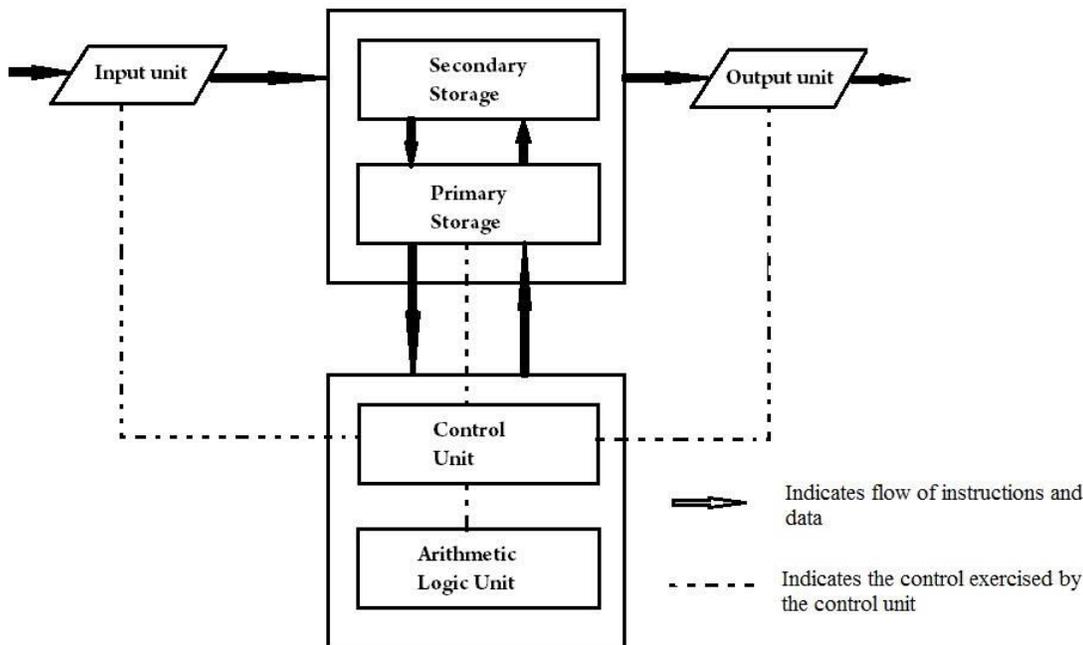


UNIT – I

➤ Block Diagram of Computer:



**1. Input:** This is the process of entering data and programs in to the computer system. You should know that computer is an electronic machine like any other machine which takes as inputs raw data and performs some processing giving out processed data. Therefore, the input unit takes data from us to the computer in an organized manner for processing.

**2. Storage:** The process of saving data and instructions permanently is known as storage. Data has to be fed into the system before the actual processing starts. It is because the processing speed of Central Processing Unit (CPU) is so fast that the data has to be provided to CPU with the same speed. Therefore the data is first stored in the storage unit for faster access and processing. This storage unit or the primary storage of the computer system is designed to do the above functionality. It provides space for storing data and instructions.

The storage unit performs the following major functions:

- All data and instructions are stored here before and after processing.
- Intermediate results of processing are also stored here.

**3. Processing:** The task of performing operations like arithmetic and logical operations is called processing. The Central Processing Unit (CPU) takes data and instructions from the storage unit and makes all sorts of calculations based on the instructions given and the type of data provided. It is then sent back to the storage unit.

**4. Output:** This is the process of producing results from the data for getting useful information. Similarly the output produced by the computer after processing must also be kept somewhere inside the computer before being given to you in human readable form. Again the output is also stored inside the computer for further processing.

**5. Control:** The manner how instructions are executed and the above operations are performed. Controlling of all operations like input, processing and output are performed by control unit. It takes care of step by step processing of all operations inside the computer.

### FUNCTIONAL UNITS

In order to carry out the operations mentioned in the previous section the computer allocates the task between its various functional units. The computer system is divided into three separate units for its operation. They are

- 1) Arithmetic logical unit
- 2) Control unit.
- 3) Central processing unit.

### Arithmetic Logical Unit (ALU) Logical Unit

**Logical Unit:** After you enter data through the input device it is stored in the primary storage unit. The actual processing of the data and instruction are performed by Arithmetic Logical Unit. The major operations performed by the ALU are addition, subtraction, multiplication, division, logic and comparison. Data is transferred to ALU from storage unit when required. After processing the output is returned back to storage unit for further processing or getting stored.

