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Programme Name   : Bachelor of Computer Applications

Course Code   : Operating Systems

Course Title   : 20UCA5CC5

Unit   : Unit V

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FILE MANAGEMENT

FILE

- File is a named collection of related information

- A file is a sequence of bits, bytes, lines or records

FILE STRUCTURE

- A file has a certain defined structure according to its type.

- A text file is a sequence of characters organized into lines.

- A source file is a sequence of procedures and functions.

- An object file is a sequence of bytes organized into blocks

- **File management is formally defined as manipulating files in a computer system, which includes creating, modifying, and deleting files.**

- Therefore, one of the simple but crucial features offered by the operating system is file management.

The various functions involved in file management are as follows:

- It is responsible for creating new files in the computer system and placing them in specific locations.

- It is responsible for locating the existing files in the computer system.

The components of the file management system in the operating system are as follows:

File Attribute

- It specifies file characteristics such as type, date of last modification, size, location on disk, and so on.

File Operations

- It defines the actions that can be taken on a file, such as opening and closing it.

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File Access Permissions

- It specifies a file's access permissions, such as read and writes. Without permission, a file cannot be accessed.
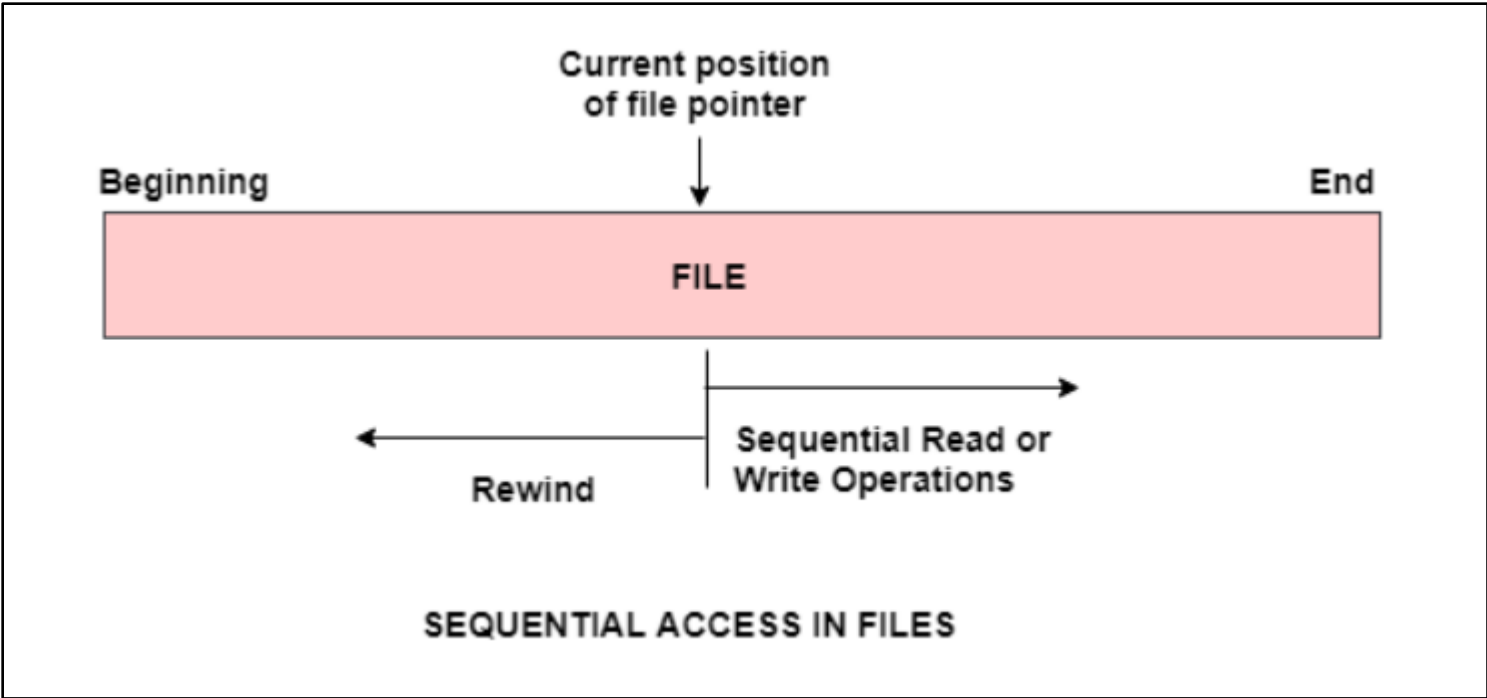
File Systems

- It defines the logical method of storing files in a computer system. FAT and NTFS are two of the most commonly used file systems.

