UNIT – IV

TWO MARKS

1. What is a File?

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.

- File attributes: Name, identifier, type, size, location, protection, time, date
- File operations: creation, reading, writing, repositioning, deleting, truncating, appending, renaming
- File types: executable, object, library, source code etc.

2. List the various File Attributes.

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.

3. What are the various File Operations?

The basic file operations are,

- Creating a file
- Writing a file
- Reading a file
- Repositioning within a file
- Deleting a file
- Truncating a file

4. What is the information associated with an Open File?

Several pieces of information are associated with an open file which may be:

- File pointer
- File open count
- Disk location of the file
- Access rights

5. What are the different Accessing Methods of a File?

The different types of accessing a file are:

- Sequential access: Information in the file is accessed sequentially
- Direct access: Information in the file can be accessed without any particular order.
- Other access methods: Creating index for the file, indexed sequential access method (ISAM) etc.

6. What is Directory?

The device directory or simply known as 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.

7. 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

8. What are the most common schemes for defining the Logical Structure of a Directory?

The most common schemes for defining the logical structure of a directory

- Single-Level Directory
- Two-level Directory
- Tree-Structured Directories
- Acyclic-Graph Directories
- General Graph Directory

9. Define UFD and MFD.

In the two-level directory structure, each user has own user file directory (UFD). Each UFD has a similar structure, but lists only the files of a single user. When a job starts the system's master file directory (MFD) is searched. The MFD is indexed by the user name or account number, and each entry points to the UFD for that user.

10. What is a Path Name?

A pathname is the path from the root through all subdirectories to a specified file. In a two-level directory structure a user name and a file name define a path name.

11. What is Access Control List (ACL)?

The most general scheme to implement identity-dependent access is to associate with each file and directory an access control unit.

12. Define Equal Allocation.

The way to split '*m'* frames among '*n'* processes is to give everyone an equal share, *m/n* frames. For instance, if there are 93 frames and 5 processes, each process will get 18 frames. The leftover 3 frames could be used as a free-frame buffer pool. This scheme is called equal allocation.

13. What is the cause of Thrashing? How does the system detect thrashing? Once it detects thrashing, what can the system do to eliminate this problem?

Thrashing is caused by under allocation of the minimum number of pages required by a process, forcing it to continuously page fault. The system can detect thrashing by evaluating the level of CPU utilization as compared to the level of multiprogramming. It can be eliminated by reducing the level of multiprogramming.

14. If the average page faults service time of 25 ms and a memory access time of 100ns.Calculate the effective access time.

Effective access time = (1-p)*ma + p*page fault time
= (1-p)*100+p*25000000
= 100-100p+25000000*p
= 100 + 24999900p

15. What is Belady's Anomaly?

For some page replacement algorithms, the page fault rate may increase as the number of allocated frames increases.

16. What are the different types of Access?

Different types of operations may be controlled in access type. These are,

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

17. What are the types of Path Names?

Path names can be of two types.

- ***Absolute path name:*** Begins at the root and follows a path down to the specified file, giving the directory names on the path.
- ***Relative path name:*** Defines a path from the current directory.

18. What is meant by Locality of Reference?

The locality model states that, as a process executes, it moves from locality to locality. Locality is of two types.

- Spatial locality
- Temporal locality.

19. What are the various layers of a File System?

The file system is composed of many different levels. Each level in the design uses the feature of the lower levels to create new features for use by higher levels.

- Application programs
- Logical file system
- File-organization module
- Basic file system
- I/O control
- Devices

20. What are the Structures used in File-System Implementation?

Several on-disk and in-memory structures are used to implement a file system

- ✓ On-disk structure include
- Boot control block
- Partition block
- Directory structure used to organize the files in File control block (FCB)
- ✓ In-memory structure include
- In-memory partition table
- In-memory directory structure
- System-wide open file table
- Per-process open table

21. What are the Functions of Virtual File System (VFS)?

It has two functions,

- It separates file-system-generic operations from their implementation defining a clean VFS interface. It allows transparent access to different types of file systems mounted locally.

- VFS is based on a file representation structure, called a vnode. It contains a numerical value for a network-wide unique file .The kernel maintains one vnode structure for each active file or directory.

22. 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.

23. What are the Allocation Methods of a Disk Space?

Three major methods of allocating disk space which are widely in use are

- Contiguous allocation
- Linked allocation
- Indexed allocation

24. What are the advantages of Contiguous Allocation?

The advantages are,

- Supports direct access

- Supports sequential access
- Number of disk seeks is minimal.

25. What are the drawbacks of Contiguous Allocation of Disk Space?

The disadvantages are,

- Suffers from external fragmentation
- Suffers from internal fragmentation
- Difficulty in finding space for a new file
- File cannot be extended
- Size of the file is to be declared in advance

26. What are the advantages of Linked Allocation?

The advantages are,

- No external fragmentation
- Size of the file does not need to be declared

27. What are the disadvantages of Linked Allocation?

The disadvantages are,

- Used only for sequential access of files.
- Direct access is not supported
- Memory space required for the pointers.
- Reliability is compromised if the pointers are lost or damaged

28. What are the advantages of Indexed Allocation?

The advantages are,

- No external-fragmentation problem
- Solves the size-declaration problems
- Supports direct access

29. How can the index blocks be implemented in the Indexed Allocation Scheme?

The index block can be implemented as follows,

- Linked scheme
- Multilevel scheme
- Combined scheme

30. 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.

31. How free-space is managed using Bit Vector Implementation?

The free-space list is implemented as a bit map or bit vector. Each block is represented by 1 bit. If the block is free, the bit is 1; if the block is allocated, the bit is 0.

