Classifications, generations, applications and limitations of digital computers

- **Computer Classification: By Size and Power**

Computers differ based on their data processing abilities. They are classified according to purpose, data handling and functionality.

According to functionality, computers are classified as:



- **Analog Computer:** A computer that represents numbers by some continuously variable physical quantity, whose variations mimic the properties of some system being modeled.
- **Personal computer:** A **personal computer**is a computer small and low cost. The term"personal computer" is used to describe desktop computers (desktops).
- **Workstation:** A terminal or desktop computer in a network. In this context, workstation is just a generic term for a user's machine (client machine) in contrast to a "server" or "mainframe."
- **Minicomputer:** A **minicomputer** isn't very mini. At least, not in the way most of us think of mini. You know how big the personal computer is and its related family.
- **Mainframe:** It refers to the kind of large computer that runs an entire corporation.
- **Supercomputer:** Itis the biggest, fastest, and most expensive computers on earth.
- **Microcomputer:** A personal computer is a

According to purpose or functionality, computers are classified as general purpose and special purpose computers. General purpose computers solve large variety of problems.They are said to be multi purpose for they perform a wide range of tasks. Examples of general purpose computer include desktop and laptops.
On the other hand,special purpose computers solve only specific problems.They are dedicated to perform only particular tasks.Examples of special purpose computers can include calculators and money counting machine.

Generation of Digital Computers

According to age,computers are grouped in terms of generations. They include;1st generation computers,2nd generation computers,3rd generation computers,4th generation computers, and finally 5th generation.

1st generation computers.This is a generation of computers that were discovered between the years 1946 and 1957.These computers had the following characteristics: They used vacuum tubes for circuiting.They used magnetic drums as memory for data processing.Their operating system was quite low as compared to the later generations.An operating system can be defined as a collection of programs designed to control the computer's interaction and communication with the user. A computer must load the operating system like Microsoft into memory before it can load an application program like Ms Word.These computers required large space for installation.They were large in size and could

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take up the entire room.They consumed a lot of power.They also produced huge amounts of energy and power which saw machines breaking down oftenly. Using the computers,programming capabilities was quite low since the computers relied on machine language.Machine language can only be understood by the computer but not human beings .Their input was based on punched cards and paper tapes.

2nd generation computers. These computers existed between the years 1958 and 1964.They possessed the following features:These computers used transistors for circuitry purposes.They were quite smaller in size compared to the 1st generation computers. Unlike the 1st generation computers, they consumed less power. Their operating system was faster.During this generation, programming languages such as COBOL and FORTRAN were developed.This phase of computers relied on punched cards too for input and printouts.

3rd generation computers.These are computers that existed between 1965 and 1971.The computers used integrated circuits(ICs) for circuitry purposes.The computers were smaller in size due to the introduction of the chip.They had a large memory for processing data. Their processing speed was much higher.The technology used in these computers was small scale integration (SSI) technology.

4th generation computers. The computers under this generation were discovered from 1972 to 1990s. The computers employed large scale integration (LSI) technology.The size of memory was /is high/large,hence faster processing of data.Their processing speed was high.The computers were also smaller in size and less costly in terms of installation.This phase of computers saw introduction of keyboards that could interface well with processing system.During this phase, there was rapid internet evolution.Other advances that were made included the introduction of GUI(graphical user interface) and mouses.Other than GUI, there exist other user interfaces like natural-language interface,question-and-answer interface,command line interface(CLI).

5th generation computers.These are computers that are still under development and invention. There development might have began in 1990s and continues in to the future. These computers use very large scale integration (VLSI) technology. The memory speed of these computers is extremely high.The computers can perform parallel processing. It is during this generation that Artificial Intelligence (AI) concept was generated e.g voice and speech recognition. These computers will use quantum computation and molecular technology.They will be able to interpret data and respond to it without direct control by human beings.

Applications and Limitations of Digital Computers

In a very general way, it can be said that the advantages of the digital computer compared to the analog computer,I are its greater flexibility and precision, while its disadvantages are its higher cost and complexity.

Information storage can be easier in digital computer systems than in analogue ones. New features can often be added to a digital system more easily too.

Computer-controlled digital systems can be controlled by software, allowing new functions to be added without changing hardware. Often this can be done outside of the factory by updating the product's software. So, the product's design errors can

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be corrected after the product is in a customer's hands.

Information storage can be easier in digital systems than in analog ones. The noise-immunity of digital systems permits data to be stored and retrieved without degradation. In an analog system, noise from aging and wear degrade the information stored. In a digital system, as long as the total noise is below a certain level, the information can be recovered perfectly.

Digital computers play an important role in life today as they can be used to control industrial processes, analyse and organize business data, assist in scientific research and designing of automobiles and aircraf, and even help making special effects in movies. Some Main Applications of Digital Computers are as follows -

Recording Information

Official statistics keepers and some scouts use computers to record statistics, take notes and chat online while attending and working at a sports event.

