UNIT 4: STORAGE MANAGEMENT

PART A

1. Define seek time and latency time

The time taken by the head to move to the **appropriate cylinder or track** is called seek time.

Once the head is at right track, it must wait until the **desired block rotates** under the read-write head. This delay is latency time.

2. Suppose that the disk rotates at 7200 rpm. What is the average rotational latency of the disk drive? .

The disk rotates at 7200 rpm; i.e., it makes one rotation in 8.33 milliseconds. The average rotational latency is the time to rotate the disk half way around, or 4.17 milliseconds.

MAXIMUM Rotational Latency: 7200RPM = 60 / 7,200 seconds per rotation = 8.3 milliseconds (meaning how long does one point on a disk need to achieve an entire rotation throughout its path) AVERAGE Rotational Latency: 7200RPM = 0.5 * 60 / 7,200 seconds per rotation = 4.2 milliseconds (= 4.17 milliseconds) = MAXIMUM Rotational Latency / 2

3. Define rotational latency and disk bandwidth

Rotational latency is the additional time waiting for the disk to **rotate the desired sector to the disk head**.

The disk bandwidth is the total number of bytes transferred, divided by the time between the first request for service and the completion of the last transfer.

4. A disk has 2310 cylinders, 16 tracks and 63 sectors. The disk spins at 7200 rpm. Seek time between adjacent tracks is 1ms. How long does it take to read the entire disk?

Bytes per cylinder ,b=512bytes*63sectors*16tracks=516096 bytes

Rotation Speed=7200 rotations per minute (1minute /7200 rotations)*(60 seconds/1minute)=60 seconds/7200 rotations=8.33ms

Seek time=1ms

Disk has 63 sectors per track performs rotation in 8.33ms.
Thus transfer time, x =(16/63)*8.33ms=2.11ms
t_{read}, Total time to read 16 tracks in the disk=8.33+1 ms=9.33ms

5. List the types of disk scheduling algorithms.

The various disk-scheduling algorithms are

a. First Come First Served Scheduling
b. Shortest Seek Time First Scheduling
c. SCAN Scheduling
d. C-SCAN Scheduling
f. LOOK scheduling

6. What is low-level formatting?

Before a disk can store data, it must be divided into sectors that the disk controller can read and write. This process is called low-level formatting or physical formatting. Low-level formatting fills the disk with a special data structure for each sector. The data structure for a sector consists of a header, a data area, and a trailer.

7. What is the use of boot block?

For a computer to start running when powered up or rebooted it needs to have an initial program to run. This bootstrap program tends to be simple. It finds the operating system on the disk loads that kernel into memory and jumps to an initial address to begin the operating system execution. The full bootstrap program is stored in a partition called the boot blocks, at fixed location on the disk. A disk that has boot partition is called boot disk or system disk.

8. Define: Sector sparing.

Low-level formatting also sets aside spare sectors not visible to the operating system. The controller can be told to replace each bad sector logically with one of the spare sectors. This scheme is known as sector sparing or forwarding.

9. Define: Sector slipping

Sector slipping is a mechanism to replace a bad block.Here is an example: Suppose that logical block 17 becomes defective and the first available spare follows sector 202. Sector slipping then remaps all the sectors from 17 to 202, moving them all down one spot. That is, sector 202 is copied into the spare, then sector 201 into 202, then 200 into 201, and so on, until sector 18 is copied into sector 19.

Slipping the sectors in this way frees up the space of sector 18 so that sector 17 can be mapped to it.

10. What is daisy chain?

In terms of the electronics, the messages are conveyed by patterns of electrical voltages applied to the wires with defined timings. When device A has a cable that plugs into device B, and device B has a cable that plugs into device C, and device C

plugs into a port on the computer, this arrangement is called a daisy chain. A daisy chain usually operates as a bus.