32. 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,

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

FIFTEEN MARKS

1. Explain the File System Structure in detail

- None - sequence of words, bytes
- Simple record structure
  - Lines
  - Fixed length
  - Variable length
- Complex Structures
  - Formatted document
  - Relocatable load file
- Can simulate the last two with the first method by inserting appropriate control characters.
- Who decides?
  - Operating system
  - Program

2. Discuss the File System Organization and File System Mounting.

A file system must be mounted before it can be accessed.
An unmounted file system is mounted at a mount point.

- Existing
- Unmounted Partition
- Mount Point

3. Explain about File Sharing.

- Introduction
- File Sharing – Remote File Systems

- File Sharing – Failure Modes
- File Sharing – Consistency Semantics

4. Explain about the File System Implementation.

- File System Structure
- File System Implementation
- Directory Implementation
- Allocation Methods
- Free-Space Management
- Efficiency and Performance
- Recovery and Log-Structured File Systems
- NFS

5. Explain about various Allocation Methods.

An allocation method refers to how disk blocks are allocated for files:

- Contiguous allocation
- Linked allocation
- Indexed allocation

1. Define Caching.

A cache is a region of fast memory that holds copies of 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.

2. 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.

3. What are the various Disk-Scheduling Algorithms?

The various disk-scheduling algorithms are,

- First Come First Served Scheduling
- Shortest Seek Time First Scheduling
- SCAN Scheduling
- C-SCAN Scheduling
- LOOK scheduling

4. 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.

5. 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.

6. What is 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.

7. What are the techniques used for performing I/O.

- Programmed I/O
- Interrupt driven I/O
- Direct Memory Access (DMA).

8. Give an example of an application in which data in a file should be accessed in the following order:

Sequentially **-** Print the content of the file.
Randomly - Print the content of record *i*. This record can be found using hashing or index techniques

9. What problems could occur if a system allowed a file system to be mounted simultaneously at more than one location?

There would be multiple paths to the same file, which could confuse users or encourage mistakes. (Deleting a file with one path deletes the file in all the other paths.)

10. Why must the bit map for file allocation be kept on mass storage rather than in main memory?

In case of system crash (memory failure), the free-space list would not be lost as it would be if the bit map had been stored in main memory.

11. What criteria should be used in deciding which strategy is best utilized for a particular file?

- **Contiguous -** File is usually accessed sequentially, if file is relatively small.

- **Linked** - File is usually accessed sequentially, if the file is large.
- **Indexed** - File is usually accessed randomly, if file is large.

12. What is meant by RAID?

"RAID" is now used as an umbrella term for computer data storage schemes that can divide and replicate data among multiple hard disk drives. The different schemes architectures are named by the word RAID followed by a number, as in RAID 0, RAID 1, etc. RAID's various designs involve two key design goals: increase data reliability and/or increase output performance. When multiple physical disks are set up to use RAID technology, they are said to be *in* a *RAID* array.

13. What is meant by Stable Storage?

Stable storage is a classification of computer data storage technology that guarantees atomicity for any given write operation and allows software to be written that is robust against some hardware and power failures. To be considered atomic, upon reading back a just written-to portion of the disk, the storage subsystem must return either the write data or the data that was on that portion of the disk before the write operation.

14. What is meant by Tertiary Storage?

Tertiary storage or **tertiary memory** provides a third level of storage. Typically it involves a robotic mechanism which will *mount* (insert) and *dismount* removable mass storage media into a storage device according to the system's demands; this data is often copied to secondary storage before use.

15. Write a note on Descriptor?

UNIX processes use *descriptors* to reference I/O streams. Descriptors are small unsigned integers obtained from the *open* and *socket* system calls.. A *read* or *write* system call can be applied to a descriptor to transfer data. The *close* system call can be used to deallocate any descriptor. Descriptors represent underlying objects supported by the kernel, and are created by system calls specific to the type of object. In 4.4BSD, three kinds of objects can be represented by descriptors: files, pipes, and sockets.

16. Write short notes on Pipes?

A *pipe* is a linear array of bytes, as is a file, but it is used solely as an I/O stream, and it is unidirectional. It also has no name, and thus cannot be opened with *open*. Instead, it is created by the *pipe* system call, which returns two descriptors, one of which accepts input that is sent to the other descriptor reliably, without duplication, and in order. The system also supports a named pipe or FIFO. A FIFO has properties identical to a pipe, except that it appears in the file system; thus, it can be opened using the *open* system call. Two processes that wish to communicate each open the FIFO: One opens it for reading, the other for writing.

FIFTEEN MARKS

1. **Explain the allocation methods for disk space?**
2. **What are the various methods for free space management?**
3. **Write about the kernel I/O subsystem.**
4. **Explain the various disk scheduling techniques**

❖FCFS
❖SSTF
❖SCAN
❖C-SCAN
❖C-LOOK

5. **Write notes about disk management and swap-space management.**
6. **Explain in detail the allocation and freeing the file storage space.**
7. **Explain the backup and recovery of files.**
8. **Discuss with diagrams the following three disk scheduling: FCFS, SSTF, C-SCAN.**
9. **Compare and contrast the FREE SPACE and SWAP SPACE management.**
10. **Explain the disk scheduling algorithms**
11. **Describe the most common schemes for defining the logical structure of a Directory.**
12. **Explain the life cycle of an I/O request with flowchart.**
13. **Discuss about the UNIX file system in detail.**
14. **Discuss briefly about Memory Management in UNIX.**
15. **Explain the process management under LINUX OS.**
16. **In what ways the directory is implemented?**
17. **Explain linked allocation in detail.**
18. **Write the indexed allocation with its performance.**