Analyzing Movements

The best athletes pay close attention to detail. Computers can slow recorded video and allow people to study their specific movements to try to improve their tendencies and repair poor habits.

Writers

Many sportswriters attend several sporting events a week, and they take their computers with them to write during the game or shortly after while their thoughts are fresh in their mind.

The main disadvantages are that digital circuits use more energy than analogue circuits to accomplish the same tasks, thus producing more heat as well. Digital circuits are often fragile, in that if a single piece of digital data is lost or misinterpreted, the meaning of large blocks of related data can completely change.

Definition of digital computer, Elements of computer: Input unit, Output unit, Primary memory, Secondary memory and Processing unit.

- Computer is an electronic device that is designed to work with Information. *term computer* is *derived from the Latin term*'**computare**', this means to *calculate*or *programmable machine*. **Computer cannot do anything without a Program**. It represents the decimal numbers through a string of binary digits. The Word 'Computer' usually refers to the Center Processor Unit plus Internal memory.
- **Charles Babbage**is called the "Grand Father" of the computer. The First mechanical computer designed by Charles Babbage was called **Analytical Engine.** It uses read-only memory in the form of punch cards.

Digital Computer Definition

- The basic components of a modern digital computer are: Input Device, Output Device, Central Processor Unit (CPU), mass storage

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device and memory. A Typical modern computer uses LSI Chips.

Four Functions about computer are:

accepts data	Input
processes data	Processing
produces output	Output
stores results	Storage

Input (Data):

Input is the raw information entered into a computer from the input devices. It is the collection of letters, numbers, images etc.

Process:

Process is the operation of data as per given instruction. It is totally internal process of the computer system.

Output:

Output is the processed data given by computer after data processing. Output is also called as Result. We can save these results in the storage devices for the future use.

All general-purpose computers require the following hardware components:

Memory: enables a computer to store, at least temporarily, data and programs.

Mass storage device: allows a computer to permanently retain large amounts of data. Common mass storage devices include solid state drives (SSDs) or disk drives and tape drives.

Input device: usually a keyboard and mouse, the input device is the conduit through which data and instructions enter a computer.

Output device: a display screen, printer, or other device that lets you see what the computer has accomplished.

Central processing unit (CPU): the heart of the computer, this is the component that actually executes instructions.

In addition to these components, many others make it possible for the basic components to work together efficiently. For example, every computer requires a bus that transmits data from one part of the computer to another.

CPU (Processing Unit)

CPU (pronounced as separate letters) is the abbreviation for central processing unit. Sometimes referred to simply as the central processor, but more commonly called processor, the CPU is the brains of the computer where most calculations take place. In terms of computing power, the CPU is the most important element of a computer system.

Components of a CPU

The two typical components of a CPU include the following:

The arithmetic logic unit (ALU), which performs arithmetic and logical operations.

The control unit (CU), which extracts instructions from memoryand decodes and executes them, calling on the ALU when necessary.

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Relationship between the elements of the CPU, input and output, and storage

Printed Circuit Boards, Microprocessors

On large machines, the CPU requires one or more printed circuit boards. On personal computers and small workstations, the CPU is housed in a single chip called a microprocessor. Since the 1970's the microprocessor class of CPUs has almost completely overtaken all other CPU implementations.

The CPU itself is an internal component of the computer. Modern CPUs are small and square and contain multiple metallic connectors or pins on the underside. The CPU is inserted directly into a CPU socket, pin side down, on the motherboard.

Each motherboard will support only a specific type (or range) of CPU, so you must check the motherboard manufacturer's specifications before attempting to replace or upgrade a CPU in your computer. Modern CPUs also have an attached heat sink and small fan that go directly on top of the CPU to help dissipate heat.

MEMORY

Memory is major part of computers that categories into several types. Memory is best storage part to the computer users to save information, programs and etc, The computer memory offer several kinds of storage media some of them can store data temporarily and some them can store permanently. Memory consists of instructions and the data saved into computer through Central Processing Unit (CPU).

Types of Computer Memory:

Memory is the best essential element of a computer because computer can't perform simple tasks. The performance of computer mainly based on memory and CPU. Memory is internal storage media of computer that has several names such as majorly categorized into two types, Main memory and Secondary memory.

1. Primary Memory / Volatile Memory.
2. Secondary Memory / Non Volatile Memory.

1. Primary Memory / Volatile Memory:

Primary Memory also called as volatile memory because the memory can't store the data permanently. Primary memory select any part of memory when user want to save the data in memory but that may not be store permanently on that location. It also has another name i.e. RAM.

Random Access Memory (RAM):

The primary storage is referred to as random access memory (RAM) due to the random selection of memory locations. It performs both read and write operations on memory. If power failures happened in systems during memory access then you will lose your data permanently. So, RAM is volatile memory. RAM categorized into following types.

DRAM

SRAM

DRDRAM

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