1. Define the following terms -
   1. Volatile storage – data is lost when power is lost
   2. Non-volatile storage – data persists when power is lost
2. Arrange the following in terms of decreasing read/write speed - cache, Hard disk (magnetic disk), magnetic tapes, RAM (main memory), magnetic tapes, flash memory, optical tapes
   1. Cache
   2. RAM
   3. Flash memory
   4. Hard disk
   5. Optical
   6. Magnetic tapes
3. Name the most appropriate type of storage device for the following purposes -
   1. A device to store data that would only be read after its first write.
      * Optical disk
   2. Very huge amount of data to be stored for rare use in the future.
      * Magnetic tape
   3. Kilobytes of data that your processor would read and write from very, very frequently.
      * cache
   4. Storing a couple of terabytes of data (video games, movies, etc.) for day to day usage
      * Magnetic disk
   5. Storing gigabytes of data (video games, movies, etc.) expected to be read and written very fast (for day to day usage).
      * Flash memory
   6. Storing a few gigabytes of temporary data that won’t be needed any longer after the computer is shut down.
      * Main memory
4. What does RAID stand for? Explain how RAID works and describe the advantages that it provides.

* Redundant Array of Independent Drives

1. You might have noticed that your computer has an option to “defragment” drives. Briefly explain what drive defragmentation is, and why it needs to be done.

* Over time, files getting deleted and written creates empty areas in the disk and spreads out related data on a disk, which makes it take longer to access the necessary information for the programs involved. Defragmenting the disk reorganizes the data so that related data is stored in clusters.

1. Briefly explain how records are organized in files using heap, hashing, and sequential order.

* Heap – data is stored wherever it has room to be stored
* Hashing – records go through a hashing function and are assigned a storage space based on the outcome
* Sequential – records are stored one after another is sequential order

1. One may argue that it is best to store records in sequential order in files because it is the simplest. But what disadvantages are there in this method?

* The sequential ordering makes it so that records have to be worked through in order rather than being able to jump to the necessary position
* Takes up chunks of space because it has to be in order

1. Explain the use of the overflow block in sequential storage of records.

* If there is no space left in the block for the record, the record is placed in an overflow block and connected with a pointer

1. Describe what problem multilevel clustering solves, and how it solves the problem.

* Multitable clustering solves the issue of having related data in separate files, which would increase the time it takes to find the records in the separate files. It joins the records in the files together using pointers.

1. How are records of variable lengths dealt with in multilevel clustering? How would we know where a record begins? What would happen when we add and delete records?

* Records of variable lengths are handled using pointers and blocks. The start of the record is held in an anchor block, while records that do not fit in the block are held in an overflow block. All records are connected with pointers.

1. Describe how buffers are used to speed up storage access. In your answer, be sure to describe the buffer manager and buffer replacement policies.

* Buffers hold blocks, which can speed up storage access because it can immediately return the correct address when the buffer manager is requesting a block that is already in the buffer. If a block is not in the buffer, another block is removed from the buffer to make room for the new block before returning the correct address.