QUESTION 1

1. **Name all the main components of the computer and explain the role and task of each component. (6 Marks)**

- **Processing Devices**

  Processing device is the computer's hardware component that helps in handling the storage and getting back data / retrieving data. These devices are responsible for processing information within the system. They carry out the instructions for programs to run and all the functions of the computer system. Some examples for processing devices are CPU, motherboard, chipset, network card and so on.

- **Memory Devices**

  Memory devices act as a temporary memory area (in which data is stored or transferred) between the CPU (Central Processing Unit) and the main memory. It holds the most needed parts of data and the program which are most frequently used by the CPU. Encoding, storing, and retrieving information are the main functions of memory devices. Some examples for memory devices are USB flash drives, SSD, HDD and so on.

- **Input & Output Devices**

  Input & Output Devices are the branch for the user and the computer system for communication. They INPUT the information or data that are given to the computer system and OUTPUT the results. Some examples for I/O devices are touch pen, monitor, touchpad, keyboard, mouse and so on.

2. **Distinguish Data, and Information.**

Data	Information
Data are not properly organized nor well prepared.	Information is well organized and well prepared.
Data does not depend on information.	Information depends on data.
Raw data is not taken into consideration when making decisions.	Information is enough in making decisions.
Data does not carry a specific meaning about something.	When those data are well organized and refined, they collectively carry a logical meaning.
Measured in bits and bytes.	Measured in meaningful measuring units, such as time, quantity, quality, and so on.
Data is not very much useful on its own.	But information is pretty much useful because they are properly analyzed.

3. **Explain how to convert data into information using suitable examples.**

As the first step, we need to identify what type of information that I seek for. And then I prepare a theory very methodically. After that we must try finding necessary data that are useful to us in developing the specific information that we needed. Then we must plan, collect, and analyze the data in order to validate our theory. Finally, if those data we gathered and analyzed are enough to prove our theory, then that information are taken into consideration. That's how to convert data into information.

As an example, let's take an instance where we must gain students' average marks and the first/second/third places of a class. There at first, I identify my need is to gain average marks and places of students. Then I begin collecting the marks of all the students of that particular class. Then I add the marks of students on by one and divide them by the number of students in the class. Then I get the average. After that I sort them in descending order. So that, I can get the places of the students in order.

As another example let's take how a weather report is created. First, they take all the data given by their weather balloons, aircrafts, satellites, ocean buoys, etc... about the temperature, humidity, wind, and data about all the atmospheric changes. Then they analyze all those data and compare them with the rest of the days and give a prediction report. They are not always right. Because atmosphere changes time by time. But most of the time, they are correct.

4. **There are several cooling systems in the computer (VGA Card, Processor and Power Supply are some of them). What is the effect of the cooling system to each module of the computer and efficiency of the computer? (7 Marks)**

Heat is an inevitable product of computer performance, but extreme heat can cause the entire system to slow down.

If the CPU temperature is too high, for example, a slower operating system will operate to avoid damaging the processor. not enough.

This safety method, sometimes called dynamic frequency scaling, is helpful in protecting your processor from potential damage. However, this protection incurs operating costs when operational. The best option is to keep the CPU cool enough that the operating system does not cause scratch.

There are many ways to keep the CPU cool, from mineral oil to minimal cooling, but it is far from the most popular solutions for air or liquid coolers. These coolers offer a wide range of features and options for almost any use case, from desktops to portable systems. Laptops that typically use high-quality air-cooling systems are specially designed for a small chassis and are not usually designed to be upgraded or replaced.

Properly heated adhesive is also an important part of any cooling solution, as it serves as a bridge between the CPU and the cooling CPU cooling plate.

CPUs are not the only ones that require temperature management. The GPU (graphic processing unit) is another sensitive element in a gaming PC and needs adequate cooling. GPU cooling solutions are pre-installed and usually contain fans embedded in the cover around the graphics processor. There are also aftermarket solutions such as liquid cooling blocks and custom air coolers available for advanced designers who have no problem with disassembling the graphics card with many cooling options made for you.

GPU and CPU temperature should be a priority, as these are the main processing centers for a gaming PC. It shouldn't be the only consideration, though.

A good PC case should account for airflow, either by increasing fan placement, or by providing airflow options to the builder. Most cases come with fans who are already installed, but even those who do not have space to install fans - usually in front, back, or near the top. PC fans can vary greatly in design and size, from standard 120mm die to more customized configurations with different sizes, depth, sound levels, and aesthetic views.