### Control Unit (CU)

The next component of computer is the Control Unit, which acts like the supervisor seeing that things are done in proper fashion. Control Unit is responsible for coordinating various operations using time signal. The control unit determines the sequence in which computer programs and instructions are executed. Things like processing of programs stored in the main memory, interpretation of the instructions and issuing of signals for other units of the computer to execute them. It also acts as a switch board operator when several users access the computer simultaneously. Thereby it coordinates the activities of computer's peripheral equipment as they perform the input and output.

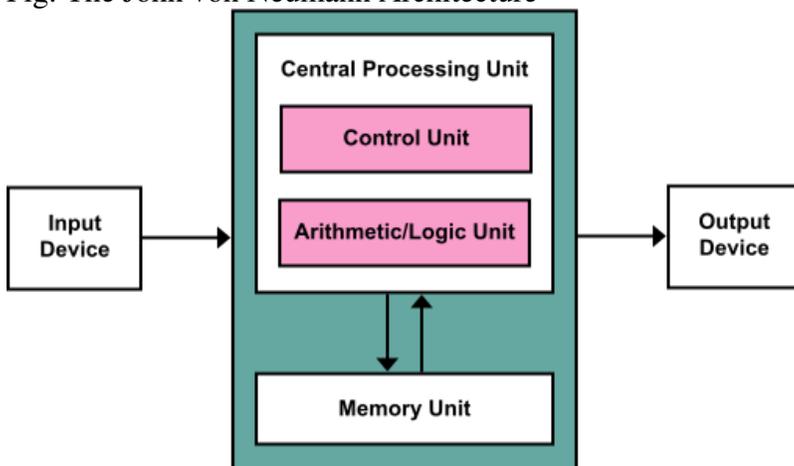
### Central Processing Unit (CPU)

The ALU and the CU of a computer system are jointly known as the central processing unit. You may call CPU as the brain of any computer system. It is just like brain that takes all major decisions, makes all sorts of calculations and directs different parts of the computer functions by activating and controlling the operations.

### Stored Program Concepts:

A stored program concept is one in which first the program and data are stored in the main memory and then the processor fetches instructions and executes them, one after another. Storage of instructions in computer memory to enable it to perform a variety of tasks in sequence or intermittently. The idea was introduced in the late 1940s by John von Neumann, who proposed that a program be electronically stored in binary-number format in a memory device so that instructions could be modified by the computer as determined by intermediate computational results.

Fig: The John von Neumann Architecture



The design of Von Neumann architecture is simpler than the more modern Harvard architecture which is also a stored-program system but has one dedicated set of address and data buses for reading data from and writing data to memory, and another set of address and data buses for fetching instructions.

A stored-program digital computer is one that keeps its programmed instructions, as well as its data, in read-write, random-access memory (RAM). Stored-program computers were advancement over the program-controlled computers of the 1940s, such as the Colossus and the ENIAC, which were programmed by setting switches and inserting patch leads to route data and to control signals between various functional units. In the vast majority of modern computers, the same memory is used for both data and program instructions, and the Von Neumann vs. Harvard distinction applies to the cache architecture, not main memory.

### Word Length and Processing Speed of the Computer:

A computer basically operates in binary digits-0 and 1. Computers can understand information only in terms of 0s and 1s. A binary digit is called a Bit. A group of 8 bits is called a Byte. The number of bits that a computer can process at a time (in parallel) is called its Word Length. Mostly used word lengths are 8, 16, 32 or 64 bits.

Word length is the measure of the computing power of a computer. Longer the word length, more powerful the computer is. A 32-bit computer means that its word length is 32-bits. Word is a term for the natural unit of data

used by a particular processor design. A word is basically a fixed-sized group of digits (binary or decimal) that are handled as a unit by the instruction set or the hardware of the characteristic of any specific processor design. Modern processors, including embedded systems, usually have a word size of 8, 16, 24, 32, or 64 bits, while modern general purpose computers usually use 32 or 64 bits processor. The number of digits in a word (the word size, word width, or word length) is an important.

A computer can calculate at a very fast speed. As the power of the computer increases, the speed also increases. For example, a micro computer can execute millions of instructions per second. Super computers can operate at speeds measured in nano-seconds and even in pico-seconds (one thousand to one million times faster than micro computers).

### **User Interface:**

A user interface, also called a "UI" or simply an "interface," is the means in which a person controls a software application or hardware device. A good user interface provides a "user-friendly" experience, allowing the user to interact with the software or hardware in a natural and intuitive way.

