# Cache Quiz

**Due** Mar 12 at 11:59pm **Points** 100 **Questions** 11
**Available** until Mar 13 at 11:59pm **Time Limit** None **Allowed Attempts** 3

# Instructions

- This quiz should be done by yourself
- If you have questions please come to office hours
- If you find any mistakes in any of the questions, please let us know about them and we will fix them as soon as possible.

Take the Quiz Again

## Attempt History

| | Attempt | Time | Score |
|---|---|---|---|
| **KEPT** | Attempt 2 | 51 minutes | 87.96 out of 100 |
| **LATEST** | Attempt 2 | 51 minutes | 87.96 out of 100 |
| | Attempt 1 | 21,431 minutes | 82.24 out of 100 |

ⓘ Correct answers are hidden.

Score for this attempt: **87.96** out of 100
Submitted Mar 12 at 6:56pm
This attempt took 51 minutes.

### Question 1 — 9 / 9 pts

You have a Direct Mapped cache with following parameters

| | |
|---|---|
| Cache Data Size (C) | 128 |
| Block Size (b) | 4 |

After partitioning the address, which is 32 bits big, into Tag, Set, and Offset, how many bits will be in each field?

| | Tag | Set | Offse |
|---|---|---|---|
| Bits per field | [ Select ] | [ Select ] | [ Se |

**Answer 1:**

25

**Answer 2:**

5

**Answer 3:**

2

Partial

## Question 2

3 / 9 pts

You have a Fully Associative cache with following parameters

| | |
|---|---|
| Cache Data Size (C) | 8192 |
| Block Size (b) | 64 |

After partitioning the address, which is 32 bits big, into Tag, Set, and Offset, how many bits will be in each field?

| | Tag | Set | Offset |
|---|---|---|---|
| Bits per field | 21 | 5 | 6 |

**Answer 1:**

21

**Answer 2:**

5

**Answer 3:**

6

## Question 3

**9 / 9 pts**

You have a K-Way set associative cache with following parameters

| | |
|---|---|
| Cache Data Size (C) | 2048 |
| Block Size (b) | 16 |
| Blocks/Ways per set (K) | 4 |

After partitioning the address, which is 32 bits big, into Tag, Set, and Offset, how many bits will be in each field?

| | Tag | Set | Offse |
|---|---|---|---|
| Bits per field | [ Select ] | [ Select ] | [ Se |

**Answer 1:**

23

**Answer 2:**

5

**Answer 3:**

4

## Question 4

9 / 9 pts

You have a single level cache system with the following setup

- CPU -- Cache -- Memory

The system has the following properties

| | |
|---|---|
| Cache Access Time | 763ns |
| Cache Hit Rate | 76% |
| Memory Access Time | 2,397ns |

What is the average memory access time?

Report your answer to **TWO** decimal places.

1,338.28

## Question 5

9 / 9 pts

You have a two-level cache system with the following set up

- CPU -- Cache 1 -- Cache 2 -- Memory

The system has the following properties

| | |
|---|---|
| Cache1 Access Time | 40ns |
| Cache1 Hit Rate | 75% |
| Cache2 Access Time | 257ns |
| Cache2 Hit Rate | 90% |
| Memory Access Time | 2,264ns |

What is the average memory access time?

Report your answer to **TWO** decimal places.

160.85

## Question 6

**9 / 9 pts**

You have a three-level cache system with the following set up

- CPU -- Cache 1 -- Cache 2 -- Cache 3 -- Memory

The system has the following properties

| | |
|---|---|
| Cache1 Access Time | 26ns |
| Cache1 Hit Rate | 92% |
| Cache2 Access Time | 298ns |
| Cache2 Hit Rate | 78% |
| Cache3 Access Time | 129ns |
| Cache3 Hit Rate | 100% |
| Memory Access Time | 1,623ns |

What is the average memory access time?

Report your answer to **TWO** decimal places.

52.11

## Question 7

9 / 9 pts

Select all of the statements that are **TRUE**

- [ ] A Write Through Cache DOES have a dirty bit
- [x] A Write Through Cache does NOT have a dirty bit
- [x] A Write Back Cache DOES have a dirty bit
- [ ] A Write Back Cache does NOT have a dirty bit

Partial

## Question 8

7.2 / 9 pts

For each of the following overhead bits, select whether there are these bits per cache, per set, per block, or per value.

- Assume the cache is a K-way set associative cache.

| | Instance Per |
|---|---|
| Valid Bit | [ Select ] |
| Dirty Bit | Block |
| Tag Bits | [ Select ] |
| Counter if using FIFO replacement policy | [ Select ] |
| Counters if using LRU replacement policy | [ Select ] |

**Answer 1:**

Block

**Answer 2:**

Block

**Answer 3:**

Block

**Answer 4:**

Set

**Answer 5:**

Set

Partial

## Question 9

**6.43 / 9 pts**

For each action, match it with when it occurs. For this problem assume the cache is a K-way set associative cache using a Least Recently Used replacement policy.

| | |
|---|---|
| **Valid Bit Is set to 0 when** | The computer is turned |
| **Valid bit is set to 1 when** | The cache reads a block |
| **Dirty Bit is set to 0 when** | The computer is turned |
| **Dirty Bit is set to 1 when** | The CPU writes to this b |
| **A block is evicted from the cache when** | The block is not in the s |

| | |
|---|---|
| **Tag bits are written to when** | The block is not in the s |
| **The LRU counters of a set are updated when** | A block that maps to tha |

## Question 10

**9 / 9 pts**

Match each type of miss with its definition.

| | |
|---|---|
| **Compulsory Miss** | A miss that occurs beca |
| **Capacity Miss** | A miss that occurs beca |
| **Conflict Miss** | A miss that occurs beca |

Partial

## Question 11

**8.33 / 10 pts**

For each of the cache modifications that we could perform, select whether it will increase, decrease, have no effect, or have an unknown effect on the parameter.

- An unknown effect means that it could either decrease or increase the parameter in question.
- No effect also includes marginal or very little effect
- When answering for multilevel caching, answer based on the caching system as a whole.

| Improvement | Hit Rate | Cache Access Time |
|---|---|---|
| Increase Cache Size (C) | [ Select ] | [ Select ] |
| Increase Associativity(K) | [ Select ] | [ Select ] |
| Increase Block Size(b) | [ Select ] | [ Select ] |
| Use Multilevel Caching | [ Select ] | [ Select ] |

**Answer 1:**

Increase

**Answer 2:**

Increase

**Answer 3:**

Unknown

**Answer 4:**

Increase

**Answer 5:**

Increase

**Answer 6:**

Unknown

**Answer 7:**

Unknown

**Answer 8:**

Increase

**Answer 9:**

Unknown

**Answer 10:**

Increase

**Answer 11:**

Increase

**Answer 12:**

Increase

Quiz Score: **87.96** out of 100