While fans of PC cases share a purpose, different fans are made for different situations. Static pressure fans, for example, are designed to move short distances of short air, such as the heatsink. Fans designed for high air flow are very focused on the amount of air that can be removed.

One thing to keep in mind when installing an airflow solution: PC fans breathe through the car chambers, which means that any sticker, wiring, marker, or protective grille is most likely behind the fan. This is the side that will take the air out, so be sure to install it properly.

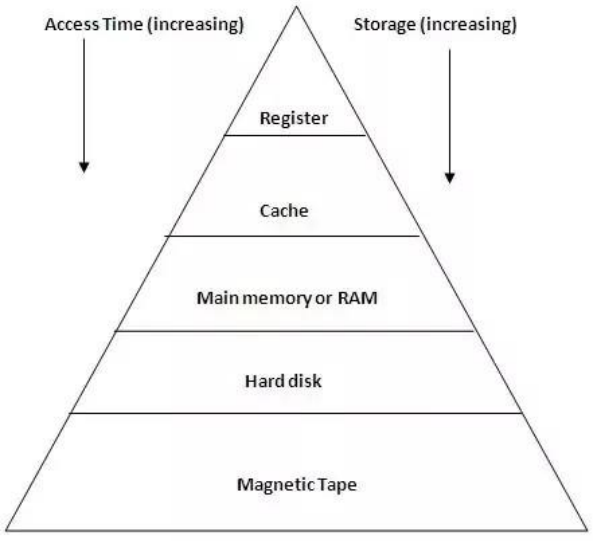
Question 2

1. **Explain Volatile and Non-Volatile Memories used in computers. (6 Marks)**

Volatile Memory is used in storing computer programs and data that the CPU needs in real time, and it is erased as soon as the computer is switched off. CACHE memory and RAM are some examples for volatile memory. They do not have a continuous source of power, so that every time the power supply is broken down, all the memory contained in them are refreshed. Volatile memory is a lot faster, and it transfers data very easily.

But nonvolatile memory is static and remains in the computer no matter you switch it off. HDD, SSD, ROM are some of the examples for non-volatile memory. They have a continuous source of power and they do not have its memory content to be periodically refreshed. Non-volatile memory is slower than volatile memory and its data transferring is difficult.

2. **As explained in the image, the access time of the memory element increase in the downward direction. Explain the architecture of each type of memory element given in the diagram below. (Consider SRAM and DRAM also and their architecture) (7 Marks)**



Register

A register is a Static Random-Access Memory or a SRAM in a processor of the computer that is used to store data word that's regularly 64 or 128 bits. Register memory is sone of the most important memories found in a processor. It is found almost in every processor. There are 2 types of registers as MAR and MDR. MAR stands for Memory Access Registers which holds the memory locations of the data that are needed to be accessed. MDR stands for Memory Data Register which's main purpose is to hold information.

Cache Memory

Cache memory, also called cache, is a memory system that automatically stores commands and data that are used for immediate processing by a central processing unit (CPU). The archive contains a copy of the most widely used information or program codes stored in large memory. Cache memory is also available in the processor. Rarely, however, could it be in another integrated circuit, divided into levels. Storage contains a chunk of data that is most needed in large memory.

RAM or Main Memory

RAM (Random Access) is the computer hardware on which the operating system (OS), operating system and data in the current application are stored for immediate access through the device processor. RAM is the main memory in a computer. It is much faster to read from and write than other types of storage, such as hard disk drive (HDD), solid-state drive (SSD) or optical drive. Random Access memory does not change. That means data is stored in RAM as long as the computer is turned on, but lost when the computer is turned off. When the computer is restarted, the OS and other files are reloaded to RAM, usually from an HDD or SSD. RAM cannot store permanent data. When RAM fills up, the computer processor has to go to the hard disk over and over again to cover old data in RAM with new data. This process slows down computer performance.

SRAM – Static Random Access Memory

Static Random Access Memory (Static RAM or SRAM) is a type of RAM that holds data in a stable way, that is, as long as the memory is strong. Unlike powerful RAM, it does not need to be upgraded. SRAM stores small data on four transistors using two integrated inverters. Two stable scenarios represent 0 and 1. During reading

and writing, two additional transistors are used to control the availability of the memory cell. SRAM can operate at a higher speed than DRAM, which is more expensive due to its complex internal structure. SRAM is well-suited for second-generation applications such as faster CPU cache memory and registry storage. SRAM is often found on hard drives such as disc cache.