FILE ACCESS METHOD

- Manner in which the records of a file may be accessed.

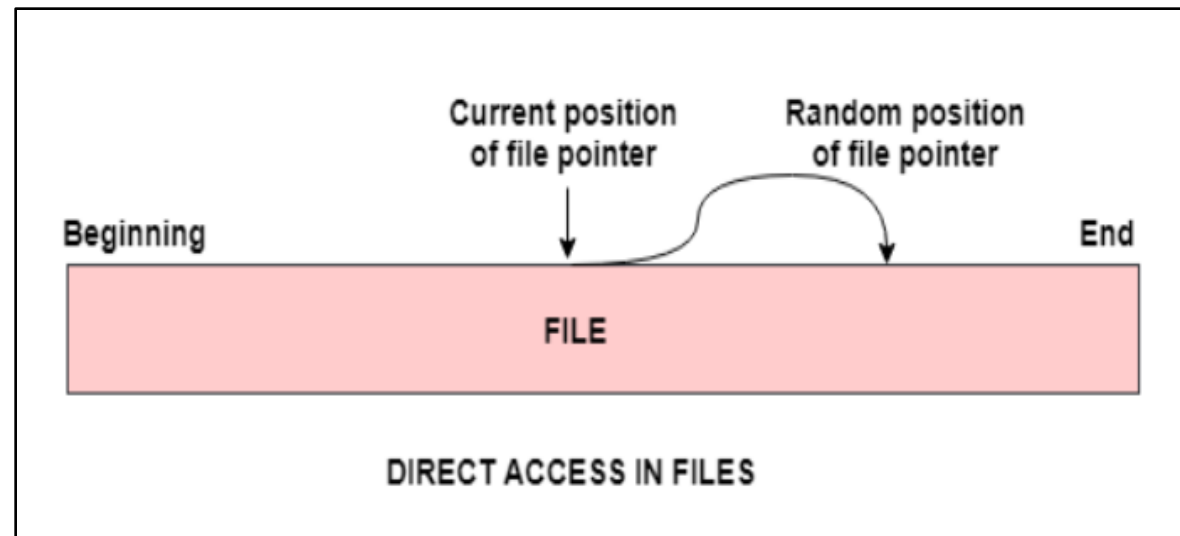- There are several ways to access files −

1.Sequential access

- The records are accessed in some sequence

- File is processed in order, one record after the other.

Current position
of file pointer

Beginning   End

FILE

Rewind   Sequential Read or
                Write Operations

SEQUENTIAL ACCESS IN FILES

2. Direct/Random Access

- Random access file organization provides, accessing the records directly.

- Each record has its own address on the file

- The records need not be in any sequence within the file

Current position of file pointer

Random position of file pointer

Beginning   End

FILE

DIRECT ACCESS IN FILES

DIRECTORY

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DIRECTORY

- A directory is a location for storing files on the computer.

- A directory can contain multiple files

TYPES OF DIRECTORY STUCTURE

1. Single Level Directory Structure

- It has only one directory which is called the root directory.

- The users are not allowed to create subdirectories under the root directory.

