# LAB MANUAL # 01

# Introduction to Computer

## Objective:

To understand

1. Parts of computer
2. Types of ports
3. Types of memory.
4. Instruction execution

## Description:

**Computer Parts:**

Computers are complex machines, with much of the processing and work being done at a microscopic level. But did you know that inside a computer are several parts that you can see or identify with ease? These computer components are what make any machine run and affect its performance.

**Why is it Important to Understand Computer parts?**

Computers are abundant in the life we live now. Most people heavily rely on computers today, so it is in their best interest to understand a basic computer's components, functions, and cost. If you can understand this, it will help you in purchasing or seeking repairs on your device. It is imperative to understand the name and function of each component in a computer in order to understand how it functions as a whole. Attempt to always remember that a computer is based off the human body and functions in the same way. You cannot expect to understand the human body without first understanding its organs and their functions. A computer is composed of components in the same way that the body is composed of organs that together work to make the body or computer function.

**1) Motherboard**

The **motherboard** is the computer's **main circuit board**. It's a thin plate that holds the CPU, memory, connectors for the hard drive and optical drives, expansion cards to control the video and audio, and connections to your computer's ports (such as USB ports). The motherboard connects directly or indirectly to every part of the computer.

**2) CPU/processor**

The central processing unit (CPU), also called a **processor**, is located inside the **computer case** on the motherboard. It is sometimes called the brain of the computer, and its job is to carry out commands. Whenever you press a key, click the mouse, or start an application, you're sending instructions to the CPU.

The CPU is usually a **two-inch ceramic square** with a **silicon chip** located inside. The chip is usually about the size of a thumbnail. The CPU fits into the motherboard's **CPU socket**, which is covered by the **heat sink**, an object that absorbs heat from the CPU.

A processor's **speed** is measured in **megahertz (MHz)**, or millions of instructions per second; and **gigahertz (GHz)**, or billions of instructions per second. A faster processor can execute instructions more quickly. However, the actual speed of the computer depends on the speed of many different components—not just the processor.

**3) RAM (random access memory)**

RAM is your system's **short-term memory**. Whenever your computer performs calculations, it temporarily stores the data in the RAM until it is needed.

This **short-term memory disappears** when the computer is turned off. If you're working on a document, spreadsheet, or other type of file, you'll need to **save** it to avoid losing it. When you save a file, the data is written to the **hard drive**, which acts as **long-term storage**.

RAM is measured in **megabytes (MB) or gigabytes (GB)**. The **more RAM** you have, the more things your computer can do at the same time. If you don't have enough RAM, you may notice that your computer is sluggish when you have several programs open. Because of this, many people add **extra RAM** to their computers to improve performance.

**4) Hard drive**

The **hard drive** is where your software, documents, and other files are stored. The hard drive is **long-term storage**, which means the data is still saved even if you turn the computer off or unplug it.

When you run a program or open a file, the computer copies some of the data from the **hard drive** onto the **RAM**. When you **save** a file, the data is copied back to the **hard drive**. The faster the hard drive, the faster your computer can **start up** and **load programs**.

**5) Power supply unit**

The power supply unit in a computer **converts the power** from the wall outlet to the type of power needed by the computer. It sends power through cables to the motherboard and other components.

### 6) ROM (Read Only Memory)

Read-only memory (ROM) is a type of storage medium that **permanently** stores data on personal computers (PCs) and other electronic devices. It contains the programming needed to start a PC, which is essential for **boot-up**; it performs major input/output tasks and holds programs or software instructions.

Because ROM is read-only, it cannot be changed; it is permanent and non-volatile, meaning it also holds its memory even when power is removed

