

Ch-6 - I/O Hardware

* Explain Input and Output Device in brief.

=> An Input-Output Device known as an IO Device.

IO Device are capable of delivering Data and receiving data from a computer.

- Input Devices :

Input Devices are the devices that are used to send signals to the computer for performing tasks.

This are the basic Input Devices.

- Keyboard
- Mouse
- Joystick
- Track Ball
- Light Pen
- Scanner

- Optical Mark Reader
- Optical Character Reader
- Bar Code Reader
- Web Camera
- Microphone

- Output Device :

Output Device are the devices that show us the result after giving the input to a computer system.

This are the basic Output Devices.

- Monitor
- Television
- Printer
- Speakers
- Projector
- Plotter
- Video Card
- Headphones

* Explain Device Controllers.
(short Define.)

=> The Operating System manages their task with the help of one intermediate electronic device is called Device Controller.

The Device Controller knows how to communicate with Operating System and IO Devices.

Device Controller is an interface between Operating System and IO Devices.

* Explain Direct Memory Access in Operating System.

=> Direct Memory Access allows to IO Devices to access memory directly.

Direct Memory Access can be controlled by DMA Controller.

DMA Controller need the same old circuits of an interface to communicate with CPU and IO Devices.

DMA Controller communicate with the CPU using data bus and control line.

DMA Controller has Three Registers.

- 1) Address Register
- 2) Word Count Register
- 3) Control Register

1 Address Register:

It contains the address of specify the location in memory.

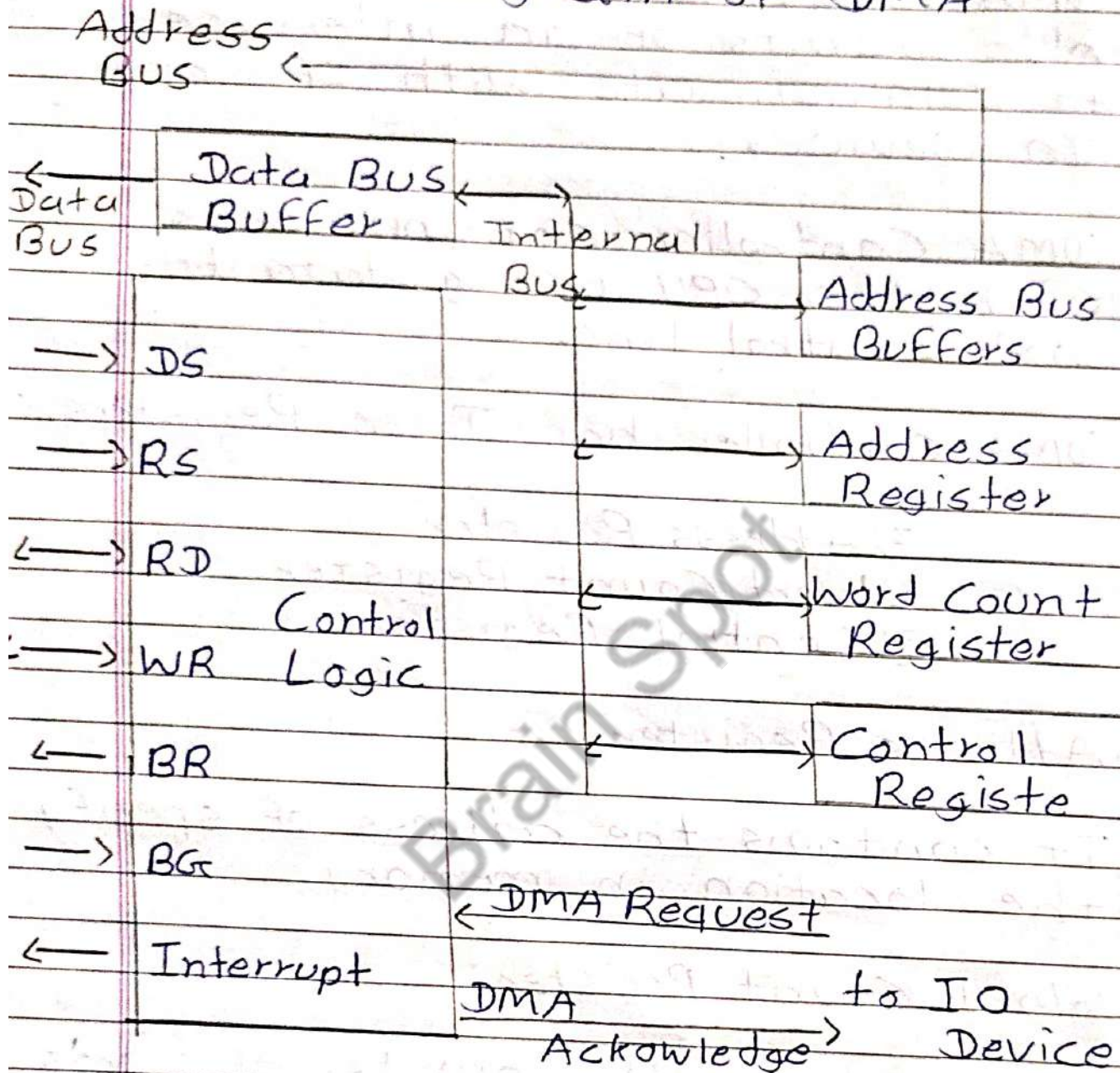
Word Count Register:

It contains the number of words to be transfer.

3 Control Register:

It specifies the transfer mode.

=> Block Diagram of DMA



Through the address bus, DMA is allowing RS Register to select inputs.

Here, RD and WR are two-way input.

When BG input is 0 and CPU can communicate with DMA Registers.

When BG input is 1 then CPU has relinquished the buses and DMA can communicate with the memory.

* Explain Device Driver in Operating System.

=> Device Driver is a special kind of software program that control specific hardware device.

Device Drivers are essential for a Computer system because Device Driver drive a particular hardware.

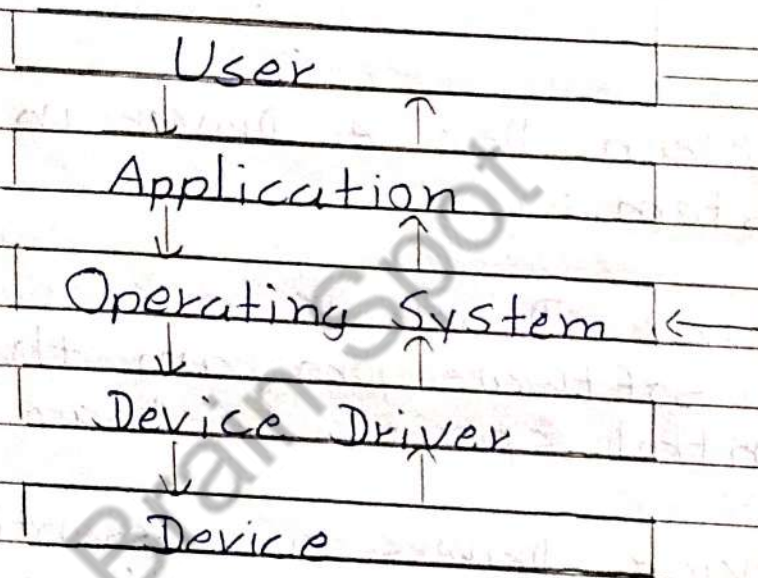
Device Driver is also known as Hardware Driver.

There are Two types of Device Driver.

1) Kernel-mode Device Driver

2) User-mode Device Driver.

According to this Diagram, Device Driver interact.



1 Kernel-mode Device Driver:

This kernel-mode Device driver includes some generic hardware like BIOS, motherboard, Processor and some other hardware.

These Device Driver include the minimum system requirement for each OS.

2 User-mode Device Driver:

User also brings some devices for use during the system that device also need Device Driver.

* Define Term: Device Independence

The most important part of IO software is device independence.

It is always preferable to write a program that can open all other IO devices.