Single-level Directory Structure
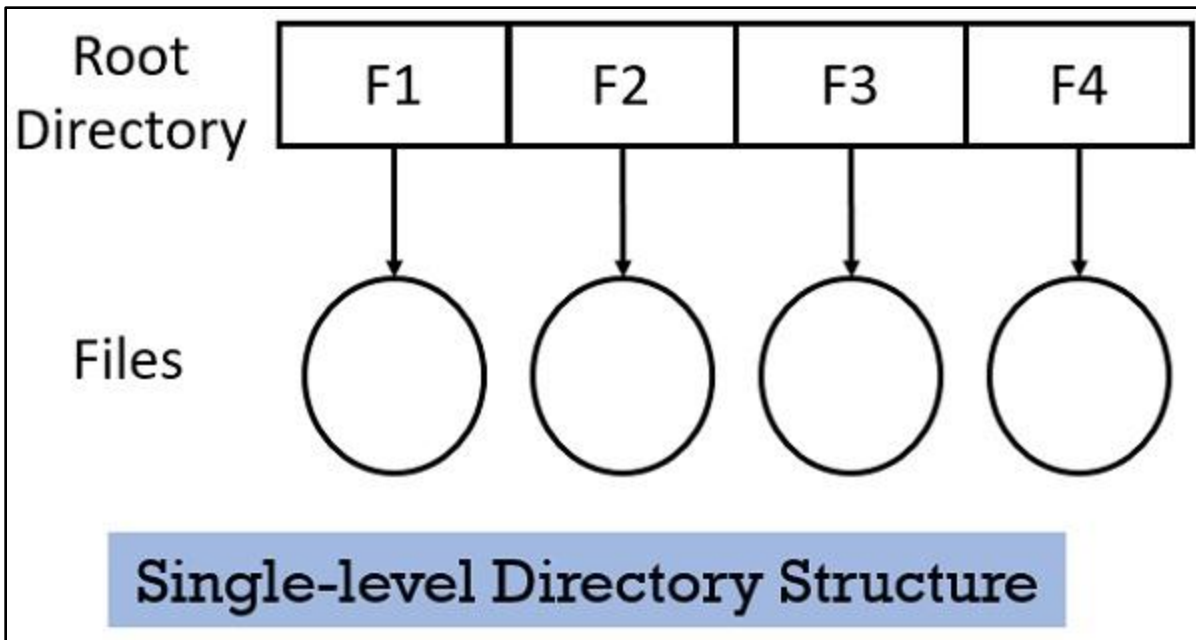
2. Two-Level Directory Structure

- The users create directory directly inside the root directory.

- Once directory is created, further subdirectory cannot be created inside that directory.


Two-level Directory Structure
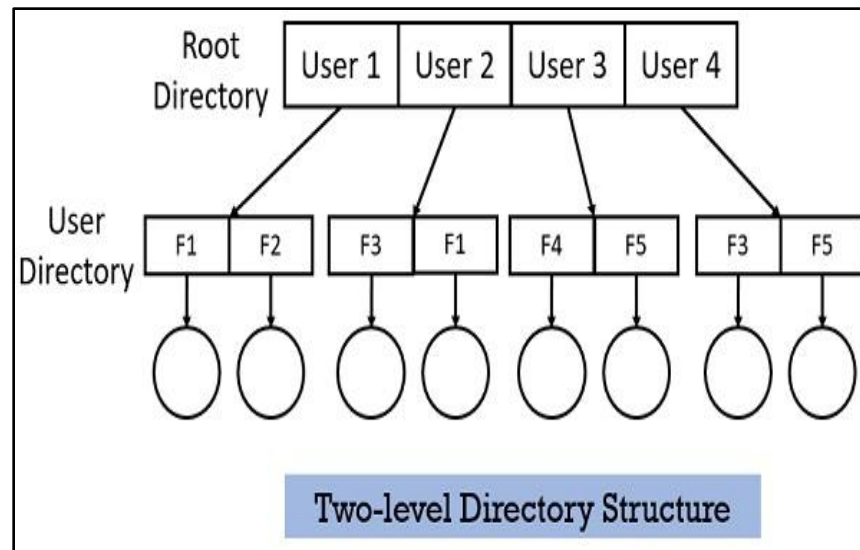
3. Hierarchical Directory Structure

- The users can create directories under the root directory and can also create sub-directories under this structure.

- Can create different sub-directories for different file types.