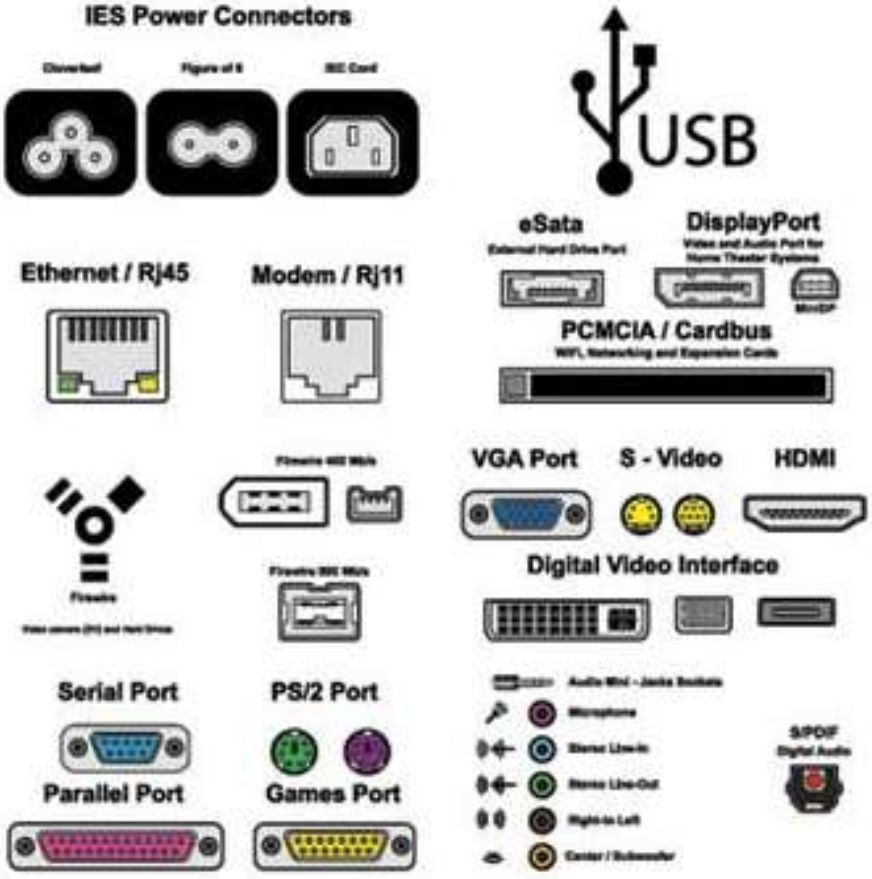
## Cables and ports:

A port is a physical docking point using which an external device can be connected to the computer. It can also be programmatic docking point through which information flows from a program to the computer or over the Internet.

### Characteristics of Ports:

A port has the following characteristics −

- External devices are connected to a computer using cables and ports.
- Ports are slots on the motherboard into which a cable of external device is plugged in.
- Examples of external devices attached via ports are the mouse, keyboard, monitor, microphone, speakers, etc.




**7) Serial Port**

- Used for external modems and older computer mouse
- Two versions: 9 pin, 25 pin model
- Data travels at 115 kilobits per second

**8) Parallel Port**

- Used for scanners and printers
- Also called printer port
- 25 pin model
- IEEE 1284-compliant Centronics port

**9) Universal Serial Bus (or USB) Port**

- It can connect all kinds of external USB devices such as external hard disk, printer, scanner, mouse, keyboard, etc.

- It was introduced in 1997.
- Most of the computers provide two USB ports as minimum.
- Data travels at 12 megabits per seconds.
- USB compliant devices can get power from a USB port.

**10) VGA Port**

- Connects monitor to a computer's video card.
- It has 15 holes.
- Similar to the serial port connector. However, serial port connector has pins, VGA port has holes.

**11) Power Connector**

- Three-pronged plug.
- Connects to the computer's power cable that plugs into a power bar or wall socket.

**12) Ethernet Port**

- Connects to a network and high speed Internet.
- Connects the network cable to a computer.
- This port resides on an Ethernet Card.
- Data travels at 10 megabits to 1000 megabits per seconds depending upon the network bandwidth.

## Memory:

A memory unit is the collection of storage units or devices together. The memory unit stores the binary information in the form of bits. Generally, memory/storage is classified into 2 categories:

- **Volatile Memory:** This loses its data, when power is switched off.
- **Non-Volatile Memory:** This is a permanent storage and does not lose any data when power is switched off.

**Types of Memory:**

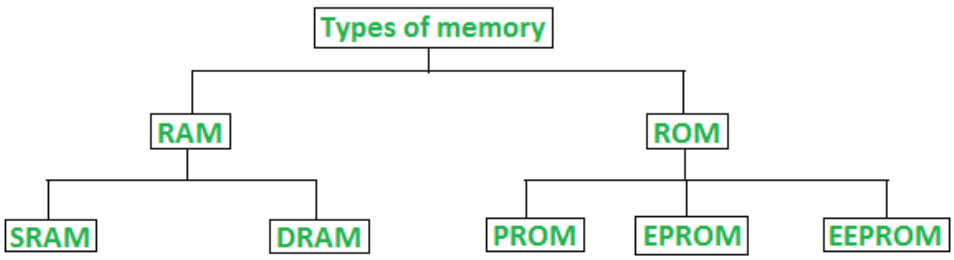
Computer memory is of two basic type – Primary memory(RAM and ROM) and Secondary memory(hard drive, CD etc.). Random Access Memory (RAM) is primary-volatile memory and Read Only Memory (ROM) is primary-non-volatile memory.