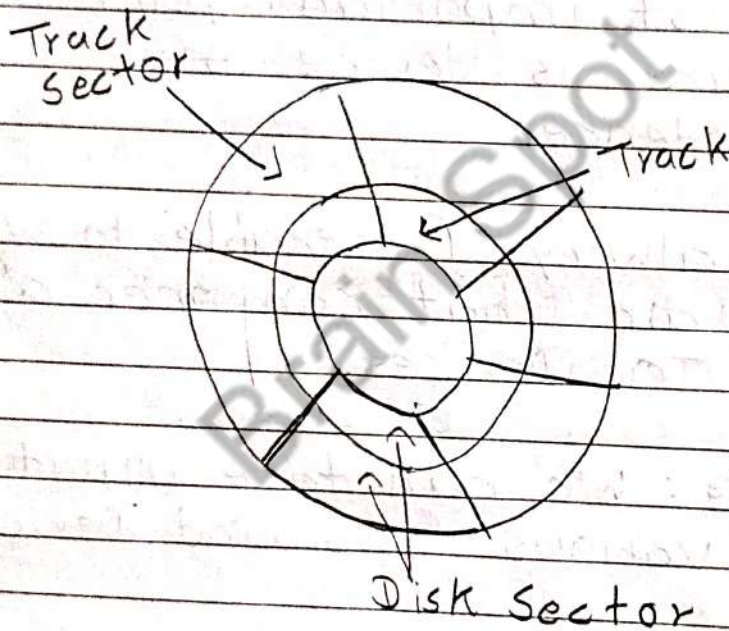
Example: We can take input from various files and devices.

* Explain Disk Structure.

⇒ Disk is a Secondary Memory Storage Device.

Disk contain three part.

- 1) Track Sector
- 2) Track
- 3) Disk Sector



1 Track : The Disk is divided into Track.

2 Track Sector : Each track is divided into Sector.

3 Disk Sector : Combination of one track and one track.

sector is called Disk Sector.

In Disk, Outer tracks is bigger in size than the inner track.

Read-Write head moves over the rotating on disk.

Read-Write head performs all the read and write operation on Disk

To perform a Read-Write Operation on a memory location, we need to place the R-W head over the position.

* Define following terms.

(a) Seek Time:

The time taken by the R-W head to reach the desired track from its current position.

(b) Rotational Latency:

Time is taken by the sector to come under the R-W head.

c) Data Transfer Time :

Time is taken to transfer the required amount of data.

cd) Controller Time :

The Processing Time taken by the controller.

ce) Average Access Time :

Average seek Time + Average Access = Rotational Latency + Time Data transfer time + Controller time.

* Explain Goals of IO Software.

=> This are the Goals of IO Software.

1 Uniform Naming:

Operating System done in a way that the user does not have to aware of all hardware name.

2 Synchronous versus Asynchronous:

When the CPU is working on some process it goes into the block state when the interrupt occurs.

3 Device ~~Inter~~ Independence:

It is always Preferable to write a program that can open all other IO Devices.

4 Buffering:

Data that we enter into a system can not be stored directly in memory.

5 Error-handling:

When the lower level solves the problem it does not reach the upper level.

6 Shareable and Non-Shareable Devices:

Devices like Hard Disk can be shared among multiple processes and Devices like Printers can not be shared.

7 Caching:

Caching is the process in which all the most accessible and most used data is kept in a ~~se~~ separate memory.

* Explain Disk Scheduling Algorithm.

=> This are the basic Disk Scheduling algorithm.

1) FCFS

2) SSTF

- 3) SCAN
- 4) C-SCAN
- 5) LOOK
- 6) C-LOOK

1 FCFS :

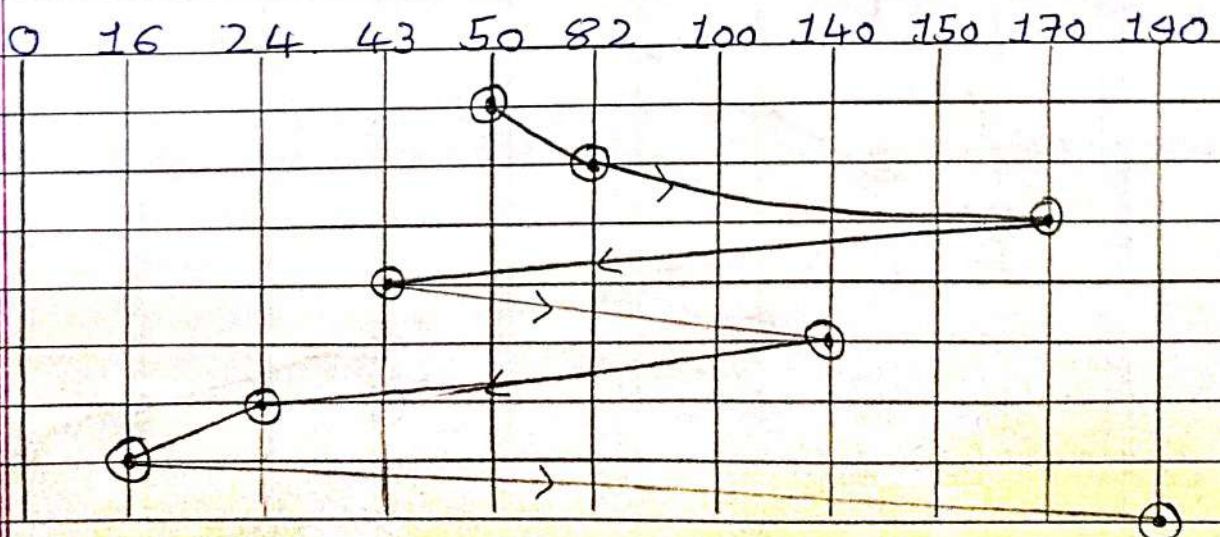
FCFS stands for First Come First Serve algorithm.