Hierarchical Directory Structure
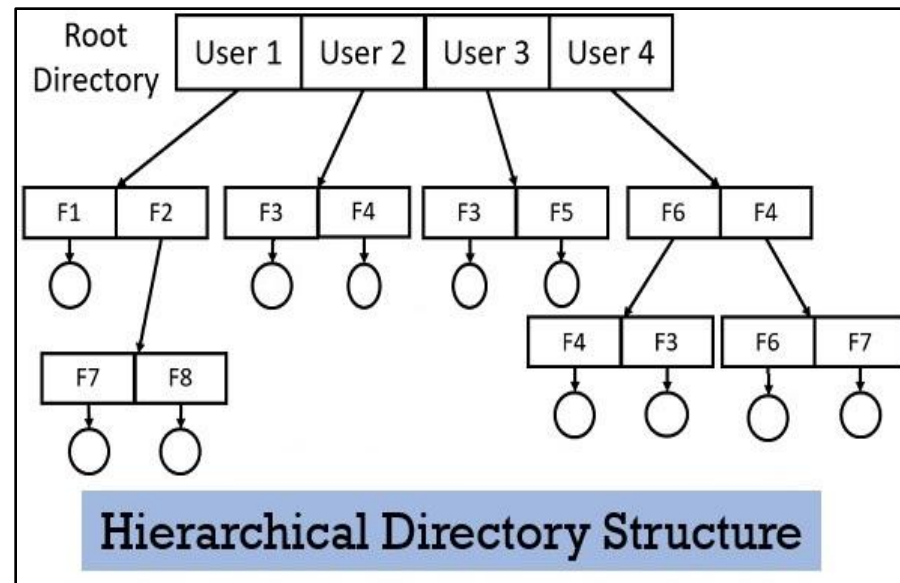
4. Tree Directory Structure

- Except root directory, every directory or file has only one parent directory.

- So to access another users file, it has to go through two or more directories.

Tree Directory Structure
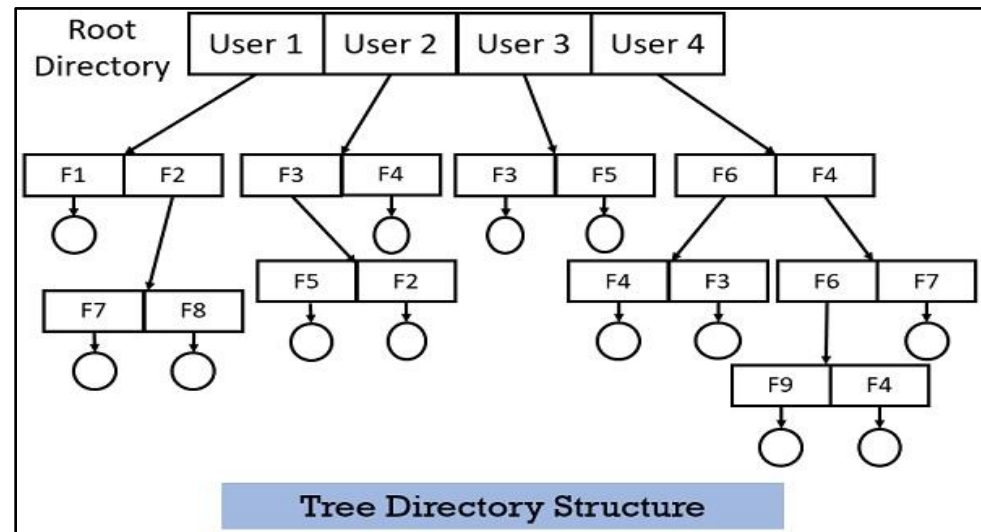
DISK STRUCUTRE

- Step wise description of Disk Structure is given below

- Disk surface divided into tracks

- A read/write head positioned just above the disk surface

- Information stored by magnetic recording on the track under read/write head

- Fixed head disk

- Moving head disk

- Designed for large amount of storage

- Primary design consideration cost, size, and speed

Hardware for disk system

- Disk drive, Device motor, Read/write head, Associated logic

Disk controller

- Determines the logical interaction with the computer

- Can service more than one drive (overlapped seeks)

