***6.1 What are the advantages of using a glass substrate for a magnetic disk?***

• Increased disk reliability

• Less surface defects

• Better stiffness to reduce disk dynamics

• Greater ability to withstand shock and damage

***6.2 How are data written onto a magnetic disk?***

- Pulses are sent to the write head, then an electric current magnetizes a small area of the recording medium to store the "pulses"

***6.3 How are data read from a magnetic disk?***

- The read head consists of a partially shielded magnetoresistive (MR) sensor that senses the magnetization of the medium

***6.4 Explain the difference between a simple CAV system and a multiple zoned recording system.***

• Constant angular velocity (CAV) system: the number of bits per track is constant;

• An increase in density is achieved with multiple zoned recording, in which the surface is divided into a number of zones, with zones further from the centre containing more bits than zones closer to the centre.

***6.5 Define the terms track, cylinder, and sector.***

- Track - On a magnetic disk, data is organized on the platter in concentric sets of rings, called tracks.

- Cylinder - On a disk with multiple platters, the set of all tracks in the same relative position on the platter is referred to as a cylinder.

- Sector - Data are transferred to and from the disk in sectors.

***6.6 What is the typical disk sector size?*** 512 bytes

***6.7 Define the terms seek time, rotational delay, access time, and transfer time.***

***Seek time - Time taken to position the head at the track.***

Rotational delay - Once the track is selected, the disk controller waits until the appropriate sector rotates to line up with the head. The time it takes for the beginning of the sector to reach the head is known as the rotational delay.

Access time - The sum of the seek time, if any, plus the rotational delay. The time it takes to get into position to read or write.

Transfer time - Time taken for data transfer. Once the head is in position, the read or write operation is performed as the sector moves under the head - data transfer portion of the operation.

***6.8 What common characteristics are shared by all RAID levels?***

1. RAID is a set of physical disk drives viewed by the operating system as a single logical drive.

2. Data are distributed across the physical drives of an array in a scheme known as striping.

3. Redundant disk capacity is used to store parity information, which guarantees data recoverability in case of a disk failure.

***6.9 Briefly define the seven RAID levels.***

• RAID 0 - Non-redundant.

• RAID 1 - Mirrored, every disk has a mirror disk containing the same data.

• RAID 2 - Redundant via Hamming code; an error-correcting code is calculated across corresponding bits on each data disk, and the bits of the code are stored in the corresponding bit positions on multiple parity disks.

• RAID 3 - Bit-interleaved parity;

• RAID 4 - Block-interleaved parity;

• RAID 5 - Block-interleaved distributed parity;

• RAID 6 - Block-interleaved dual distributed parity

***6.10 Explain the term striped data.***

The disk is divided into strips, which may be physical blocks, sectors, or some other unit. The strips are mapped round robin to consecutive array members. A set of logically consecutive strips that maps exactly one strip to each array member is referred to as a stripe.

***6.11 How is redundancy achieved in a RAID system?***

RAID 1: by having two identical copies of all data

The rest: by the use of error-correcting codes

***6.12 In the context of RAID, what is the distinction between parallel access and independent access?***

Parallel access - All member disks participate in the execution of every I/O request. Typically, the spindles of the individual drives are synchronized so that each disk head is in the same position on each disk at any given time.

Independent access - Each member disk operates independently, so that separate I/O requests can be satisfied in parallel.