

## Example Set 7

1. What does it mean when a cache line is referred to as “clean”?

When a memory block is loaded into some cache line, the line is said to be clean because its contents matches that of the memory block. Once the cache line is written to it is no longer clean (i.e., it is dirty).

2. What is the purpose of the dirty bit in a uniprocessor write-back cache system?

Each cache line has a bit used to record whether the contents of the line has been altered. This “dirty bit”, when set, indicates that the cache line must be written back to memory when the line is removed from the cache. Lines whose dirty bit is not set match the original contents of the block in memory and need not be written back upon removal from the cache.

3. In a shared memory multiprocessor system in which each processor has a separate cache, what does it mean for a cache line to be in the “modified” state?

If a line in a cache is in the modified state, this means that the line is not only dirty (i.e., has been altered) but also that there are no other caches that contain a copy of the same line.

4. What is the difference between a “write invalidate” strategy and a “write update” strategy for a cache?

Both strategies describe what happens when a processor in a multiprocessor system writes to a line in its cache. With the write update strategy all copies of the line in any other caches are also updated. With the write invalidate strategy all copies of the line in any other caches are marked as invalid.

5. What is an advantage of a write invalidate strategy and of a write update strategy?

Write invalidate is advantageous when a processor tends to write repeatedly to the same line because only one invalidation needs to occur. However if the copies of the line in other caches are invalidated, attempts to read the line by other processors would result in misses and would require reading from the much slower memory. So the write update strategy would be advantageous when a write to a line by a processor is followed by reads that map to the same memory block by other processors.