

COMP4300 Spring 2021
Homework 2

1. Suppose you are designing a cache for a machine with 32-bit addresses. The cache is 8MB in size. Cache blocks are 4096 bytes.
 - a. How many blocks can be held in the cache
 - b. How many bits of the address are devoted to the offset?
 - c. If the cache is direct-mapped, how many bits are devoted to the tag and index?
 - d. If the cache is 4-way set associative, how many bits are devoted to the tag and index? How many sets are there?
 - e. If the cache is fully associative, how many bits are devoted to the tag and index?
2. Suppose you have a machine with separate I- and D- caches. The miss rate on the I-cache is 1.6%, and on the D-cache 5.4%. On an I-cache hit, the value can be read in the same cycle the data is requested. On a D-cache hit, one additional cycle is required to read the value. The miss penalty is 110 cycles for data cache, 120 for I-cache. 25% of the instructions on this RISC machine are LW or SW instructions, the only instructions that access data memory. A cycle is 1ns. What is the average memory access time?