Fundamentals of Computers (Module-I)

Presented By:

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Subject Name : Fundamentals of Computers

Paper   : First

Unit   : First

Class   : For all Undergraduate Courses
                    Specially for...
                    B.Sc.(Computer Science)
                    B.Sc.(Information Technology)
                    B.Com./B.A./B.Sc.(Computer Application)
                    BCA

Outline of Topics Covered by Lecture

❑ Introduction

❑Definitions of Computer

❑ Characteristics of Computer

❑ Classification of Computer

❑ Evolution of Computer

❑ Components of Computer

❑ References

❑ Exercise with MCQs

Computers are Everywhere

Uses of Computer
- Education field
- Business
- Hospitals
- Banking
- Government Offices
- Home
- Marketing
- Students

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A World of Computers

- Computers are everywhere
  - People use all types and size of computer for a variety of reasons and in a range of places.

Search information
Home
Edit photos
Listen to music
Send messages
Workplace
School

Pages 4 - 5

Our Lives = F {Computer(x) , Internet(y) } as Positive

" Positive use of Computer & Internet makes our lives Easy & Simple "

Information

- ☐ **Google: Information –Search for Every thing**
- ☐ **Use maps or get driving directions**
- ☐ **Get weather reports , news**
- ☐ **Look up phone numbers, addresses or zip codes**

Communication

- ☐ **Communicate with friends and family**
- ☐ **Exchange greetings, cards and invitations**
- ☐ **Plan gatherings and arrange personal meetings, functions.**

Transactions

- ☐ **Buy tickets for movies, Train, Bus, Sport plays.**
- ☐ **Internet banking and bill paying.**
- ☐ **Purchase everyday items online.**

Entertainment

- ☐ **Play games online/offline**
- ☐ **Read Books, Magazines, Novels**
- ☐ **Listen to music or radio Regularly online/offline**
- ☐ **Watch videos, movie previews, or cartoons online/offline**

Our Lives = F (Computer , Internet) as Negative

" Technology is useful servant but a dangerous Master "

Negative Impact

- Vision Problems
- Physical Health Issues
- Exposure to Radiation
- Addiction
- Computer Crime
- Data Security
- Unemployment
- Wastage of time

Many people use computer without positive purpose they play game and chat with friends long time. It causes wastage of time and energy.

Data and Information

- **Data** can be defined as a representation of facts, concepts, numbers, characters or other symbols but not information itself.

- **Data** on its own has no meaning, or context.

- Everything that can be store into a computer and processed is termed as **Data**

- It can be numeric, text, dates, graphics sound ,images, video ,concept etc.

- **Information** is nothing but organized or classified data, which has some meaningful values for the receiver.

- When data are processed, interpreted, organized, structured or presented so as to make them meaningful or useful, they are called **information**.

- Information provides context for data.

- Information is the processed data on which decisions and actions are based.

Data v/s Information

Example : If I write…

25, 33 ,48

What you Think ? What is it ?

➢ It may be Age ?

➢ It may be Marks?

➢ It may be Roll No. ?

➢ It may be House No.? Anything Else

➢ No Context or Meaning clearly defined but these are numbers and can be store and process, hence , It is **Data.**

Now If I consider these are the marks obtained by a student and calculate the percentage and finally find the final grade of student, say '**B**'. This is an **Information**

Examples:

The history of temperature readings all over the world for the past 50 years is data. If this data is organized and analyzed to find that global temperature is rising, then that is information.