**Random Access Memory (RAM)**

- It is also called as read write memory or the main memory or the primary memory.
- The programs and data that the CPU requires during execution of a program are stored in this memory.
- It is a volatile memory as the data loses when the power is turned off.
- RAM is further classified into two types- SRAM (Static Random Access Memory) and DRAM (Dynamic Random Access Memory).

**Read Only Memory (ROM)**

- Stores crucial information essential to operate the system, like the program essential to boot the computer.
- It is not volatile.
- Always retains its data.
- Used in embedded systems or where the programming needs no change.
- Used in calculators and peripheral devices.
- ROM is further classified into 4 types- ROM, PROM, EPROM, and EEPROM.

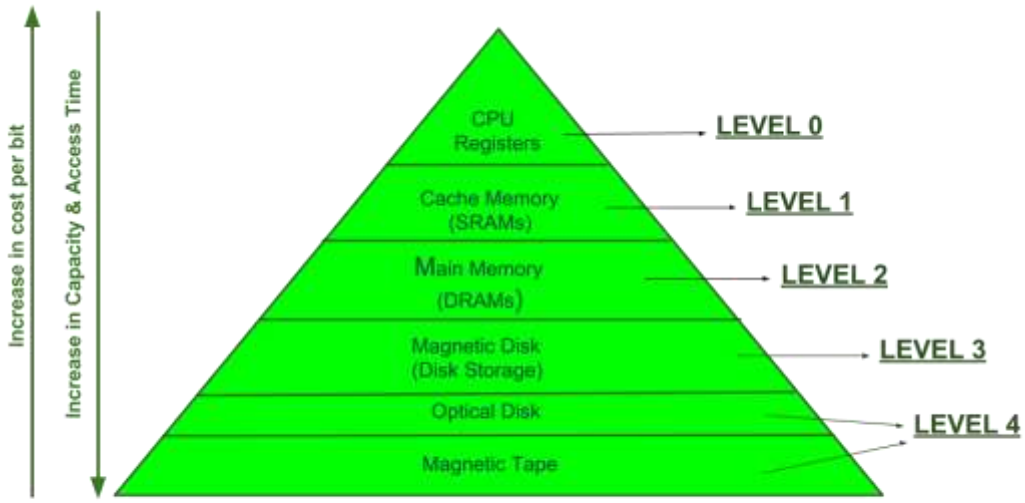



**Classification of computer memory**

**Memory Hierarchy Design and its Characteristics:**

Earlier when the computer system was designed without Memory Hierarchy design, the speed gap increases between the CPU registers and Main Memory due to large difference in access time. This results in lower performance of the system and thus, enhancement was required. This enhancement was made in the form of Memory Hierarchy Design because of which the performance of the system increases. The Memory Hierarchy was developed based on a program behavior known as locality of references. One of the most significant ways to increase system

performance is minimizing how far down the memory hierarchy one has to go to manipulate data. The figure below clearly demonstrates the different levels of memory hierarchy:




## MEMORY HIERARCHY DESIGN

This Memory Hierarchy Design is divided into 2 main types:

1. **External Memory or Secondary Memory**

Comprising of Magnetic Disk, Optical Disk, Magnetic Tape i.e. peripheral storage devices which are accessible by the processor via I/O Module.

2. **Internal Memory or Primary Memory**

Comprising of Main Memory, Cache Memory & CPU registers. This is directly accessible by the processor.

We can infer the following characteristics of Memory Hierarchy Design from above figure:

**1) Capacity:**

It is the global volume of information the memory can store. As we move from top to bottom in the Hierarchy, the capacity increases.

**2) Access Time:**

It is the time interval between the read/write request and the availability of the data. As we move from top to bottom in the Hierarchy, the access time increases.

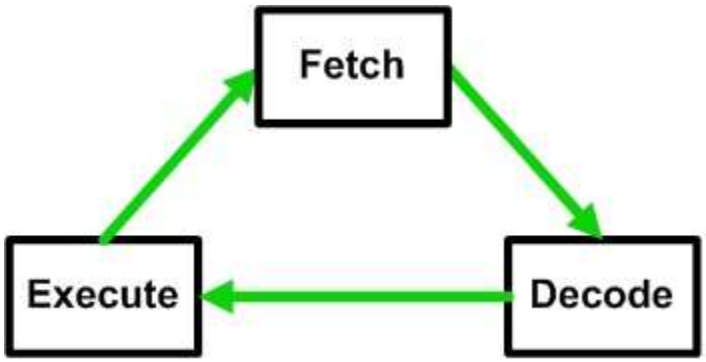
**3) Cost per bit:**

As we move from bottom to top in the Hierarchy, the cost per bit increases i.e. Internal Memory is costlier than External Memory.

