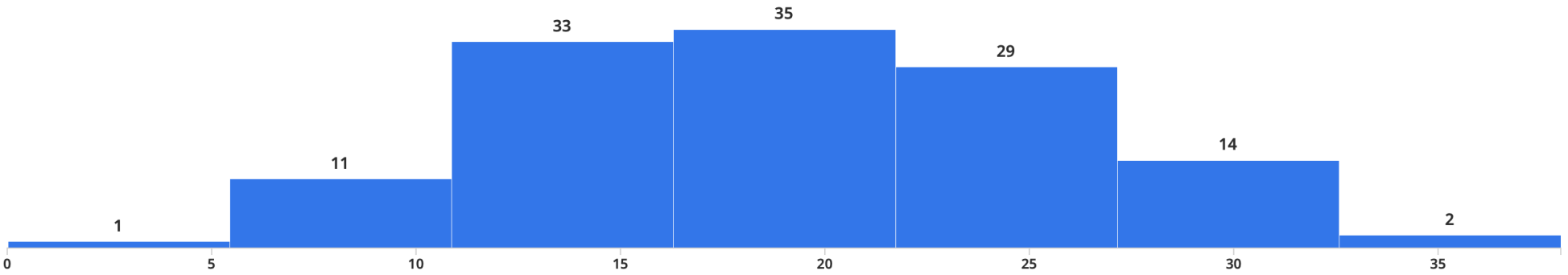
# COL 362 & COL 632

Database Storage

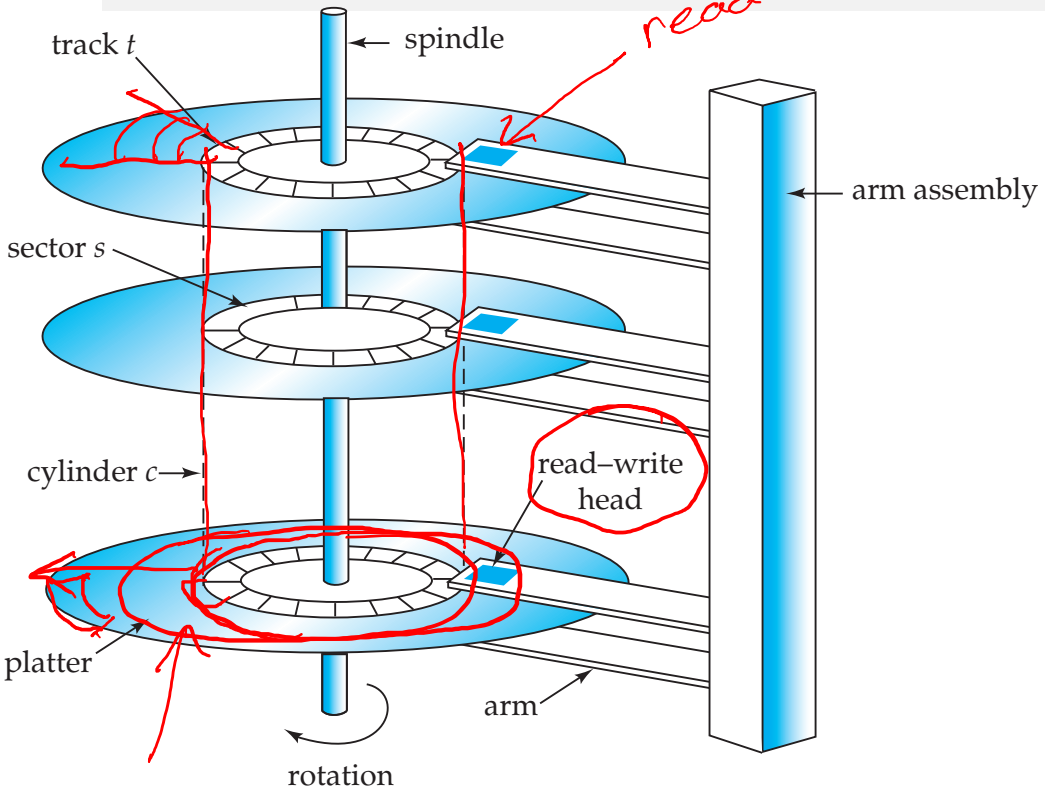
17 Feb 2023

Maximum marks = 38




| Minimum | Median | Maximum | Mean | Std Dev |
|---|---|---|---|---|
| 4.5 | 19.5 | 33.75 | 19.12 | 6.54 |

# Magnetic Hard Disk Mechanism




- Read-write head
  - reads or writes magnetically encoded information.
- Surface of platter divided into circular tracks
  - over 50K-100K tracks per platter on typical hard disks
- Each track is divided into sectors.
  - sector size typically 512 bytes
  - 500 to 2000 sectors/track
- To read/write a sector
  - read-write head moves to track, disk rotates to sector

# “Speed” of Disks

- **Access time** – the time it takes from when a read or write request is issued to when data transfer begins
  - Seek time – time it takes to reposition the arm over the correct track.
    - **2 to 20 milliseconds** on typical disks
    - **Average seek time** (4-10 milliseconds) is usually provided by the disk manufacturer
  - Rotational latency – time it takes for the sector to be accessed to appear under the head.
    - 4 to 11 milliseconds on typical disks (5400 to 15000 r.p.m.)

# Performance Measures of Disks (2/2)

- Data-transfer rate – the rate at which data can be retrieved from or stored to the disk.
  - Maximum rates upto 50-200 MB per second
- Mean time to failure (MTTF) – the average time the disk is expected to run continuously without any failure.
  - Nowadays, vendors' claim MTTF to be 57-136 years!!!
  - If one has 1000 new disks, and MTTF is 12,00,000 hours, then on an average one will fail in 1200 hours!!
  - Typical lifetime of a disk is in practice is 3 to 5 years
- Self-study: SSD/Flash memory, Storage class memory (Optane), RAID for improved reliability

# Disk Block Access (1/2)

- Disk IO requests from the OS consist of an address on disk
  - Address is a block number
- A **disk block** is a logical unit consisting of a fixed no. of consecutive sectors
- Data transfer from disk to memory is in terms of blocks
- A *page* is like a block, but virtual
  - A page can be mapped to one or more blocks
  - Applications refer to pages, OS refers to blocks

sector

page ≡ block

# Disk Block Access (2/2)

- **Sequential access**
  - Access requests are for *successive* blocks on same track
  - Reduces or eliminates seek time
- **Random access**
  - Access requests are for blocks randomly located on disk
  - Access time is higher – each access requires a seek