Cylinder

- The same numbered tracks on all the disk surfaces

- Each track contains between 8 to 32 sectors

Sector

- Smallest unit of information that can be read from/written into disk

- Range from 32 bytes to 4096 bytes

Disk Pack Structure

FILE SYSTEM STRCTURE
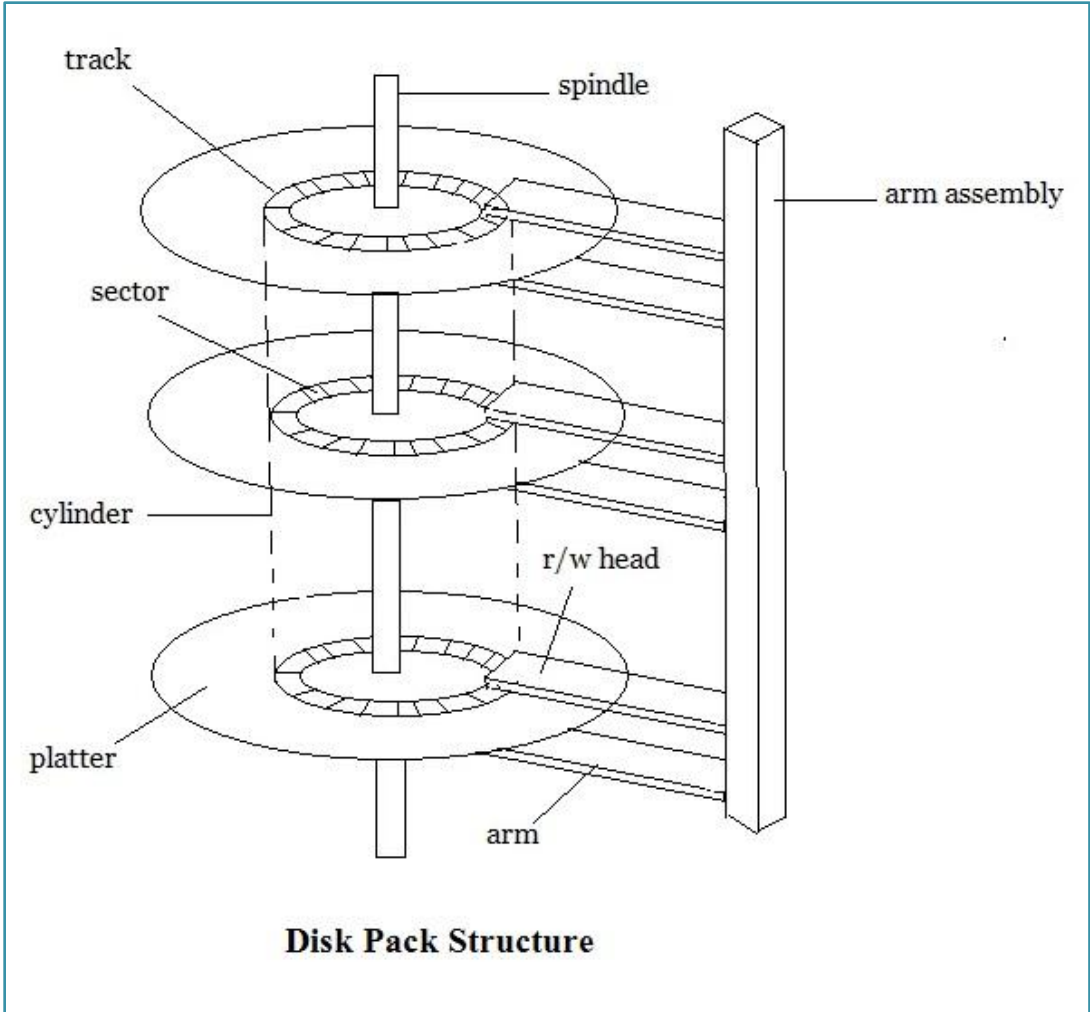
FILE SYSTEM STRUCTURE

- File System provide efficient access to the disk by allowing data to be stored, located and retrieved in a convenient way.

- A file System must be able to store the file, locate the file and retrieve the file.

- Most of the Operating Systems use layering approach for every task including file systems. Every layer of the file system is responsible for some activities.