DRAM – Dynamic Access Memory

Dynamic access memory (DRAM) is a type of semiconductor memory commonly used for data or program code required by a computer processor to operate. RAM is closer to a computer processor and enables faster access to data than storage media such as hard disk drives and solid-state drives. Each DRAM memory cell is made up of a transistor and a capacitor within an integrated circuit, and a small amount of data is stored in the capacitor. DRAM is widely used in digital electronics where low memory and high power memory are required. One of the biggest DRAM applications is the main memory (called "RAM") on modern computers and graphics cards (where "big memory" is called graphics memory). It is also used on many portable devices and video game consoles. In contrast, SRAM, which is faster and more expensive than DRAM, is often used when speed concerns more than costs, such as cache memory on processors. Since the transistors are constantly leaking a small amount, the capacitors will emit less, causing the data stored in it to pull; therefore, DRAM should be updated (given a new electronic charge) every few milliseconds to store data. The main advantages of DRAM are its simple structure and low cost compared to other types of memory. The biggest disadvantage of DRAM is its high stability and high-power consumption associated with other options.

Hard Disk

a hard disk, also called a hard disk drive or hard drive, is a magnetic field for computer computing. Solid discs are round plates made of aluminum or glass and attached to a magnetic element. Information is stored in its original location on fixed tracks. A small magnet, called a magnetic head, records a binary digit (1 or 0) by magnetizing small dots on a spinning disk in different directions and reading digits by obtaining the direction of the dot magnet. A computer hard drive is a device with multiple hard disks, read / write heads, drive-to-disk drive, and a small number of circuitries, all enclosed in a metal box to protect the discs from dust. In addition to the disks themselves, the term hard disk is also used to refer to all data

storage within a computer. Since the beginning of the 21st century, some computers and laptops have been manufactured using solid-state drives (SSDs) that rely on flash memory chips instead of hard disks.

Magnetic Tape

Magnetic recording, sound storage, images, and data in the form of an electronic signal with the selected magnetic field of the magnetic field. Magnetic tape devices. Magnetic tape provides integrated, cost-effective ways to produce a wide range of information. The recording of the tape can be played back quickly and easily erased, allowing the tape to be used many times without losing the quality of the recording. For these reasons, tape is widely used in various magnetic recording techniques. It consists of a thin plastic ribbon filled with fine particles of iron oxide or another strong magnetic field. On tape recording, an electrical signal passes through the recording head as the tape is pulled through, leaving a magnetic field sign on the surface of the tape. When a recorded tape is transmitted or played head-on, a signal equal to the recorded signal is inserted. This signal is amplified by the appropriate power of the output device. Magnetic tape recorders have also been widely used to record measurements directly from laboratory instruments and detection devices carried on wooden planks. The reading is converted into electronic signals and recorded on tape, which can be played back by researchers through detailed analysis and comparison.

3. **Compare the HDD, SSD and Hybrid Type Storage Devices (HDD + SSD) (6 Marks)**

In Hard Disk Drive (HDD),

- Hard disks contain multiple rotating disks and multiple headers back and forth on each disk read / write disk - The time taken to read / write data to the HDD is important as the disks must rotate before any action.
- Moving parts mean aging - The technology used on current hard drives is good and that is why hard drives have a longer life; this also depends on the use of the HDD.
- Hard disks do not die together - Hard disk starts to fail and dies normally unless it is used by anyone malicious to crush all disks at once (HDD has multiple disks; and data on unmodified disks, unreadable)
- The technology used on Hard Disk Drives (HDDs) is cheaper which is why you can get a lot of storage at a lower cost.

- Hard Drives available on the market do not require any special software as they are easily detected by any application.

In Solid State Drives (SSD),

- No machine components involved - No need to move anything inside the drive to read data which is why the time taken to read and write data is much faster compared to HDDs
- SSDs are actually complex regions where data is stored in ON / OFF (1/0) categories - Thus, there is no wear on SSDs
- You can't tell if an SSD is going to die; Unlike HDDs, they do not send any kind of warning signals and if the SSD dies, it dies completely without allowing other read / write operations
- The technology used on SSDs is more expensive and therefore drivers, too, are more expensive compared to Hard disks.
- Solid State Drives is treated in the same way as the OS talks about RAM and that is why the speed is much faster compared to Hard Disks, where it is not the only one that has to convert magnetic scratches into binary, also deal with disk rotation and moving heads.

