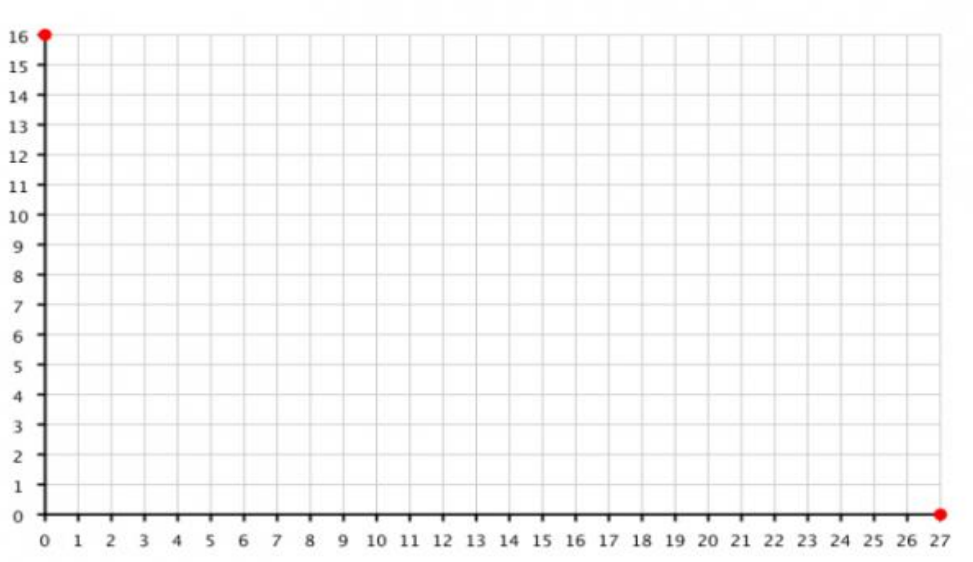
L35- STORAGE STRUCTURE TUTORIALS

Disk Access Time

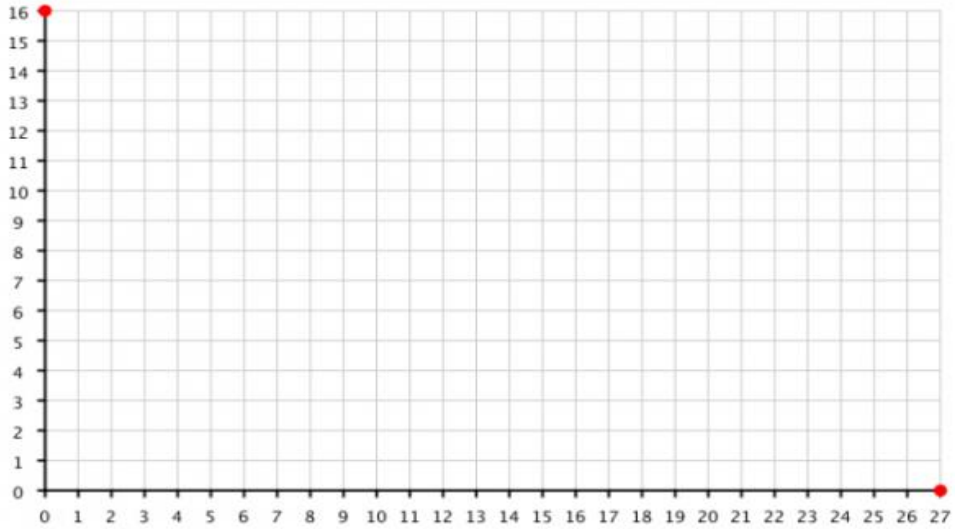
Q1: Consider a disk arm seek movement. When the arm starts from zero speed, it covers 1 track in first 1ms, covers 2 tracks in next 1ms, then thereafter it will cover 4 tracks/ms, 8 tracks/ms etc. The coast speed is 16 tracks/ms. The deceleration for pointing to target cylinder is also similar to the acceleration mentioned above. It took 12 ms to reach cylinder A from cylinder B. How far is cylinder A from cylinder B in terms of cylinder numbers?

