66
2	2	0	0.0303	2	64	66
3	2	0	0.04545	3	63	66
4	2	0	0.7424	49	17	66
5	2	0	0.7424	49	17	66
3	1	0	0.01515	1	65	66
3	2	0	0.04545	3	63	66
3	3	0	0.8636	57	9	66
3	4	0	0.9242	61	5	66
3	5	0	0.9545	63	3	66
3	2	0	0.04545	3	63	66
3	2	1	0.7424	49	17	66
3	2	2	0.7424	49	17	66

L1: (8, 16)						
Lines	Blocks	Ways	Hit Rate	# hits	# misses	Total # accesses
1	2	0	0.01538	2	128	130
2	2	0	0.01538	2	128	130
3	2	0	0.01538	2	128	130
4	2	0	0.01538	2	128	130
5	2	0	0.01538	2	128	130
3	1	0	0.007692	1	129	130
3	2	0	0.01538	2	128	130
3	3	0	0.01538	2	128	130
3	4	0	0.01538	2	128	130
3	5	0	0.9385	122	8	130
3	2	0	0.01538	2	128	130
3	2	1	0.01538	2	128	130
3	2	2	0.01538	2	128	130

L1: (16, 8)						
Lines	Blocks	Ways	Hit Rate	# hits	# misses	Total # accesses
1	2	0	0.01538	2	128	130
2	2	0	0.01538	2	128	130
3	2	0	0.03846	5	125	130
4	2	0	0.8538	111	19	130
5	2	0	0.8538	111	19	130
3	1	0	0.007692	1	129	130
3	2	0	0.03846	5	125	130
3	3	0	0.9231	120	10	130
3	4	0	0.9615	125	5	130
3	5	0	0.9769	127	3	130
3	2	0	0.03846	5	125	130
3	2	1	0.8538	111	19	130
3	2	2	0.8538	111	19	130

L1: (16, 16)						
Lines	Blocks	Ways	Hit Rate	# hits	# misses	Total # accesses
1	2	0	0.007752	2	256	258
2	2	0	0.007752	2	256	258
3	2	0	0.007752	2	256	258
4	2	0	0.007752	2	256	258
5	2	0	0.01163	3	255	258
3	1	0	0.003876	1	257	258
3	2	0	0.007752	2	256	258
3	3	0	0.007752	2	256	258
3	4	0	0.01163	3	255	258
3	5	0	0.9574	247	11	258
3	2	0	0.007752	2	256	258
3	2	1	0.007752	2	256	258
3	2	2	0.007752	2	256	258

In P2, the hit rate is low if the number of lines, ways and blocks is low but hit rate is high if that number is increased.

Q2. Program 1:

L1: (8, 8)					
Write Policy	Write allocation	Hit Rate	# hits	# misses	Total # accesses
Write-back	With allocation	0.7462	97	33	130
Write-back	Without allocation	0.04545	3	63	66
Write-through	With allocation	0.7462	97	33	130
Write-through	Without allocation	0.04545	3	63	66
L1: (16, 8)					
Write Policy	Write allocation	Hit Rate	# hits	# misses	Total # accesses
Write-back	With allocation	0.7462	97	33	130
Write-back	Without allocation	0.02308	3	63	66
Write-through	With allocation	0.7462	97	33	130
Write-through	Without allocation	0.02308	3	63	66
L1: (8, 16)					
Write Policy	Write allocation	Hit Rate	# hits	# misses	Total # accesses
Write-back	With allocation	0.7462	97	33	130
Write-back	Without allocation	0.02308	3	63	66
Write-through	With allocation	0.7462	97	33	130
Write-through	Without allocation	0.02308	3	63	66
L1: (16, 16)					
Write Policy	Write allocation	Hit Rate	# hits	# misses	Total # accesses
Write-back	With allocation	0.7481	193	65	258
Write-back	Without allocation	0.01163	3	255	258
Write-through	With allocation	0.7481	193	65	258
Write-through	Without allocation	0.01163	3	255	258

In P1, the hit rate is low if we do not use write allocation but it is increased if we use write allocation.