Hybrid Drives are actually Disk Drive Disks that use other SSDs to act as a repository. They come with firmware that identifies what data is always needed and stores it in the SSD (storage) component of Hybrid Drives. This results in faster performance and time (as you use Hybrid Drives). To make the previous statement a little clearer, you will not see any difference in the speed of Hybrid Drives at first but as you use Hybrid Drive - over time - you will see that your programs and applications (and other data) are much faster than before.

Hybrid Drives are ideal for people who need speed and space. Being part of HDD and part of SSD, Hybrid drives are cheaper while providing you with better storage space. By comparison, Hybrid drives are faster than standard Hard Disks and slower than standalone SSDs, while not compromising on storage space.

4. **Discuss the factors that affect; (6 Marks)**
    a. **The Capacity of the Hard Disk Drives (HDD – Magnetics Disk)**
    b. **Data Reading Speed of the Hard Disk Drive (HDD – Magnetics Disk)**

a. Read / write speed measures the performance of the storage device. Reading speed means how long it takes to open a file from a device, and write speed takes longer to save a file to a device. Perform read / write speed tests on internal and external disk drives and storage networks and USB flash drives.

   The hard disk drive uses a magnet to store data on a rotating disk. The read / write head floats above the spinning disk reading data. The faster the disk spin, the HDD works the faster.

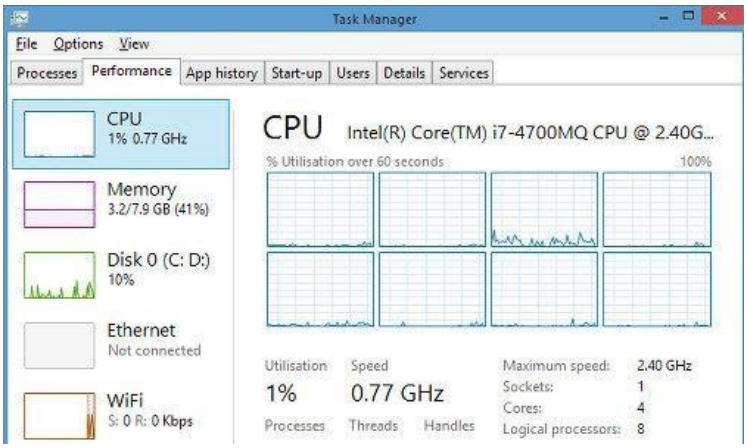
   Instead of a disk, solid-state drives use semiconductors to store data, which is very efficient. As a result, SSDs read and write watches faster than HDDs. They are also very durable because they do not have many moving parts, so SSDs are more likely to survive disposal.

b. His main factor in the performance of your computer is the speed of the hard disk. How quickly the hard drive can detect (time-consuming rate), reading, writing, and transferring data will make a huge difference in the way your computer works.

   The size of your hard drive plays a very small role in computer performance. As long as you have enough free space for visible memory and keep the disk disabled it will work fine no matter what size.

   The hard drive does not affect how fast the processor works. However, the hard drive is one of the slowest parts of a computer and actually leaves the processor waiting for more details. Hard drive is a data bottle: It is a member of a team that delays everyone. The size of the hard drive does not matter, but a fast hard drive takes less time to send data to the processor. Additionally, the hard drive can be used to hold a page file, also known as virtual memory, which serves as an extension of a computer's main memory, RAM. A larger hard drive can support a larger page file.

Question 3



I. **According to the above image of Task Manager of Windows operating system and intel Core i7 processor, (6 Marks)**

   a. **Explain what a socket? The computer details given in the figure shows that it has one socket. Are there any computers which having two or more sockets?**

   b. **There are 4 cores, and 8 logical processors explain having 1 socket how it can have 4 core and 8 logical processors in this computer.**

A. Sockets allow connection between two different processes on the same or different devices. More precisely, it is a way to communicate with other computers using standard descriptions of a Unix file. In Unix, all I / O actions are performed by writing or reading a file annotation. A file identifier is a complete number associated with an open file and can be a network connection, text file, endpoint, or more.

Yes. There are computers with multiple sockets available.

B. If I have a computer with a 4-core processor, which runs two threads per layer, then I have 8 logical processors. You can see your basic computer skills by

using the lscpu command (collecting CPU building data from sysfs and / proc / cpuinfo.). If the processor has 4 cores, but can work 8 threads at the same time, it means it has only 4 physical cores (processing units)

II. **Explain what the maximum speed of the processor 2.40 GHz is. (6 Marks)**

The "Maximum speed" displayed on the right is usually the advertiser's advertisement, as reported directly from the processor. However, processors have the ability to use "turbo" states where it can run for a while longer than its advertised rate. Many modern processors will do this, and the difference may be much higher than that shown in the picture.