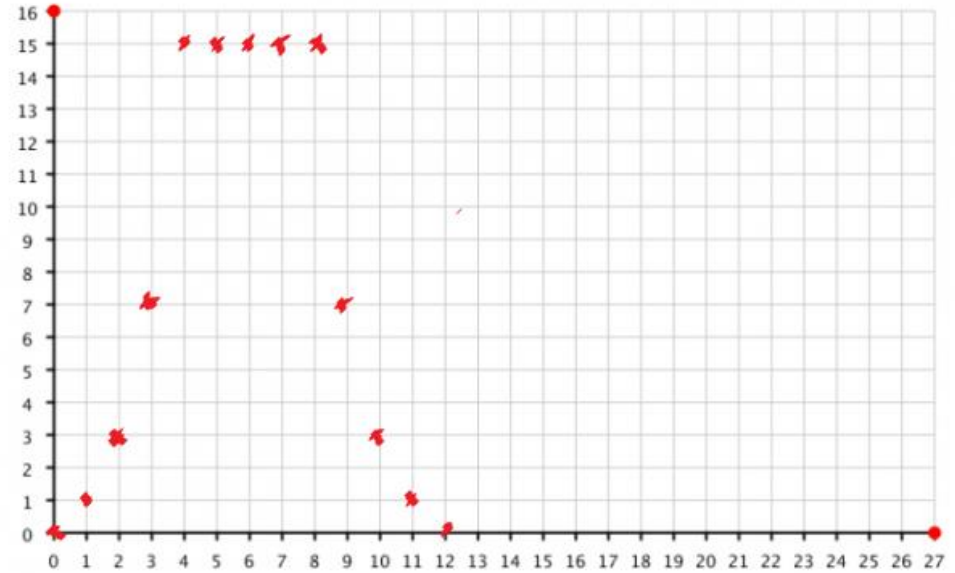
Disk Access Time

- 1 track/ms, 2 tracks/ms, 4 tracks/ms, 8 tracks/ms (acceleration)
- 16 tracks/ms (coast),
- 8 tracks/ms ,4 tracks/ms, 2 tracks/ms, 1 track/ms (deceleration)
- 12 ms to reach cylinder A from cylinder B.
- How far is cylinder A from cylinder B (in terms of cylinder numbers)?