Program 2:

L1: (8, 8)					
Write Policy	Write allocation	Hit Rate	# hits	# misses	Total # accesses
Write-back	With allocation	0.7424	49	17	66
Write-back	Without allocation	0.04545	3	63	66
Write-through	With allocation	0.7424	49	17	66
Write-through	Without allocation	0.04545	3	63	66
L1: (16, 8)					
Write Policy	Write allocation	Hit Rate	# hits	# misses	Total # accesses
Write-back	With allocation	0.8538	111	19	130
Write-back	Without allocation	0.02308	3	127	130
Write-through	With allocation	0.8538	111	19	130
Write-through	Without allocation	0.02308	3	127	130
L1: (8, 16)					
Write Policy	Write allocation	Hit Rate	# hits	# misses	Total # accesses
Write-back	With allocation	0.01538	2	128	130
Write-back	Without allocation	0.02308	3	127	130
Write-through	With allocation	0.01538	2	128	130
Write-through	Without allocation	0.02308	3	127	130
L1: (16, 16)					
Write Policy	Write allocation	Hit Rate	# hits	# misses	Total # accesses
Write-back	With allocation	0.01163	3	255	258
Write-back	Without allocation	0.01163	3	255	258
Write-through	With allocation	0.01163	3	255	258
Write-through	Without allocation	0.01163	3	258	258

In P2, the hit rate is generally low except for (8, 8) and (16, 8) values of L1 when we use write back and write through policies with allocation.

Q3. Program 1:

L1: (8, 8)				
Type of configuration	Hit Rate	# hits	# misses	Total # accesses
32 entry 4-word direct mapped	0.7424	49	17	66
32 entry 4-word 2-way set associative	0.7424	49	17	66
32-entry 4-word fully associative	0.7424	49	17	66
L1: (16, 8)				
Type of configuration	Hit Rate	# hits	# misses	Total # accesses
32 entry 4-word direct mapped	0.7462	97	33	130
32 entry 4-word 2-way set associative	0.7462	97	33	130
32-entry 4-word fully associative	0.7462	97	33	130
L1: (8, 16)				
Type of configuration	Hit Rate	# hits	# misses	Total # accesses
32 entry 4-word direct mapped	0.7462	97	33	130
32 entry 4-word 2-way set associative	0.7462	97	33	130
32-entry 4-word fully associative	0.7462	97	33	130
L1: (16, 16)				
Type of configuration	Hit Rate	# hits	# misses	Total # accesses
32 entry 4-word direct mapped	0.7481	193	65	258
32 entry 4-word 2-way set associative	0.7481	193	65	258
32-entry 4-word fully associative	0.7481	193	65	258

In P1, the hit rate is the same for all configurations for each parameter of L1.

Program 2:

L1: (8, 8)				
Type of configuration	Hit Rate	# hits	# misses	Total # accesses
32-entry 4-word direct mapped	0.7424	49	17	66
32-entry 4-word 2-way set associative	0.7424	49	17	66
32-entry 4-word fully associative	0.7424	49	17	66

L1: (16, 8)				
Type of configuration	Hit Rate	# hits	# misses	Total # accesses
32-entry 4-word direct mapped	0.8538	111	19	130
32-entry 4-word 2-way set associative	0.8538	111	19	130
32-entry 4-word fully associative	0.8538	111	19	130

L1: (8, 16)				
Type of configuration	Hit Rate	# hits	# misses	Total # accesses
32-entry 4-word direct mapped	0.01538	2	128	130
32 entry 4-word 2-way set associative	0.01538	2	128	130
32-entry 4-word fully associative	0.6308	82	48	130

L1: (16, 16)				
Type of configuration	Hit Rate	# hits	# misses	Total # accesses
32-entry 4-word direct mapped	0.01163	3	255	258
32-entry 4-word 2-way set associative	0.007752	2	256	258
32-entry 4-word fully associative	0.6899	178	80	258

In P2, the hit rate is the same for all configurations for each of (8, 8) and (8, 16) values of L1. However, for (8, 16) and (16, 16) values of L1, the hit rate is high if we use a 32-entry 4-word fully associative cache.

Program 3:

L1: (8, 8)				
Configuration	Hit Rate	# hits	# misses	Total # accesses
32-entry 4-word direct mapped	0.01538	2	128	130
32-entry 4-word 2-way set associative	0.7385	96	34	130
32-entry 4-word fully associative	0.7385	96	34	130

L1: (16, 8)				
Configuration	Hit Rate	# hits	# misses	Total # accesses
32-entry 4-word direct mapped	0.01163	3	255	258
32-entry 4-word 2-way set associative	0.7442	192	66	258
32-entry 4-word fully associative	0.7442	192	66	258

L1: (8, 16)				
Type of configuration	Hit Rate	# hits	# misses	Total # accesses
32 entry 4-word direct mapped	0.01163	3	255	258
32-entry 4-word 2-way set associative	0.7442	192	66	258
32-entry 4-word fully associative	0.7442	192	66	258

L1: (16, 16)				
Type of configuration	Hit Rate	# hits	# misses	Total # accesses
32 entry 4-word direct mapped	0.06809	35	479	514
32-entry 4-word 2-way set associative	0.7471	384	130	514
32-entry 4-word fully associative	0.7471	384	130	514

In P3, hit rate is high if only we use either a 32-entry 4-word 2-way set associative or a 32-entry 4-word fully associative cache.