In addition, different algorithms are used to measure processor speed. For example, the algorithm used by Intel for its trademark speed is different from the algorithm used by Task Manager to accurately measure CPU speed. You can use other processor resources, such as Intel Processor Identification Utility or CPU-Z, to obtain additional processor speeds.

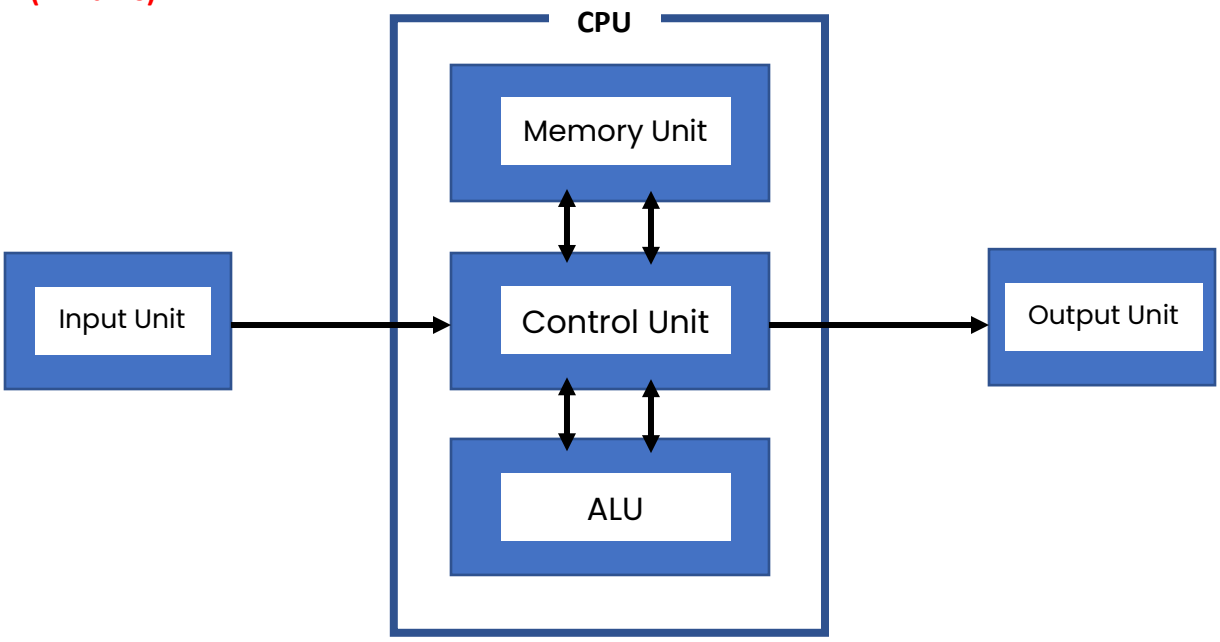
III. **The current speed of the computer is 0.77 GHz, explain the reason for having such speed while having maximum speed of 2.4 GHz. (6 Marks)**

What function is indicated by the task manager is the basic CPU frequency.

CPUs will deliberately slow down to exceed their maximum limit where the CPU can be put under pressure to reduce power consumption and increase CPU time.

When you perform in-depth CPU tasks such as video editing, animation, donation, or gambling, you will see the CPU start to accelerate. It is a small CPU speed guaranteed when there is no threat to CPU life

IV. **CPU consisting of several other components name them and explain their role and task. (7 Marks)**



- **CU – Control Unit**
  Control Unit is a main component of the CPU, which receives signal, information, instruction from the user as input and converts them into control signals for the execution in the CPU. CU fetches instructions from the processor's main memory and send them to the instruction register of the processor, containing register contents.

- **ALU – Arithmetic and Logical Unit**
  All the arithmetic and logical functions are carried out in this part of the CPU. In some of the processors, the ALU is divided into two parts as Arithmetic Unit (AU) & Logical Unit (LU), and there are some processors containing more than one Arithmetic Units. ALU has access directly to input and output to the process controller, RAM, and I/O devices.

- **Memory Unit**
  Memory unit has the ability to store data, instructions and intermediate results. This unit supplies information to the other units of the computer only when the data or information is requested or needed. Memory unit is also known as RAM's main memory. It stores all the data and instructions which are required for processing. All the inputs and outputs are passed through the main memory.

