MEMORY
MEMORY REPRESENTATION

- **BIT** – Binary Digit – Basic unit of memory (0 or 1)
- 1 bit = 0 or 1
- 1 byte = 8 bits
- 1 Kilobyte (KB) = $2^{10} = 1024$ Bytes
- 1 Megabyte (KB) = $2^{20} = 1024$ KB
- 1 Gigabyte (KB) = $2^{30} = 1024$ MB
- 1 Terabyte (KB) = $2^{40} = 1024$ GB

[To Get more materials click here](www.ktustudents.in)
MEMORY HIERARCHY

- COST: HIGH, LOW
- ACCESS SPEED: HIGH, LOW
- STORAGE CAPACITY: LOW

- PRIMARY or MAIN MEMORY
- CACHE MEMORY
- REGISTER
- MAGNETIC DISK & OPTICAL DISK
- MAGNETIC TAPE

www.ktustudents.in

To Get more materials click here: www.ktustudents.in
How the data is accessed?

• Sequential access
• Direct access
PRIMARY MEMORY

• **RAM** (Stores data and instructions during operation of computer)
  • **ROM** (Stores the **BIOS**)
RAM - Types

• DRAM
  • Commonly used
  • Contains transistors and capacitors
  • Transistors are arranged in a Matrix of rows and columns
  • Requires constant refreshing
  • DRAM is slow because of high refreshing time

• SRAM
  • Usually used in cache memory because of its high speed
  • No need of constant refreshing so it is faster. Also expensive

To Get more materials click here> www.ktustudents.in
2 Types of RAM Modules

• SIMM
  • 32 bit memory
  • Memory chips on one side of the PCB (Printed circuit board)

• DIMM
  • 64 bit memory
  • Memory chips on both sides of the PCB (Printed circuit board)
SECONDARY MEMORY / STORAGE DEVICE
MAGNETIC TAPE

• Sequential access device
  • Tape needs to rewind or move forward to the location of the data
• A storage medium on a large open reel or in a smaller cartridge or cassette
• They are
  • Durable
  • Written, erased, and rewritten
• Not suitable for data files which are updated frequently (Because it’s sequential)
• Generally used to store backup data which are not used often
To Get more materials click here> www.ktustudents.in
## Working of Magnetic Tape

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To get more materials click here: [www.ktustudents.in](http://www.ktustudents.in)
• Data is recorded in the form of blocks (records – a group of data)
• Each block is read continually
• There is an INTER RECORD GAP (IRG) between two blocks
  • To provide time for the tape to be stopped and started between records
Features – Magnetic Tape

• Inexpensive storage device
• Can store a large amount of data
• Easy to carry or transport
• Not suitable for random access data
• Slow access device
• Needs dust prevention (dust can harm the tape)
• Suitable for backup storage
2. MAGNETIC DISK

• Direct Access Device

• It is a thin plastic/metallic circular plate coated with magnetic oxide and encased in a protective cover

• Data is stored as – MAGNETIZED SPOTS
  • Data present – bit=1
  • Data absent – bit=0
Surface of the disk is divided into CONCENTRIC CIRCLES called TRACKS

To Get more materials click here> www.ktustudents.in
On a magnetic disk, the sectors are of different sizes: bigger at the rim and smaller at the center. The disk spins at a constant angular velocity (CAV) to compensate for this difference.
Working – Magnetic Disk

• SECTOR – Smallest unit that can be read or written on a disk
• Data is stored in the SECTOR
• Disk has 8 or more sectors per track
• Magnetic disk is inserted to magnetic disk drive for access
  • Drive consists of a read/write head
• During read/write, the motor of drive moves at high speed (60-150 times per sec)
Accessing data on the disk

1. Read/write head is positioned to the desired TRACK
   • Seek time: time taken to move read/write head to desired track
2. The read/write head waits for the desired TRACK SECTOR to reach under it
   • Latency time: time taken for desired track sector to reach under it
3. The data is read/written

Access Time = Seek time + Latency time + time for data transfer
• Large disk storage can be formed by stacking together multiple disks
  • Known as CYLINDER
  • Each disk has its own read/write head which works in coordination

