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2CSC205 section 1 Spring 2015

Homework 9

How to Submit:

Please submit your solutions (parts A and B separately) through Blackboard. Remember to put your name and homework number on all the documents that you submit as attachments.

Total possible points in this homework: 5 for Part B

(You receive 1 bonus point towards Part A if you get all Part A questions correct.)

Part A

1. This problem explores the problem of thrashing in different types of cache. Consider a system of 12Kbytes of main memory partitioned into blocks of 1Kbytes each. The system has cache of size 4Kbytes. The main memory blocks are being accessed in the following order: 2, 6, 10, 6, 10, 2, 10, 2 (the numbers are in decimal). Assuming the cache is empty at the start. Show whether each memory block access is a hit or a miss. Then, compute the hit ratio for each of the following cases.
   1. The system uses directly mapped cache;

|  |  |  |
| --- | --- | --- |
| Memory Block | Maps to Cache Block | Hit/Miss |
| 2 | 2 | Miss |
| 6 | 2 | Miss |
| 10 | 2 | Miss |
| 6 | 2 | Miss |
| 10 | 2 | Miss |
| 2 | 2 | Miss |
| 10 | 2 | Miss |
| 2 | 2 | Miss |
| Hit ratio: | | 0% |

* 1. The system uses fully associative cache and first-in-first-out replacement policy;

|  |  |  |
| --- | --- | --- |
| Memory Block | Maps to Cache Block | Hit/Miss |
| 2 | 0 | Miss |
| 6 | 1 | Miss |
| 10 | 2 | Miss |
| 6 | 1 | Hit |
| 10 | 2 | Hit |
| 2 | 0 | Hit |
| 10 | 2 | Hit |
| 2 | 0 | Hit |
| Hit ratio: | | 62.5% |

* 1. The system uses 2-way set associative cache and first-in-first-out replacement policy.

|  |  |  |  |
| --- | --- | --- | --- |
| Memory Block | Maps to Cache | | Hit/Miss |
| Set | Block |
| 2 | 0 | 0 | Miss |
| 6 | 0 | 1 | Miss |
| 10 | 0 | 0 | Miss |
| 6 | 0 | 1 | Hit |
| 10 | 0 | 0 | Hit |
| 2 | 0 | 1 | Miss |
| 10 | 0 | 0 | Hit |
| 2 | 0 | 1 | Hit |
| Hit ratio: | | | 50% |

1. Consider a 2-level memory hierarchy with parameters *T1*=5, *T2*=100. The hit rate *h* is known to be 0.8. Find the EAT of this system if the access strategy is:
   1. Parallel.

EAT = h\*T1 + (1-h)\*T2 = 0.8\*5 + (1-0.8)\*100 = 24

* 1. Sequential.

EAT = T1 + (1-h)\*T2 = 5 + (1-0.8)\*100 = 25