A user interface is the system by which people (users) interact with a machine. The user interface includes hardware (physical) and software (logical) components. User interfaces exist for various systems, and provide a means of:

- Input, allowing the users to manipulate a system
- Output, allowing the system to indicate the effects of the users' manipulation

All software programs have a graphical user interface, or GUI. This means the program includes graphical controls, which the user can select using a mouse or keyboard. A typical GUI of a software program includes a menu bar, toolbar, windows, buttons, and other controls. The Macintosh and Windows operating systems have different user interfaces, but they share many of the same elements, such as a desktop, windows, icons, etc. These common elements make it possible for people to use either operating system without having to completely relearn the interface. Similarly, programs like word processors and Web browsers all have rather similar interfaces, providing a consistent user experience across multiple programs. Hardware devices also include a user interface, though it is typically not as complex as a software interface. A common example of a hardware device with a user interface is a remote control. A typical TV remote has a numeric keypad, volume and channel buttons, mute and power buttons, an input selector, and other buttons that perform various functions. This set of buttons and the way they are laid out on the controller makes up the user interface. Other devices, such as digital cameras, audio mixing consoles, and stereo systems also have a user interface.

While user interfaces can be designed for either hardware or software, most are a combination of both. For example, to control a software program, you typically need to use a keyboard and mouse, which each have their own user interface. Likewise, to control a digital camera, you may need to navigate through the on-screen menus, which is a software interface. Regardless of the application, the goal of a good user interface is to be user-friendly. After all, we all know how frustrating it can be to use a device that doesn't work the way we want it to.

### Hardware and Software Concepts:

**Hardware** - It is described as a device that is physically connected to the computer or something that can be physically touched. A CD-ROM, monitor, printer, scanners, label makers, routers, and modems and video card are all examples of computer hardware. Without any hardware your computer would not exist and software would have nothing to run on. It is the physical part of a computer, including the digital circuitry, as distinguished from the computer software that executes within the hardware.

Functionality of hardware serves as the delivery system for software solutions. The hardware of a computer is infrequently changed, in comparison with software and data, which are “soft” in the sense that they are readily created, modified, or erased on the compute. Hardware starts functioning once software is loaded. Its failure is random. Hardware does not have an increasing failure rate at the last stage. It wears out over time. Hardware is physical in nature.

**Software** - It is a collection of instructions that enables a user to interact with the computer. Software is a program that enables a computer to perform a specific task, as opposed to the physical components of the system (hardware).

There are two types of software:

- 1) System software
- 2) Application software

Example: Windows 98/2000/XP/7/8, Linux, QuickBooks, Adobe Acrobat, Internet Explorer, Microsoft Office.

It performs the specific task you need to complete. Software is generally not needed for the hardware to perform its basic level tasks such as turning on and responding to input. Software is installed on hardware. Its failure is systematic. Software does not have an increasing failure rate. Software does not wear out over time. However, bugs are discovered in software as time passes. Software is logical in nature.

### Microprocessor and Single chip microprocessor concepts:

**Microprocessor:** The word comes from the combination micro and processor. Processor means a device that processes whatever. In this context processor means a device that processes numbers, specifically binary numbers, 0's and 1's.

“The microprocessor is a programmable device that takes in numbers, performs on them arithmetic or logical operations according to the program stored in memory and then produces other numbers as a result.”

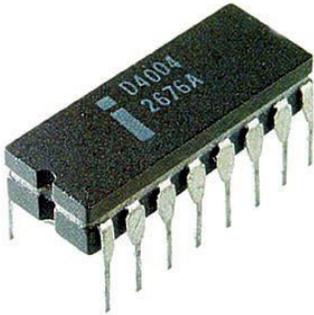
Microprocessors are the devices in a computer which make things happen. Microprocessors are capable of performing basic arithmetic operations, moving data from place to place, and making basic decisions based on the quantity of certain values. In addition, microprocessors have logic operations as well. Such as AND, OR, XOR, shift left, shift right, etc. the number and types of operations define the microprocessor's instruction set and depends on the specific microprocessor.

Each microprocessor is designed to execute a specific group of operations. This group of operations is called an instruction set. This instruction set defines what the microprocessor can and cannot do.

When a program is entered into a computer, it is stored in memory. Then as the microprocessor starts to execute the instructions, it brings the instructions from memory one at a time. – The microprocessor reads (brings in) the data from memory when it needs it and writes (stores) the results into memory when it is done.