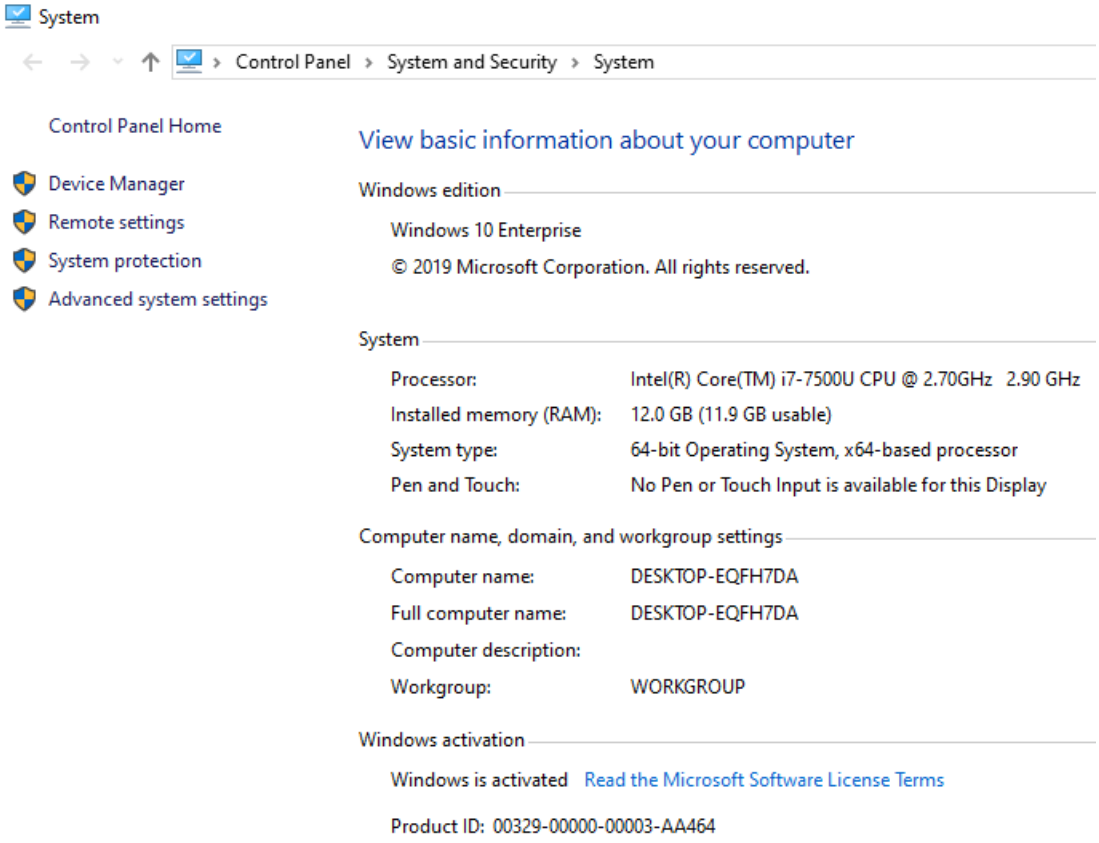
## Instruction:

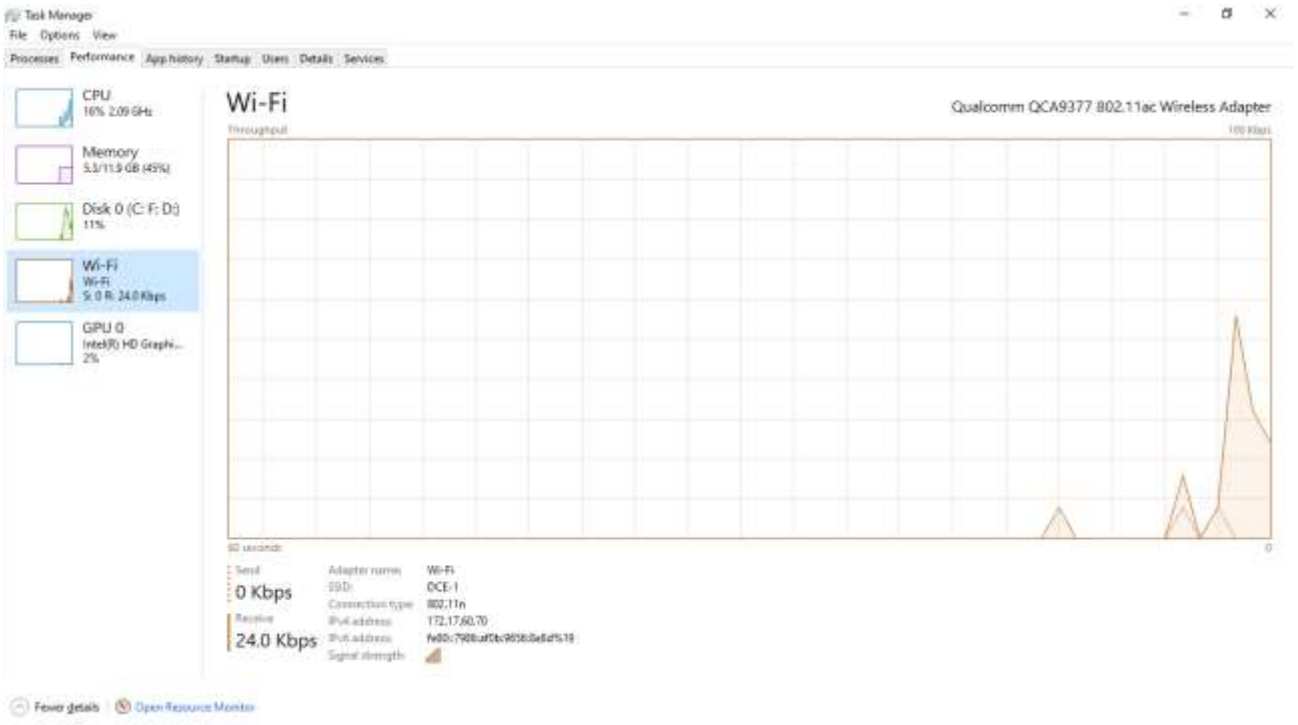
Instruction is an order given to computer processor by computer program to perform an operation.

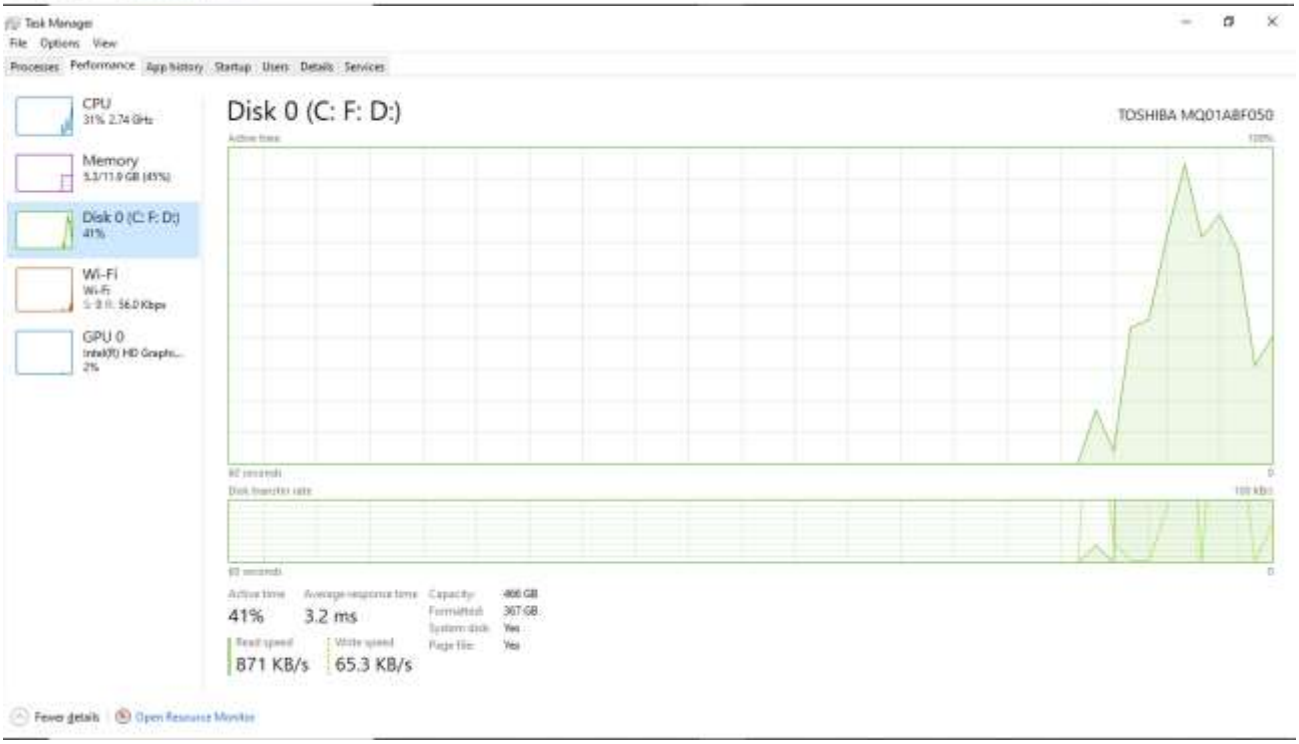
Instruction cycle is the cycle that CPU follows from boot-up until the computer has shut down in order to process instruction.