FCFS is the simplest algorithm of Disk scheduling.

In FCFS, the requests are addressed in the order they arrive in the disk queue.

Ex. 82, 170, 43, 140, 24, 16, 190

Head Position: 50



~~Head Position 1~~

~~Head Mov~~

$$\text{Head Movement} = (82 - 50) + (170 - 82) + (170 - 43) + (140 - 43) + (140 - 24) + (24 - 16) + (190 - 16)$$

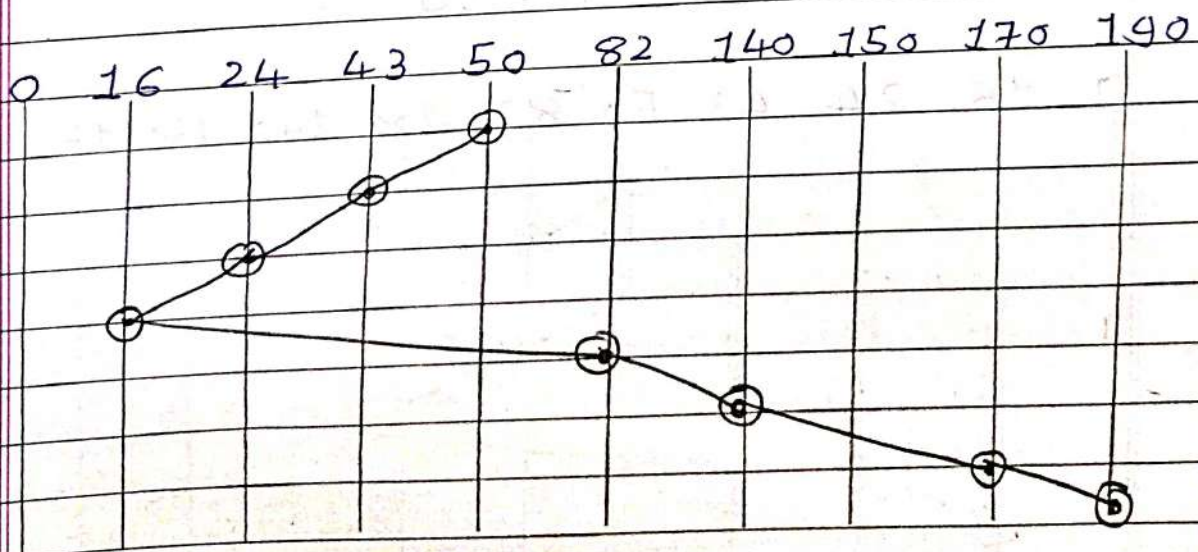
$$\text{Total Head Movement} = 642$$

2 SSTF :

SSTF stands for Shortest Seek Time First.

In SSTF, seek time of every request is calculated in advance in queue, according to shortest time disk arrive in queue.

Ex.



Total
Head

$$\text{Movement} = (50 - 43) + (43 - 24) + (24 - 16) + (82 - 16) + (140 - 82) + (170 - 140) + (190 - 170)$$