### Single chip microprocessor concepts:

It's an integrated circuit with (almost) all the functions of a processor designed into one chip.



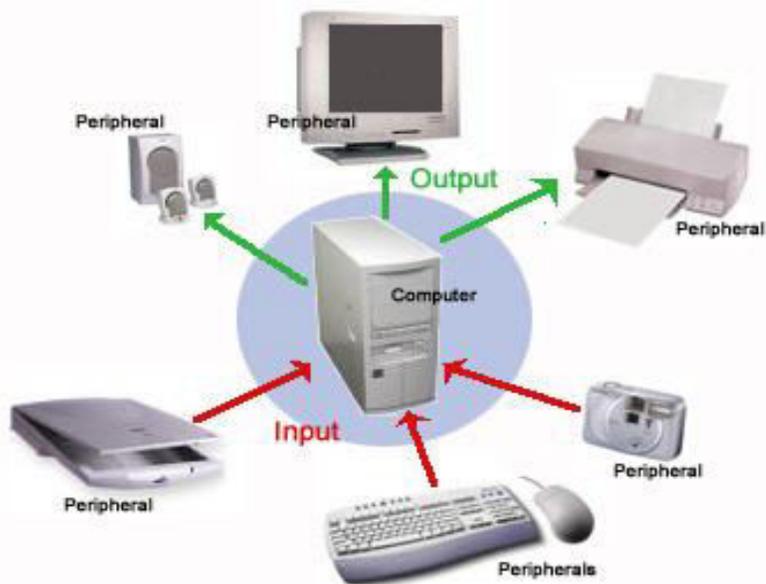
In November, 1971, a company called Intel publicly introduced the world's first single chip microprocessor, the Intel 4004 invented by Intel engineers Federico Faggin, Ted Hoff, and Stanley Mazor. After the invention of integrated circuits revolutionized computer design, the only place to go was down -- in size that is. The Intel 4004 chip took the integrated circuit down one step further by placing all the parts that made a computer think (i.e. central processing unit, memory, input and output controls) on one small chip. Programming intelligence into inanimate objects had now become possible.

The microprocessor chip is an electronic device that is a computer's central processing unit (CPU) aka the brains of your computer. A microprocessor is a single integrated circuit that is a multipurpose, programmable, clock-driven, register based electronic device that accepts binary data as input, processes it according to instructions stored in its memory, and provides results as output. A microprocessor is a type of integrated circuit built on a tiny piece of silicon. Today's microprocessors contain hundreds of millions of transistors, which are interconnected through extremely fine wires made of copper. The transistors work together to store and manipulate data so that the microprocessor can perform a wide variety of functions.

**UNIT – II**

**Input Output Unit:**

An I/O unit is a component of computer. The I/O unit is composed of two parts—input unit and output unit. The input unit is responsible for providing input to the computer and the output unit is for receiving output from the computer.



**Input Unit**

The input unit gets the data and programs from various input devices and makes them available for processing to other units of the computer. The input data is provided through input devices, such as—keyboard, mouse, trackball and joystick. Input data can also be provided by scanning images, voice recording, video recording, etc. Irrespective of the kind of input data provided to a computer, all input devices must translate the input data into a form that is understandable by the computer, i.e., in machine readable form. The transformation of the input data to machine readable form is done by the input interface of input device.

**Output Unit:**

The output unit which delivers information from the computer to an external device or from internal storage to external storage.

**Input / Output Devices:**

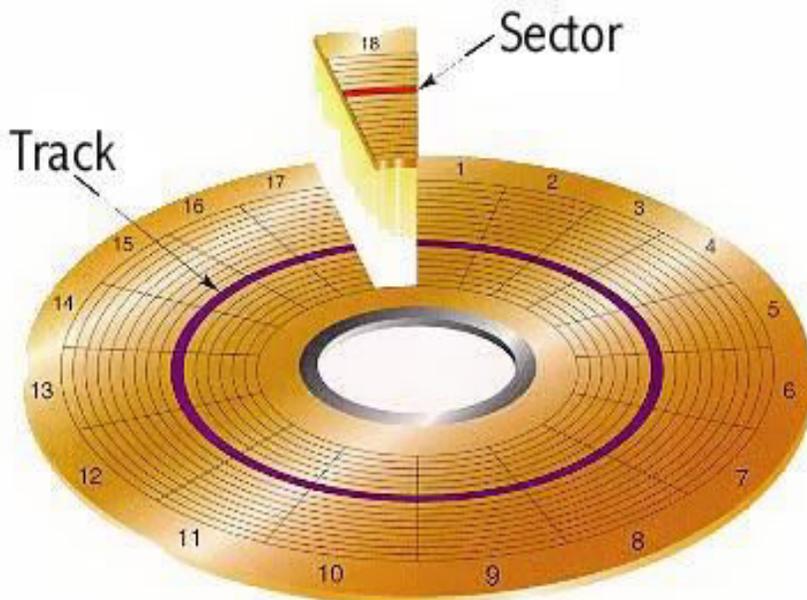
Input / output device, also known as computer peripheral, any of various devices (including sensors) used to enter information and instructions into a computer for storage or processing and to deliver the processed data to a human operator or, in some cases, a machine controlled by the computer.