Disk Access Time

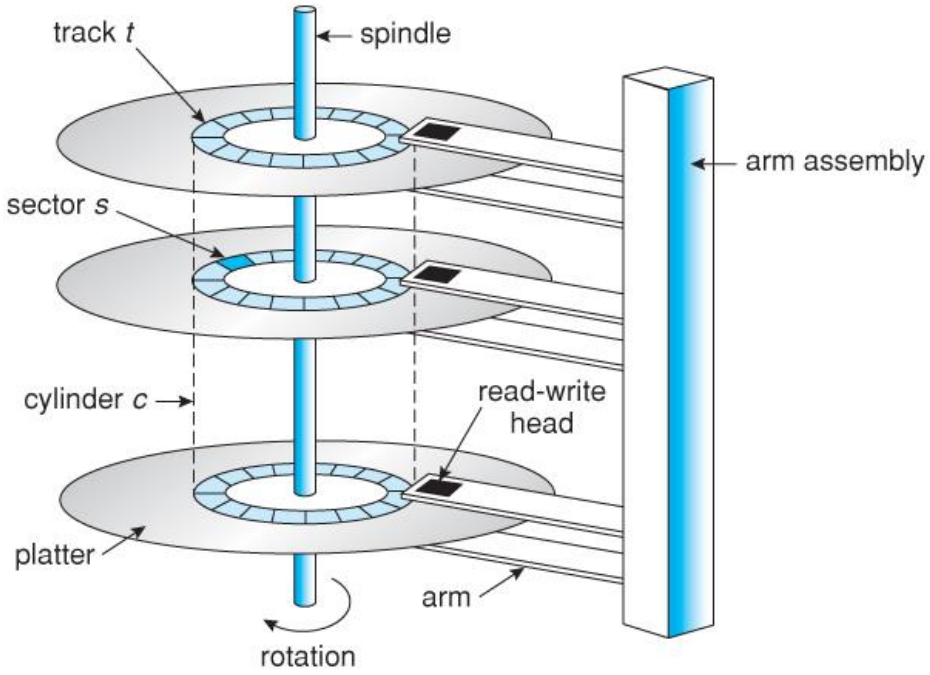


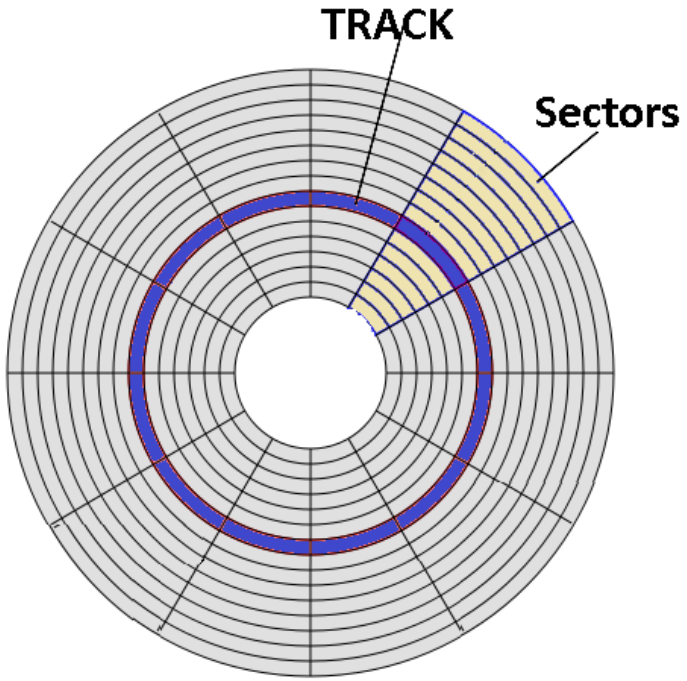


- (1+2+4+8) + (nx16) + (1+2+4+8) = distance
- 15 + (nx16) +15 =distance
- Total 12ms
- 4 + n + 4 = 12ms → n= 4
- Total distance between A and B = 15 + 64 + 15 = 94 cylinders

Disk Seek Time

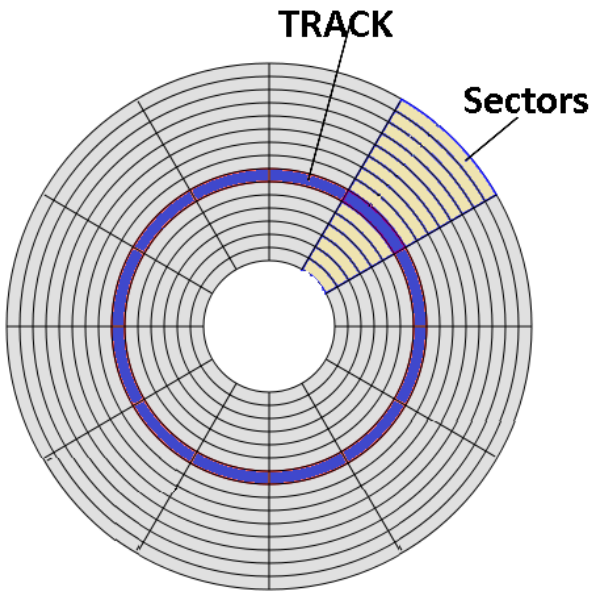
Q2: Consider a hard disk in which the head is currently located at cylinder A. Consider four other cylinders B, C, D, and E. It was found that the seek time from A to B, B to C, and D to E does not involve coast at all. But seek time from A to D and B to E is dominated by coast time. What can you infer about the relative locations of these five cylinders?