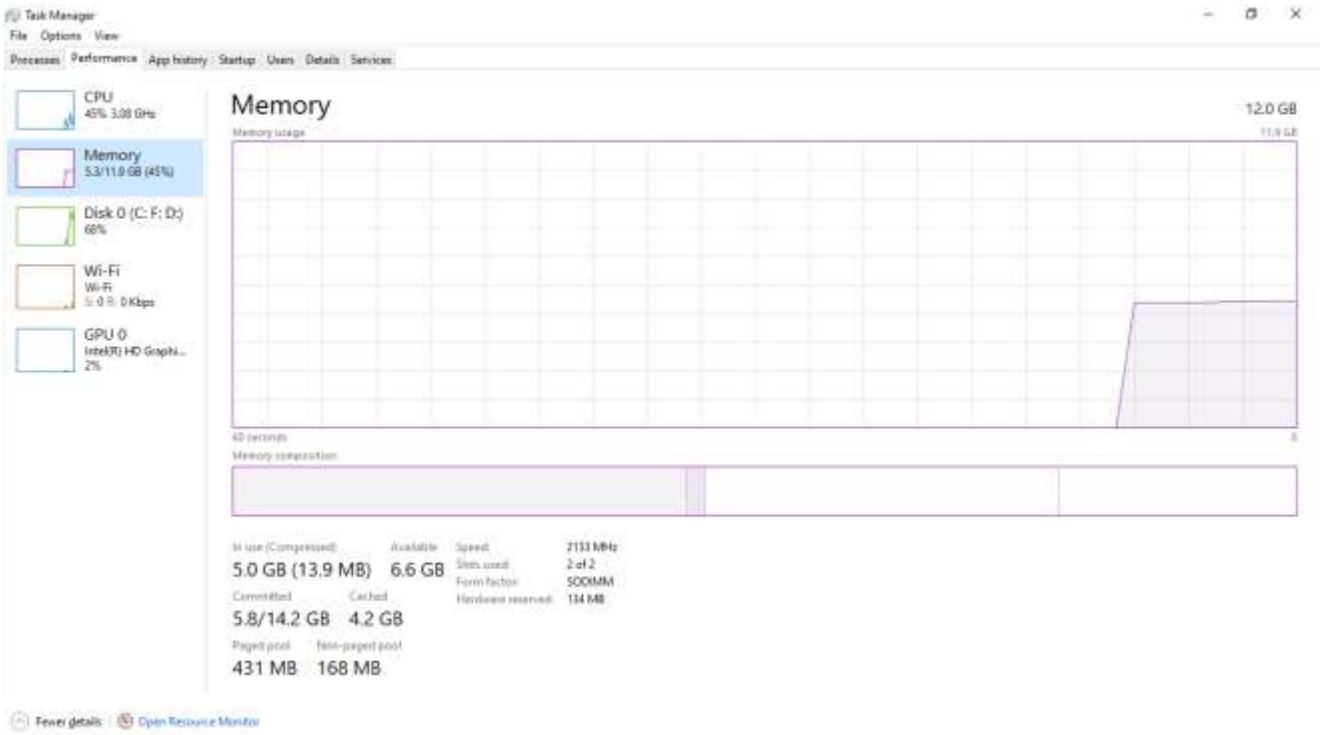


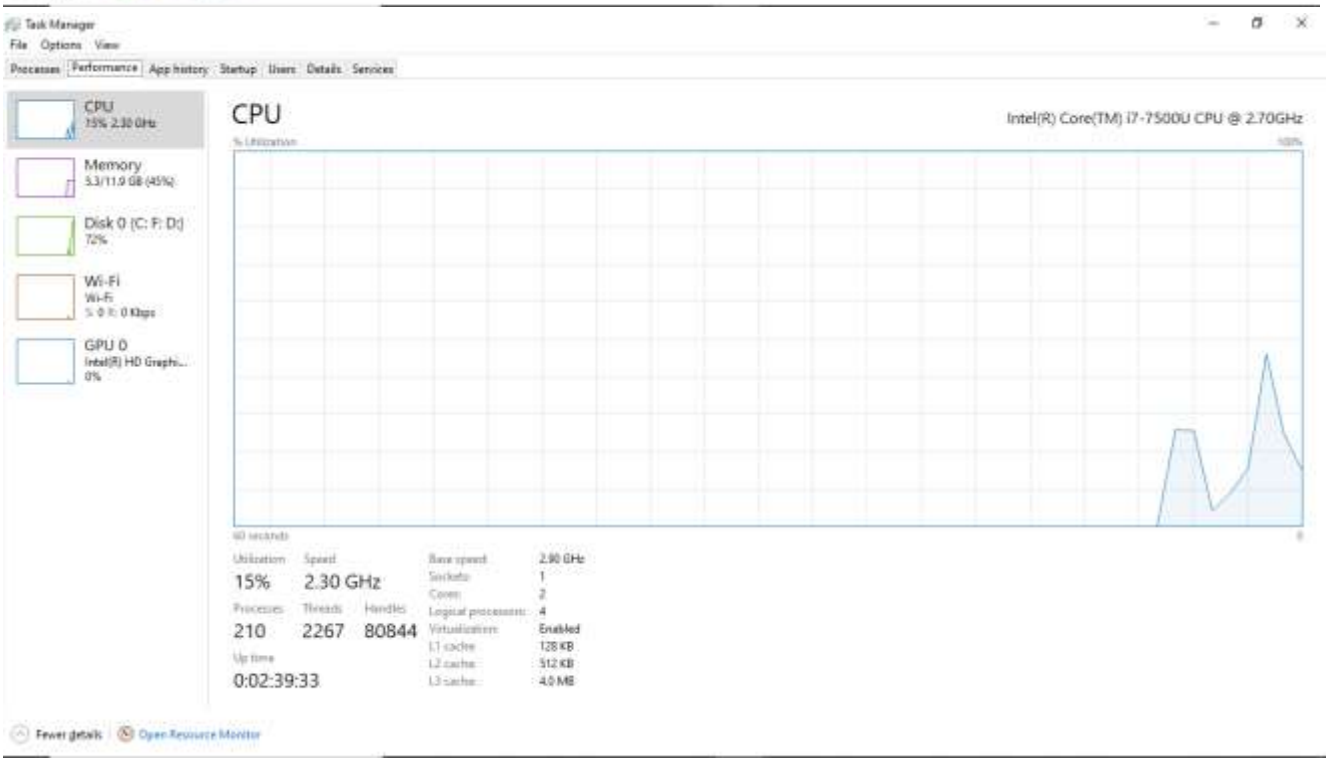

## System Specification:

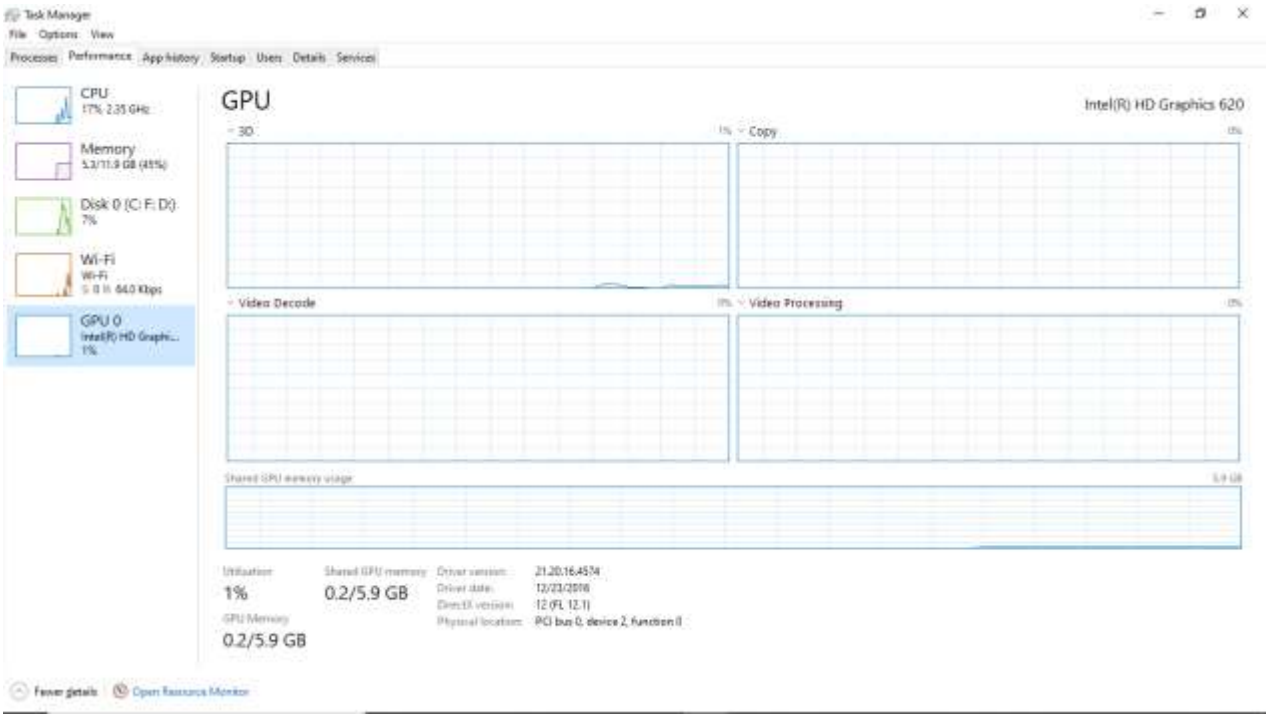



Task Manager
File Options View
Processes Performance App history Startup Users Details Services
CPU
16% 2.09 GHz
Memory
5.3/11.9 GB (45%)
Disk 0 (C: F: D:)
11%
Wi-Fi
Wi-Fi
S: 0 R: 24.0 Kbps
GPU 0
Intel(R) HD Graphi...
2%
Wi-Fi
Qualcomm QCA9377 802.11ac Wireless Adapter
Throughput
60 seconds
0
Send
0 Kbps
Receive
24.0 Kbps
Adapter name: Wi-Fi
SSID: DCE-1
Connection type: 802.11n
IPv4 address: 172.17.60.70
IPv6 address:
Signal strength:
Fewer details
Open Resource Monitor


Task Manager
File Options View
Processes Performance App history Startup Users Details Services
CPU
31% 2.74 GHz
Memory
5.3/11.9 GB (45%)
Disk 0 (C: F: D:)
41%
Wi-Fi
Wi-Fi
S: 0 R: 56.0 Kbps
GPU 0
Intel(R) HD Graphi...
2%
Disk 0 (C: F: D:)
TOSHIBA MQ01ABF050