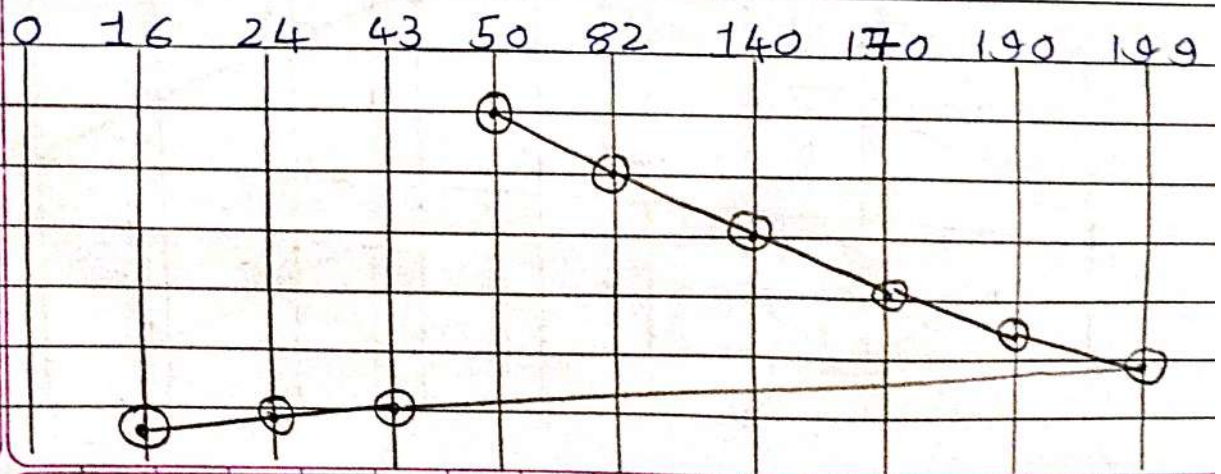
$$= 208$$

3 SCAN :

SCAN is known as a Elevator Algorithm.

In SCAN algorithm, the disk arm moves in a particular direction and request coming in its path and after reaching the end of disk, it reverses its direction and again services the request arriving in its path.

Ex. 82, 170, 43, 140, 24, 16, 190,



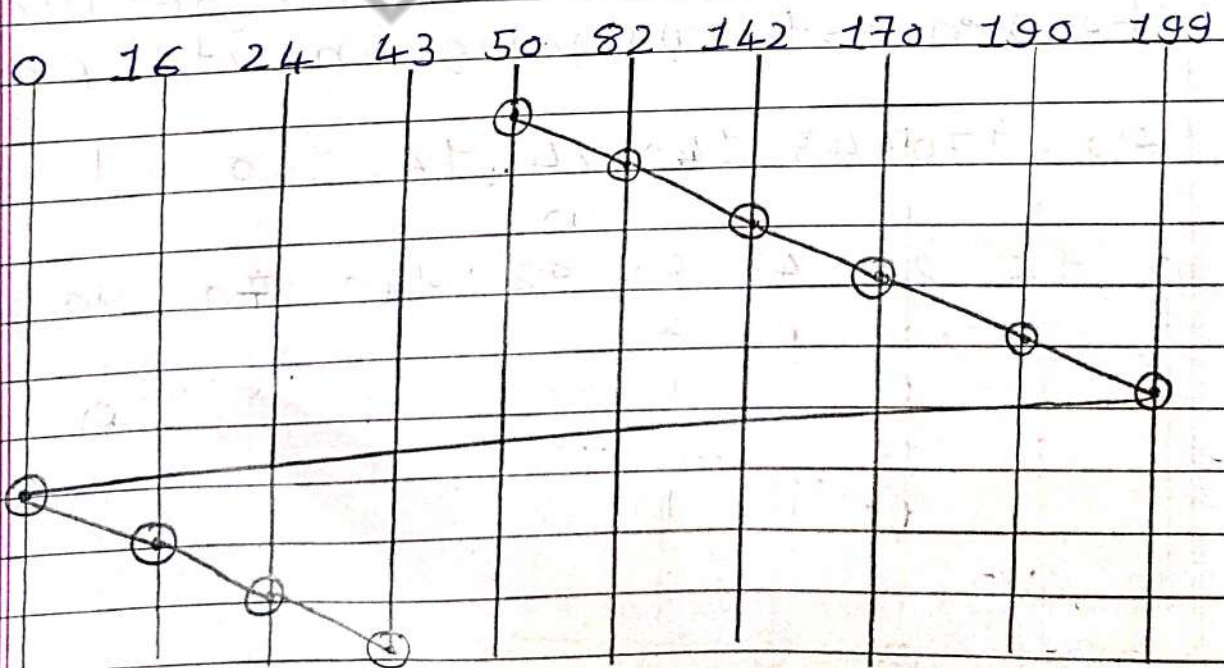
Head

$$\begin{aligned} \text{Movement} &= (82-50) + (140-82) + \\ & (170-140) + (190-170) + (199-190) \\ & + (199-43) + (43-24) + (24-16) \\ & = 332 \end{aligned}$$

4 CSCAN :

In CSCAN, the disk arm moves in a one direction and request coming services in path and reach the one end after that move the next end of path and again move in previous direction.