Disk Seek Time

- Seek time from A to B, B to C, and D to E → No coast at all.
- Seek time from A to D and B to E → dominated by coast.



- G are closer) & Group-2 (D and E are closer)
- Group-1 and Group-2 are far apart.

Comparison of Scheduling Algorithms

Q3: Consider a disk whose head is at the cylinder number N/2, where N is the total number of cylinders. Assume there are requests in the request queue of the disk that are to be scheduled. These requests are to cylinders larger than N/2 as well as smaller than N/2. Describe a scenario in disk scheduling, where SSTF scheduling and SCAN scheduling gives the same service order for the incoming requests?

Comparison of Scheduling Algorithms

Q4: Consider a disk whose head is at the cylinder number N/2, where N is the total number of cylinders. Assume there are requests in the request queue of the disk that are to be scheduled. These requests are to cylinders larger than N/2 as well as smaller than N/2. Describe a scenario in disk scheduling, where SSTF scheduling and C-LOOK scheduling gives the same service order for the incoming requests?

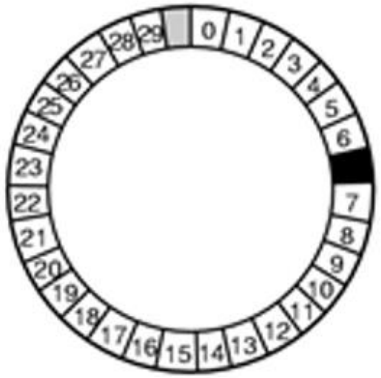
Bad block management

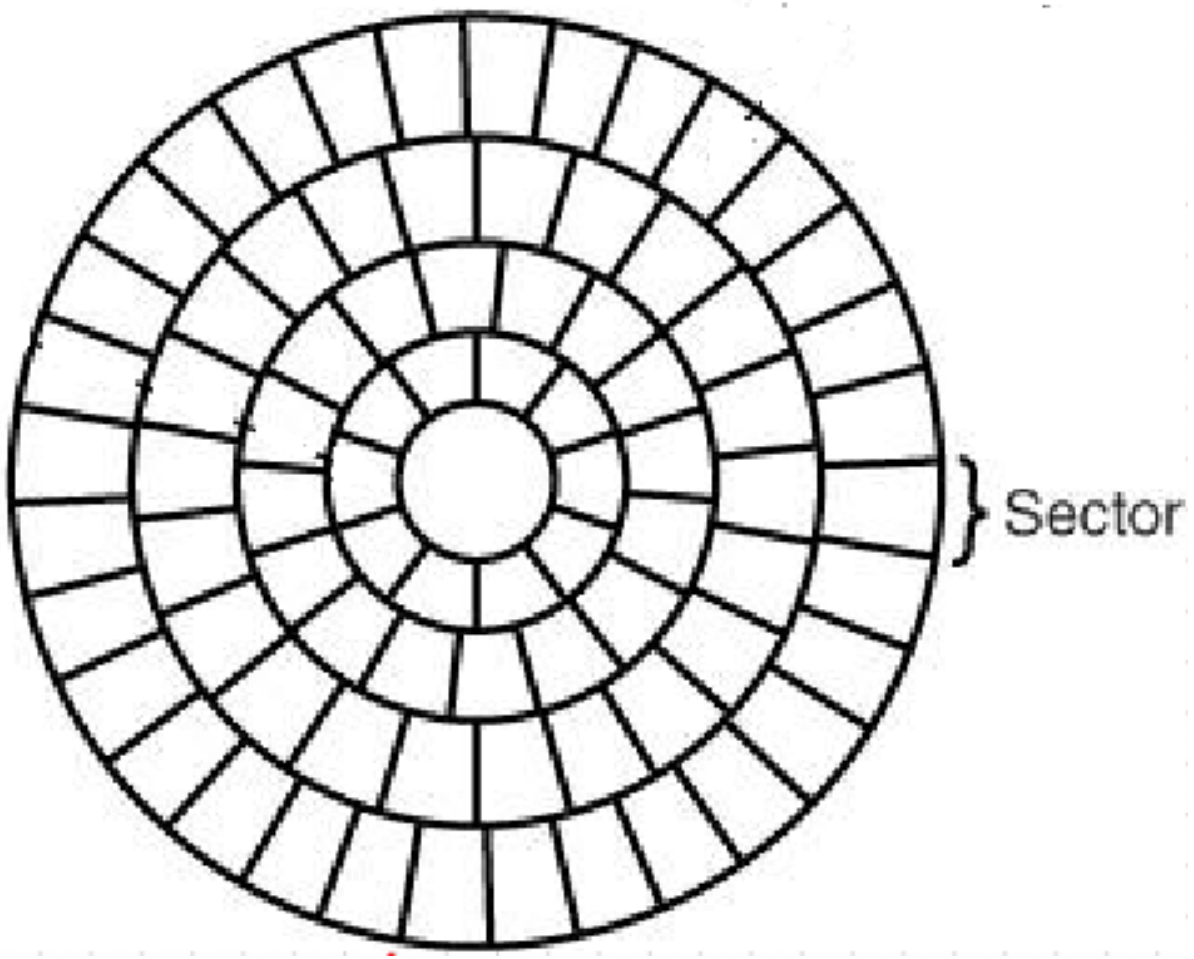
Q4: A very long video file is saved in 60 continuous sectors (1, 2,..60) of a given track of a cylinder. Assume there are 64 physical sectors in a track. It was found that after reading contents of sector 20, instead of reading from sector 21 the data is read from sector 22, followed by 23, 24 and so on. Similarly, this pattern is repeated at sectors 30 and 40 also where contents of 31 and 41 are skipped, respectively. The reading ends at sector 63. In your opinion what could be the most suitable reason for this variation from sequential reading? Explain whether it could be a malfunction or a specific optimization?