**Floppy disk:**

A flexible plastic disk coated with magnetic material and covered by a protective jacket, used primarily by computers to store data magnetically. Also called diskette. Magnetic storage medium used with COMPUTERS. Floppy disks are made of flexible plastic coated with a magnetic material, and are enclosed in a hard plastic case. They are typically 3.5 in. (9 cm) in diameter. Data are arranged on their surfaces in concentric tracks. A disk is inserted in the computer's floppy disk drive, an assembly of magnetic heads and a mechanical device for rotating the disk for reading or writing purposes. A small electromagnet, called a magnetic head, writes a binary digit (1 or 0) onto the disk by magnetizing a tiny spot on the disk in different directions, and reads digits by detecting the magnetization direction of the spots. The floppy disk drive has been replaced by other types of drives such as CD drives, DVD drives as well as USB flash drives.

### Characteristics of a Floppy Disk

- A "track" (see figure below) is a narrow recording band that forms a full circle on the surface of the disk
- The disk's storage locations are then divided into pie-shaped sections, which break the tracks into small arcs called sectors (can hold 512 bytes of data)
- Floppy Disks store data on both sides. Each side consists of 80 tracks with 18 sectors per track
- To read from and write on the disk, sectors are grouped into clusters (consist of 2 to 8 sectors)
- A cluster is the smallest unit of space used to store data

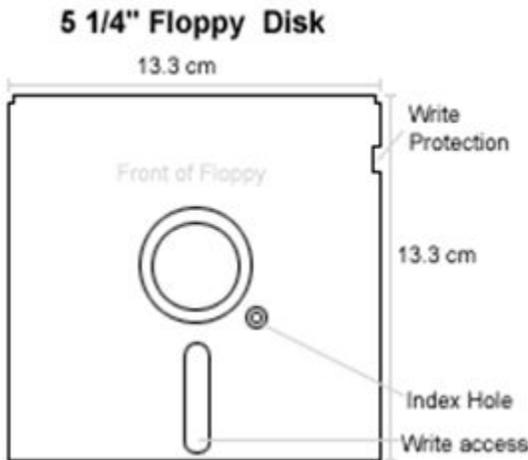


- **Advantages:**  
Portable, inexpensive, write-protect notch
- **Disadvantages:**  
It cannot hold a lot of information compared to other modes of storage, fairly easy to damage, relatively slow, sometimes not formatted (although not difficult to do)

### 5 ¼ -Inch Drive

A 5 ¼-inch floppy disk drive was common on personal computers that were produced during the 1980's and were still included on computers in the early 1990's. A 5 ¼ -inch floppy disk could store between 360 kilobytes

and 1.2 megabytes of data. Some 5 1/2-floppy disks could be modified and used to write data to both sides of the disk. This led to manufacturers producing double-sided drives that could read both sides of the disk.