11. State the registers control I/O devices.

- **The data-in register** is read by the host to get input.
- **The data-out register** is written by the host to send output.
- **The status register** contains bits that can be read by the host. These bits indicate states.
- **The control register** can be written by the host to start a command or to change the mode of a device.

12. Describe the concept of polling.

Polling is a method where a device continuously checks the status of another device to determine if it needs attention. This involves sending requests or queries to the device, waiting for a response, and repeating this process in a loop until the desired condition or data is obtained.

13. What is the concept of interrupt chaining?

In practice, computers have more devices than they have address elements in the interrupt vector. A common way to solve this problem is to use **interrupt chaining**, in which each element in the interrupt vector points to the head of a list of interrupt handlers. When an interrupt is raised, the handlers on the corresponding list are called one by one, until one is found that can service the request.

14. Infer how DMA increases system concurrency?

DMA increases system concurrency by allowing the CPU to perform tasks while the DMA system transfers data via the system and memory busses

15. What is the role of device-status table?

Device-status table contains entry for each I/O device indicating its type, address, and state. – Operating system indexes into I/O device table to determine device status and to modify table entry to include interrupt.

16. Define: Buffering.

A buffer is a memory area that stores data while they are transferred between two devices or between a device and an application. Buffering is done for three reasons

a. To cope with a speed mismatch between the producer and consumer of a data stream.
b. To adapt between devices that have different data transfer sizes
c. To support copy semantics for application I/O

17. Describe the concept of double buffering.

In a situation where a drive write is not instantaneous and the network interface still needs a place to store additional incoming data, **two buffers** are used. This is known as double buffering.

After the network fills the first buffer, the drive write is requested. The network then starts to fill the second buffer while the first buffer is written to storage. By the time the network has filled the second buffer, the drive write from the first one should have completed, so the network can switch back to the first buffer while the drive writes the second one. This double buffering decouples the producer of data from the consumer, thus relaxing timing requirements between them.

18. Define: Caching.

A cache is a region of fast memory that holds copies of frequently needed data. Access to the cached copy is more efficient than access to the original. Caching and buffering are distinct functions, but sometimes a region of memory can be used for both purposes

19. Define: Spooling.

A spool is a **buffer that holds output for a device**, such as printer, that cannot accept interleaved data streams. When an application finishes printing, the spooling system queues the corresponding spool file for output to the printer. The spooling system copies the queued spool files to the printer one at a time.

20. Describe file and list its types.

A file is a named collection of related information that is recorded on secondary storage. A file contains either programs or data. A file has certain "structure" based on its type.

- **Text file**- a sequence of characters organized into lines
- **Source file** - a sequence of functions, each of which is further organized as declarations followed by executable statements.
- **Executable file** - a series of code sections that the loader can bring into memory and execute.

21. What are the different attributes of file?

A file has certain other attributes, which vary from one operating system to another, but typically consist of these: Name, identifier, type, location, size, protection, time, date and user identification.

22. What is directory?

The directory records information-such as name, location, size, and type for all files on that particular partition. The directory can be viewed as a symbol table that translates file names into their directory entries.

23. What are the operations that can be performed on a directory?

The operations that can be performed on a directory are

- Search for a file
- Create a file
- Delete a file
- Rename a file
- List directory
- Traverse the file system

24. Define: Mount point.

Mount point is the location within the file structure where the file system is to be attached.

File must be opened before it is used, a file system must be mounted before it can be available to processes on the system. More specifically, the directory structure may be built out of multiple volumes, which must be mounted to make them available within the file-system name space.

25. What are the different types of access rights given to a file?

- Read
- Write
- Execute
- Append
- Delete
- List

26. Describe the challenges associated with file sharing.

When an operating system accommodates multiple users, the issues of file sharing, file naming, and file protection become high.

To implement sharing and protection, the system must maintain more file and directory attributes than are needed on a single-user system.

Care must be taken to be sure that IDs match between systems when devices move between them or that file ownership is reset when such a move occurs.