- The image shown below, elaborates how the file system is divided in different layers, and also the functionality of each layer.
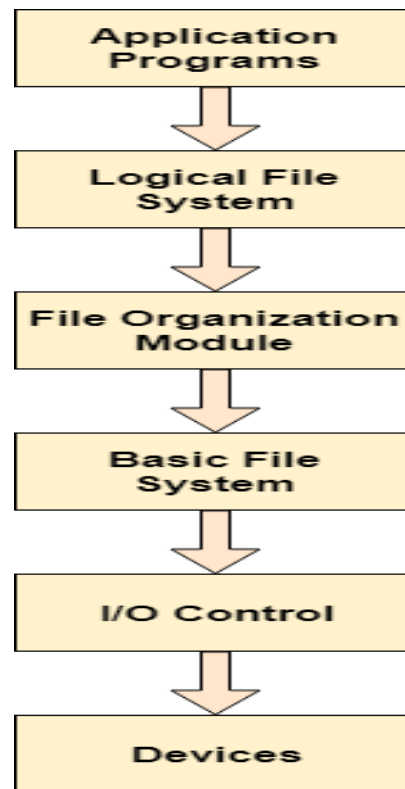
- When an application program asks for a file, the first request is directed to the logical file system.

- Generally, files are divided into various logical blocks. Files are to be stored in the hard disk and to be retrieved from the hard disk.

- Hard disk is divided into various tracks and sectors. Therefore, in order to store and retrieve the files, the logical blocks need to be mapped to physical blocks.

- Once File organization module decided which physical block the application program needs, it passes this information to basic file system.

- The basic file system is responsible for issuing the commands to I/O control in order to fetch those blocks.

- I/O controls contain the codes by using which it can access hard disk.

- These codes are known as device drivers. I/O controls are also responsible for handling interrupts

ALLOCATION METHOD

1. Contiguous Allocation

- Each file occupies a contiguous address space on disk.

- Assigned disk address is in linear order.

- If block b as the starting location, then the blocks assigned to the file will be: b, b+1, b+2……b+n-1
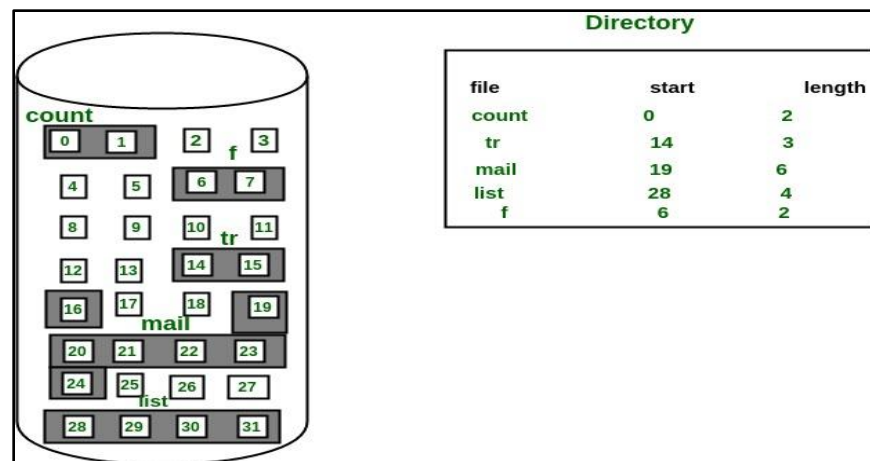
2. Linked list allocation

- Each file carries a list of links to disk blocks.

- Directory contains link / pointer to first block of a file.

