CARC103 Week 9 Tutorial – Memory (Ch 06 – Part 2)

Work on the following questions:

1. Consider a byte-addressable computer with 24-bit addresses, a cache capable of storing a total of 32K bytes of data and blocks of 16 bytes. Show the format of a 24-bit memory address for:
   a. Direct mapped
   b. Associative
   c. 4-way set associative

2. Consider a byte-addressable computer with 16-bit addresses, a cache capable of storing a total of 16K bytes of data and blocks of 8 bytes. Show the format of a 16-bit memory address for:
   a. Direct mapped
   b. Associative
   c. 4-way set associative

3. Suppose we have a byte-addressable computer using fully associative mapping with 16-bit main memory addresses and 32 blocks of cache. If each block contains 16 bytes, determine the size of the offset and tag field.

4. How caching and virtual memory help to enhance the performance of computers?

5. What is memory fragmentation? How external and internal fragmentation take place?

6. Consider a byte-addressable computer with 16-bit addresses and a cache of 16 blocks, and each cache block contains 8 words.

   a. If this cache is 2-way set associative, what is the format of a memory address as seen by the cache, that is, what are the sizes of the tag, set, and offset fields?

   b. If this cache is 4-way set associative, what is the format of a memory address as seen by the cache?