• DOUBLE-SIDED Disk
  • Has tracks and sectors on both sides
Features – Magnetic Disk

- Cheap storage device
- Can store large amount of data
- Easy to carry/transport
- Suitable for read frequently read/written data
- Fast access device
- More reliable
- To be prevented from dust
What happens when formatted

To Get more materials click here> www.ktustudents.in
Floppy Disk

- Flat, round, single disk made of Mylar plastic
- Enclosed in square plate jacket
- Can be single sided/double sided
- FDD (Floppy Disk Drive)
- Floppy disk – inserted to FDD to read/write
- Floppy disk has a WRITE PROTECT slide tab
  - Prevents user to write to it
- Portable – can be removed and carried/stored separately
- Slower to access than Hard disk
- Size: 5.25 inch and 3.5 inch
Hard Disk (HD)

READ/WRITE HEAD

SPINDLE

TRACK

PLATTERS

ACCESS ARMS

To Get more materials click here> www.ktustudents.in
Hard Disk

• Key secondary storage device of the computer
• Consists of one or more PLATTERS divided into concentric tracks and sectors
• It is mounted on a central spindle, like a stack
• It can be read by a read/write head that pivots across the rotating disks
• Data is stored on the platters covered with magnetic coating

To Get more materials click here> www.ktustudents.in
• Hard disk and Hard Disk Drive (HDD) is a single unit
• Large capacity HDD has 12 or more platters
• Unlike floppy, the read/write head does not touch the disk during accessing
• Speed: upto 10000 revolution/minute
• Access time: 9-14 ms
• Stores 512 bytes/sector, but no. of sectors are more (>54)
• Portable external HDD is available

To Get more materials click here> www.ktustudents.in
Zip disk

• High Capacity Removable Disk and drive
• Speed as that of Hard disk
• Portability as that of floppy
• Zip disk have same size of floppy
• Capacity – 100 MB to 750 MB
• Comes as a complete unit – disk drive, connection cable, power cord, and OS
• Can be Connected to computer
Optical Disk

• Flat, circular disk, coated with reflective plastic material that can be altered by laser light
• Optical disk does not use magnetism
• Bits 0 and 1 are stored as spots that are relatively bright and light respectively
• Consists of a single spiral track starting from the edge towards the centre of the disk
• Can access large amount of data sequentially (eg: music & video)
  • Due to its spiral shape

To Get more materials click here> www.ktustudents.in
Optical disk (cntd...)

• Tracks are divided into sectors of same length
• Slower than hard disks
• Can store large amount of data (up to 6GB) (Commonly used is 700MB)
• Access time : 100 to 200ms
• 2 Types:
  • READ-ONLY
  • RECORDABLE
CD ROM

- Optical memory which can only be read once written (size: 120 mm or 80 mm diameter)
- Data is stored as pits (depressions) and lands (flat) on CD ROM disk
- When laser light is focused on disk, the pits scatter the light (interpreted as 0) and lands reflect (interpreted as 1) to a sensor
- Do not get worn out easily (Since only light is touching on the disk)
DVD ROM (Digital Video Disk ROM)

- Optical storage device used to store digital video or computer data
- It is a high density medium with increased track and bit density
- Uses both sides of the disk and special compression technologies. The tracks for storing data are extremely small
- Each side can store 4.7GB of data, So a single DVD can store 9.4GB data

To Get more materials click here> www.ktustudents.in
Recordable Optical Disk

1. Compact Disk-Recordable (CD-R): WROM disk (Write once read many) disk
   - Cannot erase
   - Requires a CD burner (Uses a laser which burns pits into the disk surface)

2. Compact Disk-Rewritable
   - Allows data to be written, erased and rewritten

3. Digital Video Disk – Recordable (DVD-R):
   - A DVD writer device is required to write data
   - Data once written cannot be erased

To Get more materials click here> www.ktustudents.in
Magneto Optical Disk

• Use laser beam to read data and magnetic field to write data to disk
• Data can be written, erased and re-written
• Outdated now
• Currently CD-RW, DVD-R etc are used

To Get more materials click here> www.ktustudents.in