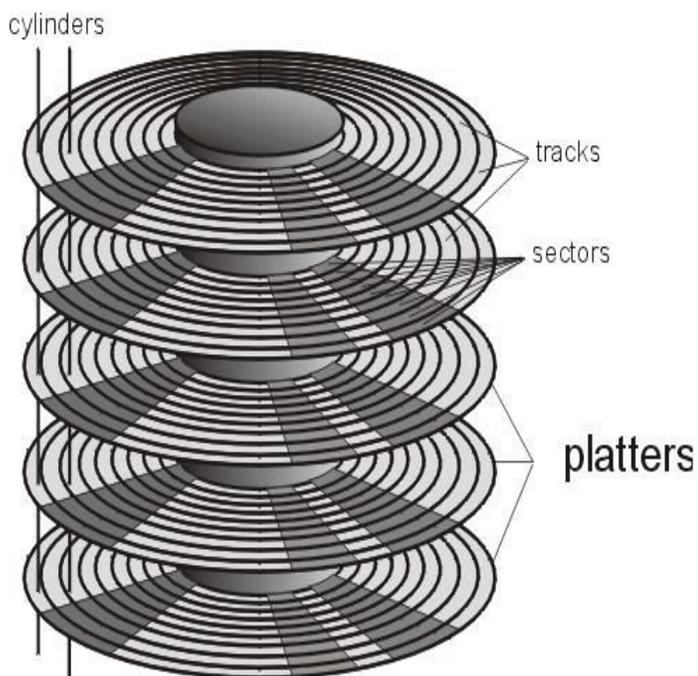
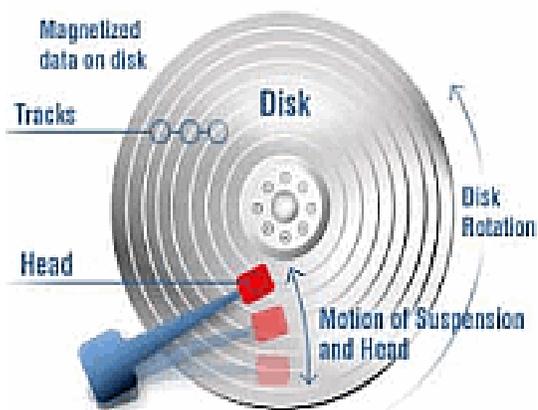
### **3 1/2 -Inch Drive**

A 3 1/2-inch floppy drive is considered a floppy drive because the diskette uses a magnetic floppy disk that is encased in plastic. A 3 1/2-inch floppy disk is capable of storing 730 kilobytes on a double density disk and 1.44 megabytes on a high density disk. On older computers the only way to load programs such as Windows 3.0 was to use multiple disks to install the program.

### **Hard disk:**

HDDs were introduced in 1956 as data storage for an IBM real-time transaction processing computer and were developed for use with general purpose mainframe and minicomputers. The desktop hard drive has six components: the head actuator, read/write actuator arm, read/write head, spindle, and platter. On the back of a hard drive is a circuit board called the disk controller. The hard disk is a spindle of magnetic disks, called platters, that record and store information. Because the data is stored magnetically, information recorded to the hard disk remains intact after you turn your computer off.

A single hard disk usually consists of several *platters*. Each platter requires two read/write heads, one for each side. All the read/write heads are attached to a single access arm so that they cannot move independently. Each platter has the same number of *tracks*, and a track location that cuts across all platters is called a cylinder. The stack of platters rotates at a constant speed. The drive head, while positioned close to the center of the disk reads from a surface that is passing by more slowly than the surface at the outer edges of the disk. To compensate for this physical difference, tracks near the outside of the disk are less-densely populated with data than the tracks near the center of the disk.



**Keyboard:**

It is an input device. The keyboard helps in inputting the data to the computer. The layout of the keyboard is like that of traditional typewriter, although there are some additional keys provided for performing some additional functions. Keyboards are of two sizes 84 keys or 101/102 keys, but now 104 keys or 108 keys keyboard is also available for Windows and Internet. The computer keyboard is used to enter text information into the computer, as when you type the contents of a report.

The keyboard can also be used to type commands directing the computer to perform certain actions. Commands are typically chosen from an on-screen menu using a mouse, but there are often keyboard shortcuts for giving these same commands.

The keys are following

Sr.	Keys	Description
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No.		
1	Typing Keys	These keys include the letter keys (A-Z) and digits keys (0-9) which generally give same layout as that of typewriters.
2	Numeric Keypad	It is used to enter numeric data or cursor movement. Generally, it consists of a set of 17 keys that are laid out in the same configuration used by most adding machine and calculators.
3	Function Keys	The twelve functions keys are present on the keyboard. These are arranged in a row along the top of the keyboard. Each function key has unique meaning and is used for some specific purpose.
4	Control keys	These keys provide cursor and screen control. It includes four directional arrow key. Control keys also include Home, End, Insert, Delete, Page Up, Page Down, Control(Ctrl), Alternate(Alt), Escape(Esc).
5	Special Purpose Keys	Keyboard also contains some special purpose keys such as Enter, Shift, Caps Lock, Num Lock, Space bar, Tab, and Print Screen.