QUESTION 4

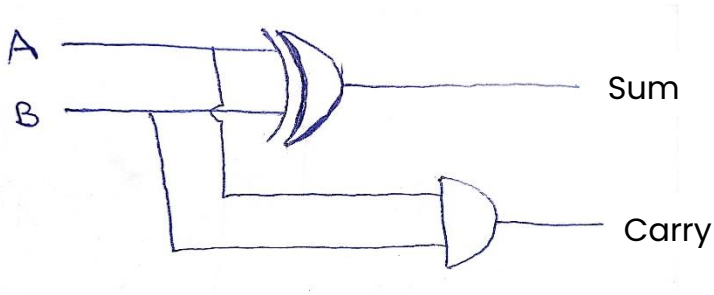
Explain following topics deliberately with suitable examples. (5*5 Marks= 25 Marks)

1. **Embedded Computer System and Usage**

2. **Half Adder and Full Adders**

Half Adder

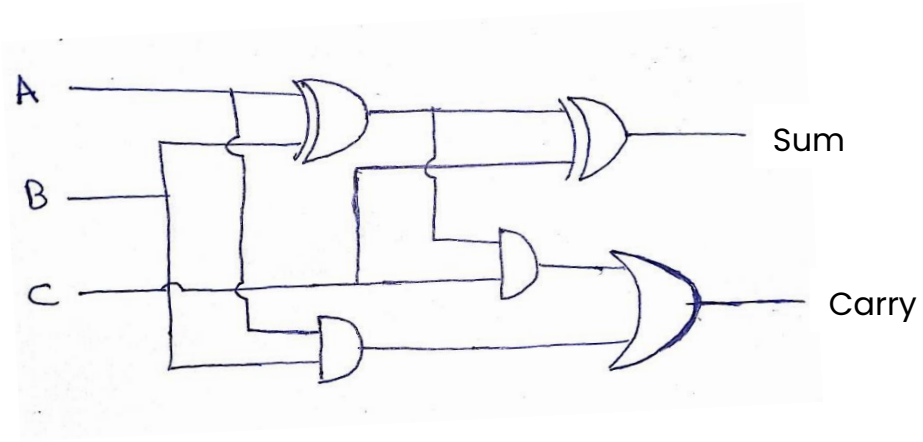
It is a combinational logic circuit designed by the connection of one EX-OR gate and one AND gate. This has two inputs and outputs/generates a carry and a sum.



Truth Table			
Input		Output	
A	B	Sum	Carry
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

Full Adder

It is a combinational logic gate which consists with 2 EX-OR gates, 2 AND gates and one OR gate. Full adders gets 3 inputs and generate their outputs as Sum and Carry.



Truth Table			
Input		Output	
A	B	Sum	Carry
0	0	0	0
0	0	1	0
0	1	1	0
0	1	0	1
1	0	1	0
1	0	0	1
1	1	0	1
1	1	1	1

3. **Flip Flop (RS and D Flip Plop)**

RS Flip Flop (Reset & Set Flip Flop)

2 NAND gates or 2 NOR gates are used in the production of RS Flip Flops. In this system, when you set the "S" as the output "Q" will be at the top and "Q" at the bottom. Once the results are established, the wiring of the circuit is maintained until an "S" or "R" is up, or the power is off.

D Flip flop (Delay Flip Flop)

Output terminals work just like RS flipflop. The D Flip Flop works as part of an electronic memory because the result remains unchanged unless it is deliberately altered by changing the D input mode followed by an ascending clock signal.

4. **Oscillators and Clock Cycles**

Oscillators

Any oscillator is anything that creates oscillations. The oscillator manufactures clock signals to control processor speed, generates tones and radio waves, and builds a timer. The oscillator sets the clock speed of the processor or micro-controller. This clock speed determines how fast the micro-controller processes the code. Oscillators are measured in cycles per second (Hertz).

Clock Cycles

The CPU speed is determined by the clock cycle, which is the time between two oscillator pulses. A higher number of pulses per second, at which the computer processor speeds up processing data. Clock speed is measured in Hz, usually megahertz (MHz) or gigahertz (GHz).

5. **GPU (Graphical Processing Unit)**

A specially designed processor for rendering all images on a computer screen. GPU provides fast graphics processing. The GPU performs the same functions. Although used for 2D data as well as zoom in and out of the screen, the GPU is essential for efficient translation and rendering of 3D images and video. The more complex the GPU is, the higher the resolution the faster and smoother the movement. GPUs on stand-alone cards add their own memory, while GPUs are built into the main memory of a chipset or CPU chip with a CPU.