Bad block management

- Data: sectors →1, 2,..60
- 64 physical sectors in a track.
- Block order of reading
- 1, 2,..,20, 22, 23,….. 30, 32, 33,…… 40, 42, 43,…… 62, 63.
- Skipped blocks: 21,31,41

Sector Slipping





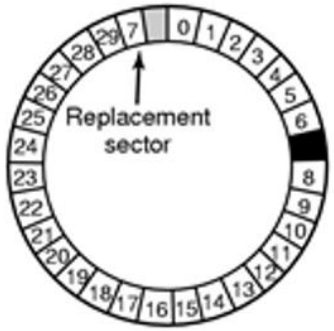
Bad block management

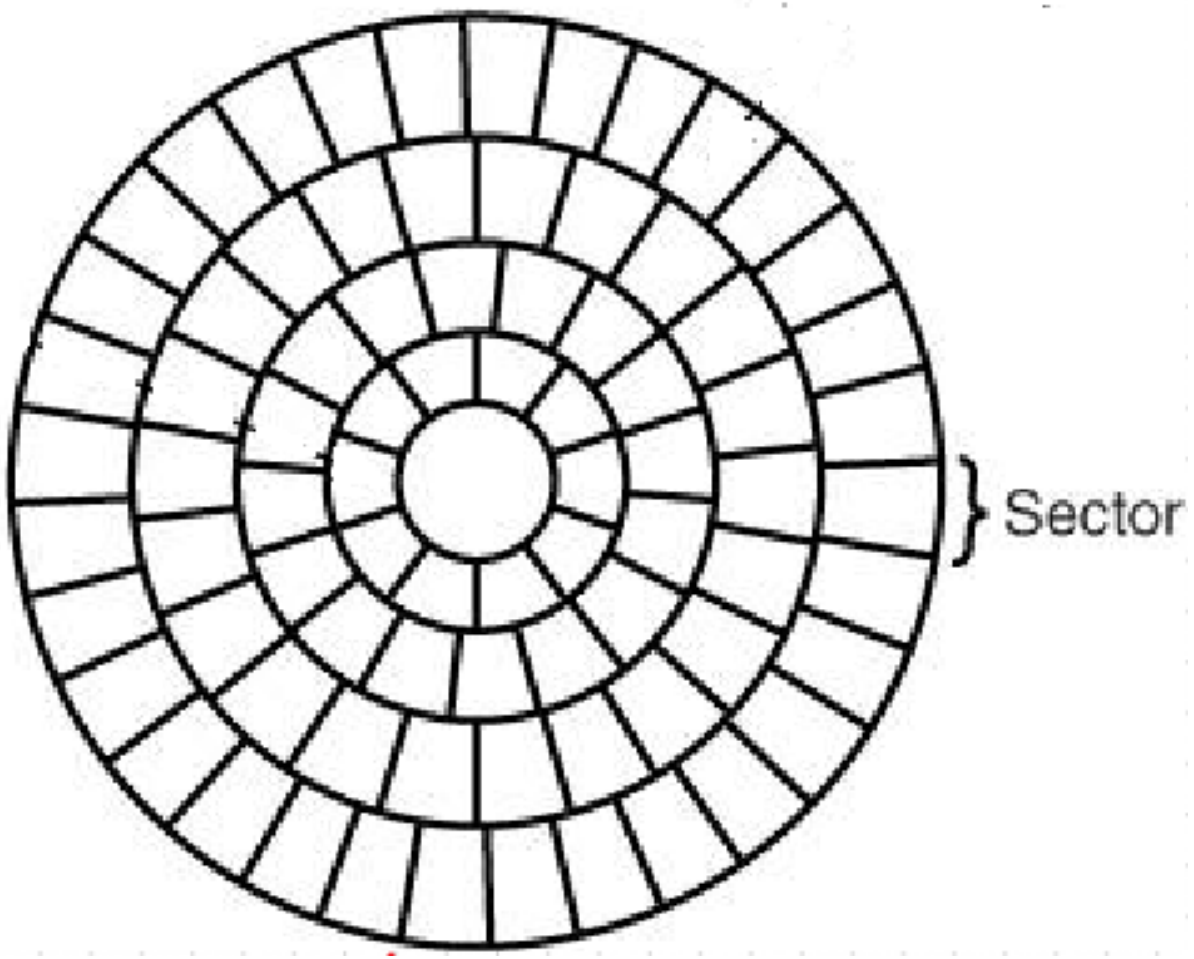
Q5: A very long video file is saved in 60 continuous sectors (1, 2..60) of a given track of a cylinder. Assume there are 64 physical sectors in a track. It was found that after reading contents of sector 20, instead of reading from sector 21 the data is read from sector 61 followed by sector 22, 23, 24 and so on. Similarly, this pattern is repeated after sector 30 and 40 also where reading happens from sectors 62 and 63, respectively. (30, 62, 32, 33….. 40, 63, 42, 43..) The reading ends at sector 60. In your opinion what could be the most suitable reason for this variation from sequential reading? Explain whether it could be a malfunction or a specific optimization?

Bad block management

- Data: sectors →1, 2,..60
- 64 physical sectors in a track.
- Block order of reading
- 1, 2,..,20, 61, 22, 23,….. 30, 62, 32, 33,…… 40, 63, 42, 43,…… 59, 60.
- Skipped blocks: 21,31,41

Sector Forwarding





Disk Scheduling

Q6: Consider a disk queue that has 6 requests to be serviced. There are 200 cylinders and currently the head is positioned at zero speed at cylinder number 100. It is found that, to service these requests, the direction of movement of arm was reversed 5 times both in the case of FCFS scheduling and SSTF scheduling. Give a list of 6-cylinder numbers (in the order of arrival to disk queue) that can satisfy these. Draw the head movement path for FCFS and SSTF scheduling algorithm.