Ex. 82, 170, 43, 140, 24, 16, 190



Total Head

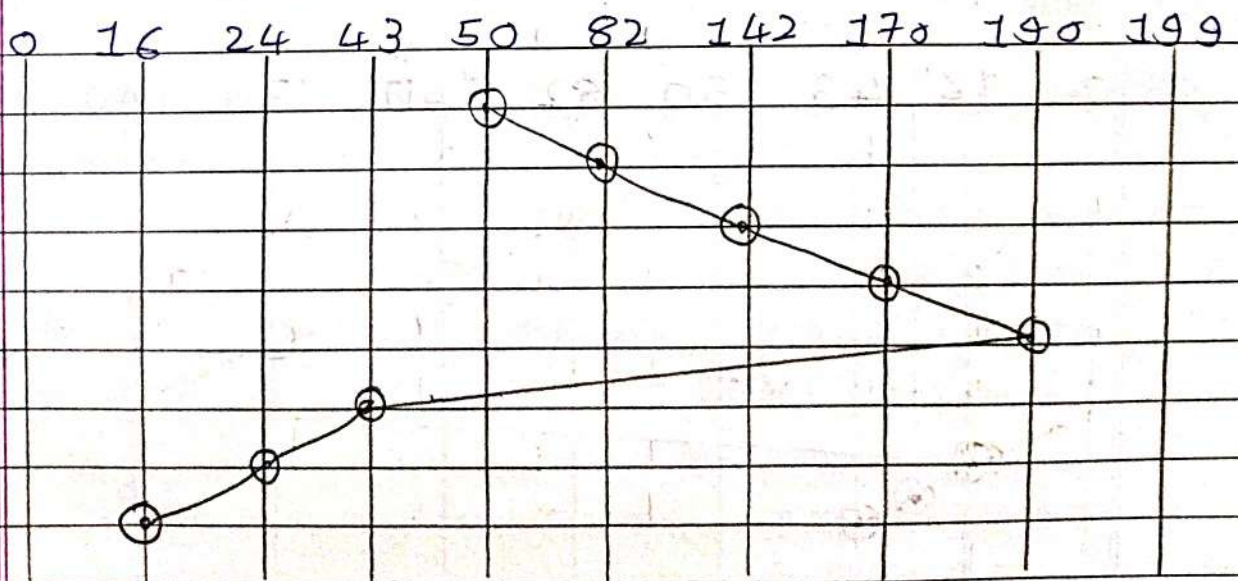
$$\begin{aligned} \text{Movement} &= (82 - 50) + (142 - 82) \\ &+ (170 - 142) + (190 - 170) + (199 - 190) \\ &+ (199 - 0) + (16 - 0) + (24 - 16) + \\ &(43 - 24) \end{aligned}$$

$$= 397$$

5 Look :

In Look, the disk arm move in one direction and request the services in a path but not reaching the end of disk. After that move reverse direction and request the services.