- Each block contains a pointer to the next block occupied by the file.
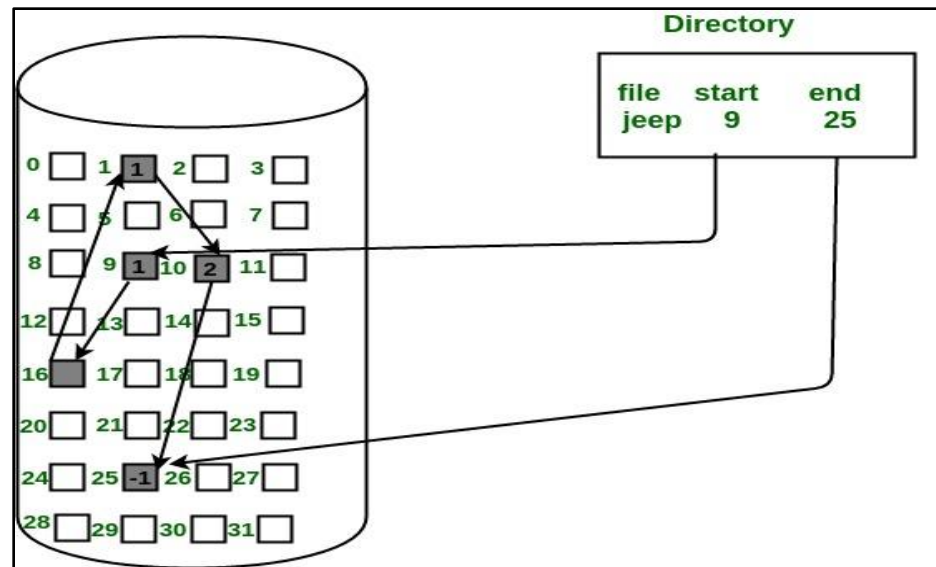
3. Indexed Allocation

* An index block is created having all pointers to files.

* Each file has its own index block which stores the addresses of disk space occupied by the file.

* Directory contains the addresses of index blocks of files
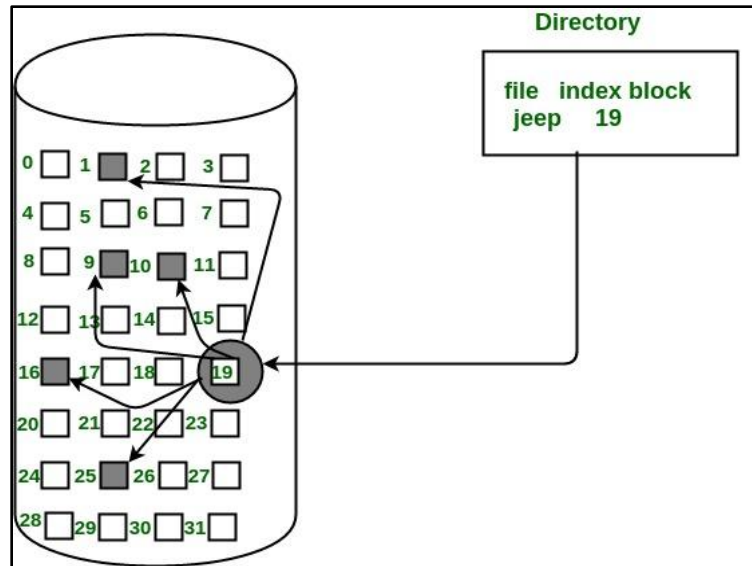
DISK SCHEDULING

DISK SCHEDULING

- Disk scheduling is done by operating systems to schedule I/O requests arriving for the disk. Disk scheduling is also known as I/O scheduling.

Seek Time: Seek time is the time taken to locate the disk arm to a specified track where the data is to be read or write. So the disk scheduling algorithm that gives minimum average seek time is better.

- **Rotational Latency:** Rotational Latency is the time taken by the desired sector of disk to rotate into a position so that it can access the read/write heads. So the disk scheduling algorithm that gives minimum rotational latency is better.

- **Transfer Time:** Transfer time is the time to transfer the data. It depends on the rotating speed of the disk and number of bytes to be transferred.

Disk Access Time :

Disk Access Time = Seek Time +

Rotational Latency +

Transfer Time

Total Seek Time = Total head Movement * Seek Time

Disk Queuing Delay	Seek Time	Rotational Latency	Transfer Time

← Disk Access Time →

← Disk Response Time →

Disk Response Time: Response Time is the average of time spent by a request waiting to perform its I/O operation.

Average Response time is the response time of the all requests.

Variance Response Time is measure of how individual request are serviced with respect to average response time.

So the disk scheduling algorithm that gives minimum variance response time is better.