Disk Scheduling

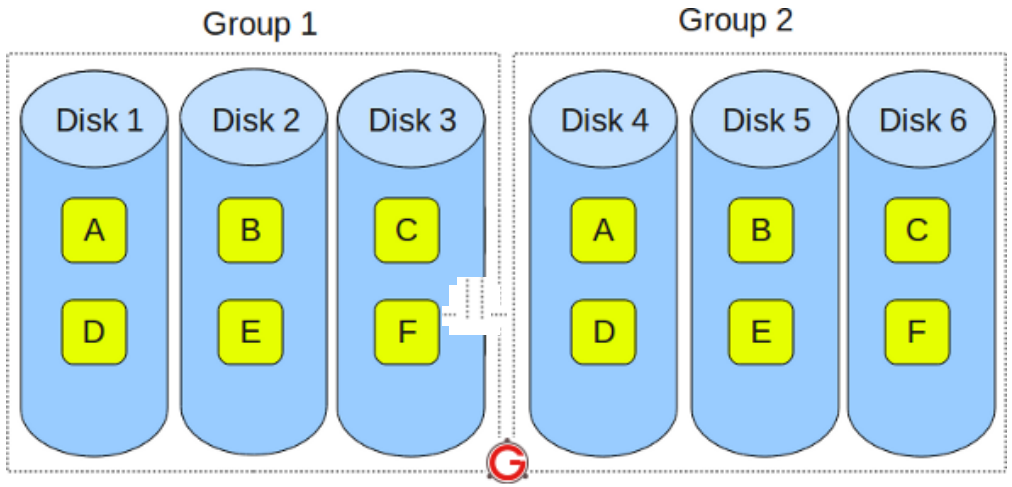
6 requests to be serviced.

200 cylinders, head is positioned at 100.

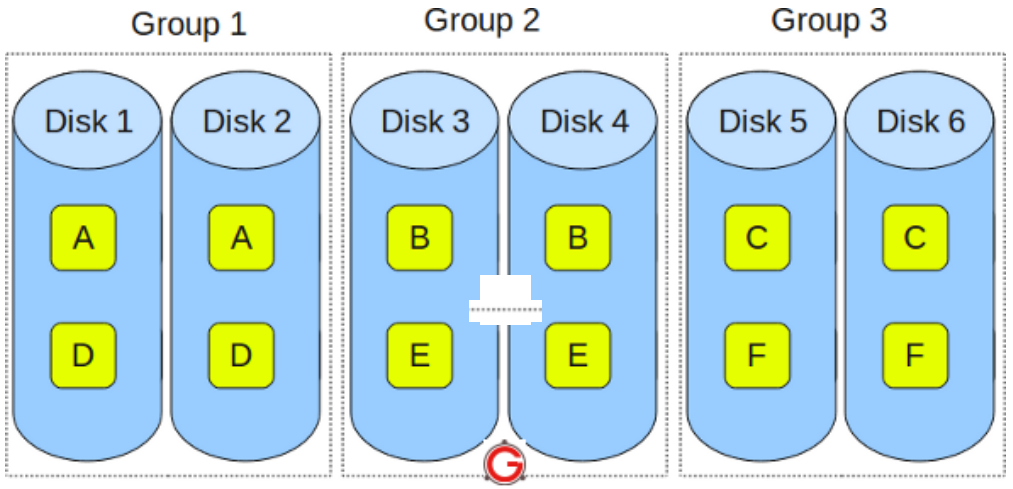
FCFS & SSTF scheduling- 5 times direction of arm movement reversed.

RAID Structures

Q7: Consider a RAID system with a total of six identical disks (D1, D1,..D6) in terms of storage capacity and access speed. Assume we have to store 6 blocks of data viz; A, B, C, ..F in these disks. Draw a schematic of RAID 10 and RAID 01 clearly marking the name, grouping and contents of each disk.



RAID 01 – Blocks Striped. (and Blocks Mirrored)



RAID 10 – Blocks Mirrored. (and Blocks Striped)

Thank You