Ex. 82, 170, 43, 140, 24, 16, 190



Total Head

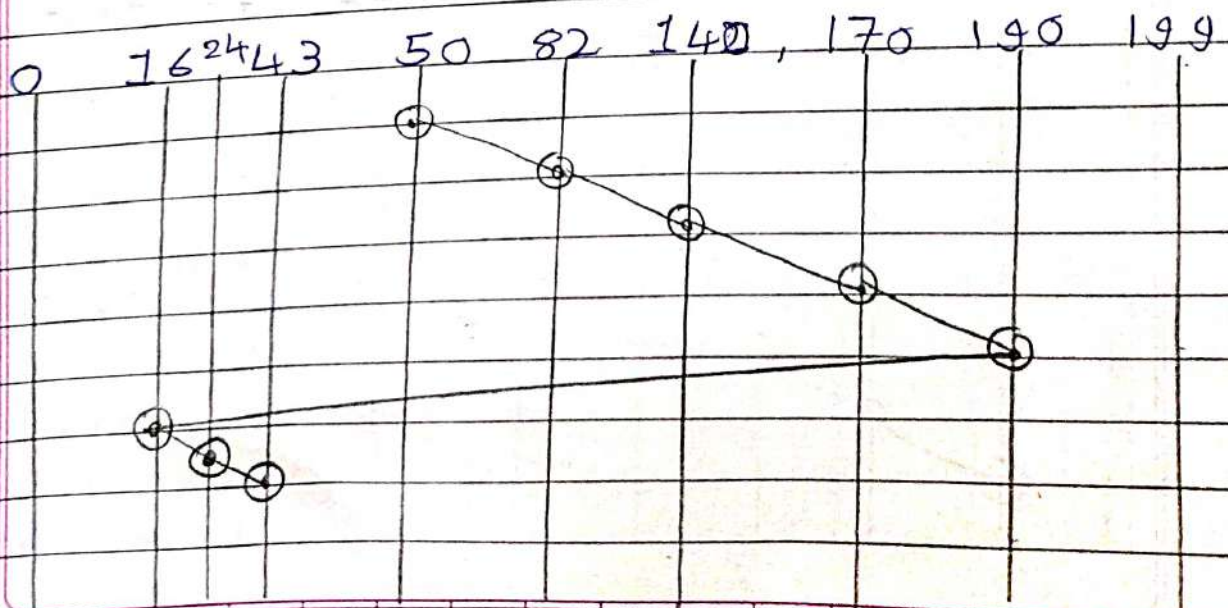
$$\text{Movement} = (82 - 50) + (142 - 82) + (170 - 142) + (190 - 170) + (190 - 43) + (43 - 24) + (24 - 16)$$

$$= 314.$$

6 CLOOK :

In CLOOK, the disk arms moves in one direction and request services in a path but not reaching the end of disk and after that coming in reverse side end and request reverse side first services and move in this direction.

Ex. 82, 170, 43, 140, 24, 16, 190



Total Head

$$\text{Movement} = (82 - 50) + (142 - 82) + (170 - 142) + (190 - 170) + (190 - 16) + (24 - 16) + (43 - 24)$$

$$= 347$$

* Explain File Access Methods in Operating System.

=> When a file is used into computer memory than we have to use several ways to access this file.

This are the basic File Access Methods.

1 Sequential Access:

This is a simplest File access method.

In this Access mode File is Processed in order, one record after the other.

Data is accessed one record right after another record in order.

When we use read command, it move ahead pointer by one.

When we use write command, it will allocate memory and move the pointer to the end of file.

2 Direct Access:

Direct Access method is known as Relative Access Method.

A Fixed-length Logical record that allows the program to read and write directly.

The Direct Access is based on the disk model of file since disk allows random access to any file block.

There is no restriction on the order of reading and writing.

In Direct Access, files can be immediately accessed decreasing the average access time.

3 Index - Sequential Method :

In this method, every file can have one index.

This method of accessing a file that built on the top of the sequential method.

To find a record in the file, we have to search the index of file.

An index in the back of ~~block~~ blocks, contains the pointer to various blocks.

This method, is control the pointer by using index.

Using index we can find any file in computer system.

* Explain File Attributes in Operating System.

=> This are the File Attributes.

1 Name :

Every File carries a name by which the file is recognized in the file system.

2 Identifier :

Each File has its own extension which identifier the type of the file.

3 Type :

The Files are classified in different type such as video file, text file etc.

4 Location :

In the File system, there are several locations on which the file can be stored.

5 Size :

The size of the file is one of its most important attribute.

6 Protection :

Each File carries its own set of Permission to the different group of users.

7 Time and Date :

Each File carries last modified time and date.

* Explain File Operations in Operating System.

=> This are the Basic File Operation in Operating System.

1 Create Operation :

This operation is used to create a file in this file system.

2 Open Operation:

This Operation is used to Open file in file system.

3 Write Operation:

This Operation is used to write the information into a file.

4 Read Operation:

This Operation reads the contents from a file.

5 Seek Positioning Operation:

The seek system call re-position the file pointers from the current position to a specific place in file.

6 Delete Operation:

This operation is used delete data in the file.

7 Close Operation:

When the Processing to the File is complete, than it should be close.

8 Truncate Operation:

~~To~~ Truncating is simply deleting the File except deleting attributes

9 Append Operation:

This Operation is Used to add data at the end of File.

10 Rename Operation:

This Operation is used ~~is~~ rename the existing file.