Active time
100%
60 seconds
0
Disk transfer rate
100 KB/s
60 seconds
0
Active time
41%
Average response time
3.2 ms
Capacity: 466 GB
Formatted: 367 GB
System disk: Yes
Page file: Yes
Read speed
871 KB/s
Write speed
65.3 KB/s
Fewer details
Open Resource Monitor


Task Manager
File Options View
Processes Performance App history Startup Users Details Services
CPU
45% 3.08 GHz
Memory
5.3/11.9 GB (45%)
Disk 0 (C: F: D:)
68%
Wi-Fi
Wi-Fi
S: 0 R: 0 Kbps
GPU 0
Intel(R) HD Graphi...
2%
Memory
12.0 GB
Memory usage
60 seconds
Memory composition
In use (Compressed)
5.0 GB (13.9 MB)
Available
6.6 GB
Committed
5.8/14.2 GB
Cached
4.2 GB
Paged pool
431 MB
Non-paged pool
168 MB
Speed:
2133 MHz
Slots used:
2 of 2
Form factor:
SODIMM
Hardware reserved:
134 MB
Fewer details
Open Resource Monitor


Task Manager
File Options View
Processes Performance App history Startup Users Details Services
CPU
15% 2.30 GHz
Memory
5.3/11.9 GB (45%)
Disk 0 (C: F: D:)
72%
Wi-Fi
Wi-Fi
S: 0 R: 0 Kbps
GPU 0
Intel(R) HD Graphi...
0%
CPU
Intel(R) Core(TM) i7-7500U CPU @ 2.70GHz
% Utilization
60 seconds
Utilization
15%
Speed
2.30 GHz
Processes
210
Threads
2267
Handles
80844
Up time
0:02:39:33
Base speed:
2.90 GHz
Sockets:
1
Cores:
2
Logical processors:
4
Virtualization:
Enabled
L1 cache:
128 KB
L2 cache:
512 KB
L3 cache:
4.0 MB
Fewer details
Open Resource Monitor




## Think

1. What is the high speed memory between the main memory and the CPU called?

2. Which type of memory is slowest and cheapest?

3. Difference between register and memory?

4. Write down system type of your PC?

## Home Task

1. Check your operating system & hardware specification:

| | |
|---|---|
| System processor | |
| Memory RAM | |
| System type | |
| Wireless Adopter name | |
| CPU Specification | |
| Memory ROM | |