1. **What are the differences among sequential access, direct access, and random access?**

*+ Sequential access* : Memory is divided into records, which are data units. Access must be granted in a precise order

*+ Direct access* : Individual blocks or records have a unique address based on physical location. Access is accomplished by direct access to reach a general vicinity plus sequential searching, counting, or waiting to reach the final location

*+ Random access* : Each physical accessible region in memory has its own addressing method. The time it takes to go to a certain site is constant and independent of the sequence of previous accesses.

1. **What is the general relationship among access time, memory cost, and capacity?**

- Bigger capacity, lower cost per bit; faster access time, higher cost per bit; greater capacity, longer access time

1. **How does the principle of locality relate to the use of multiple memory levels?**

- Higher levels use slower and less costly memory, with the most expensive being the CPU registers and cache

1. **What are the differences among direct mapping, associative mapping, and set-associative mapping?**

- In a cache system, *direct mapping* maps each block of main memory into only one possible cache line.

- *Associative mapping* permits each main memory block to be loaded into any line of the cache.

- In *set-associative mapping*, the cache is divided into a number of sets of cache lines; each main memory block can be mapped into any line in a particular set.

1. **For a direct-mapped cache, a main memory address is viewed as consisting of three fields.  List and define the three fields.**

- A unique word or byte within a block of main memory is identified by one field on the direct-mapped cache memory. The following two fields each designate one of the primary memory blocks. A line field specifies one of the cache lines, and a tag field indicates one of the blocks that can fit into that line**.**

**6. For an associative cache, a main memory address is viewed as consisting of two fields. List and define the two fields.**

- A tag field uniquely identifies a block of main memory. A word field identifies a unique word or byte within a block of main memory.

**1. EXTERNAL memory consists of peripheral storage devices, such as disk and tape.**

**2. One byte equals 8 bits.**

**3. From a user’s point of view two the most important characteristics of memory are capacity and PERFORMANCE**

**4. The three performance parameters for memory are: access time, transfer rate, and MEMORY CYCLE TIME**

**5. ASSOCIATIVE is a random access type of memory that enables one to make a comparison of desired bit locations within a word for a specified match, and to do this for all words simultaneously, thus retrieving a word based on a portion of its contents rather than its address.**

**6. The TRANSFER rate is the rate at which data can be transferred into or out of a memory unit.**

**7. The most commonly used physical types of memory are: semiconductor memory, MAGNETIC SURFACE memory (used for disk and tape), and optical and magneto-optical.**

**8. The three key characteristics of memory are capacity, access time, and COST**

**9. External, nonvolatile memory is referred to as SECONDARY or auxiliary memory.**

**10. The cache consists of blocks called LINES.**

**11. VIRTUAL memory is a facility that allows programs to address memory from a logical point of view, without regard to the amount of main memory physically available.**

**12. For set-associative mapping the cache control logic interprets a memory address as three fields: Set, Word, and TAG.**