The number of visitors to a website by country is an example of data. Finding out that traffic from the India is increasing while that from Australia is decreasing is meaningful information.
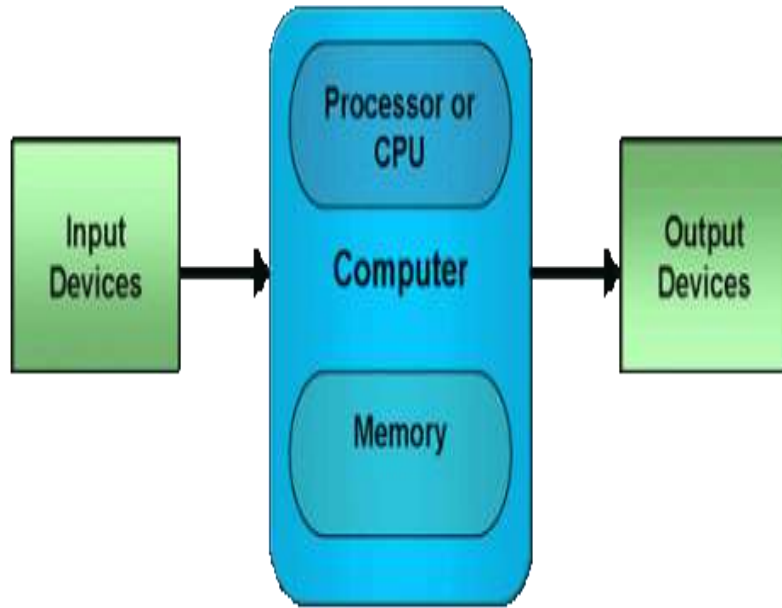
What is Computer

A Computer is an electronic data processing device, which accepts and stores **data** as input, processes the data, and generates the **information** as output in a required format.
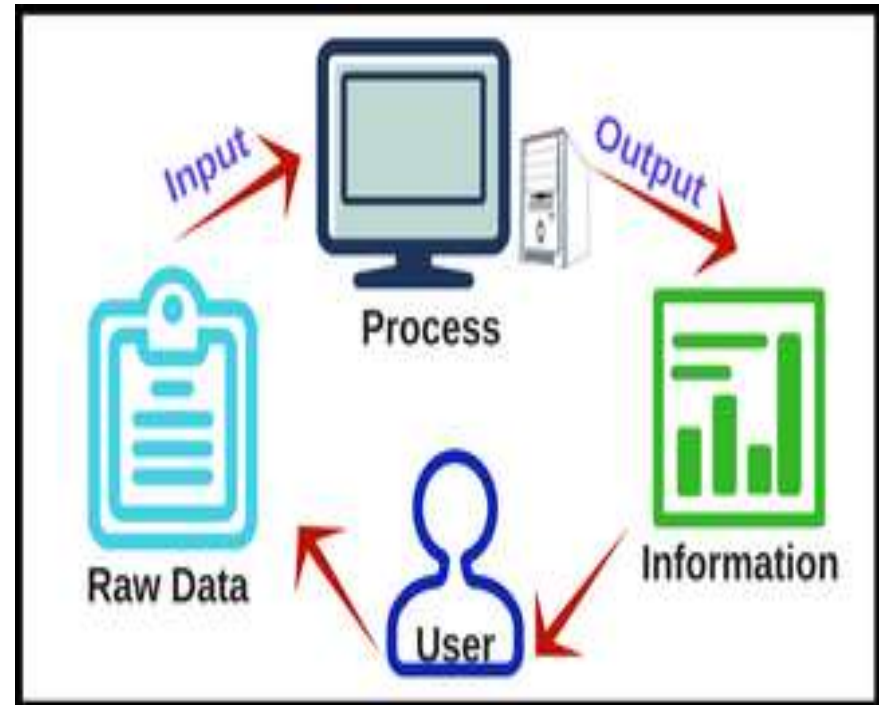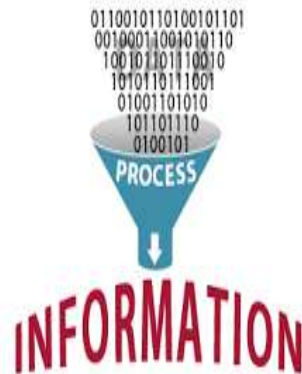
What is Computer System

- A Computer system is a basic, complete and functional computer, including all the components required to process the input data into information at it output.

- A Computer system has two main components which when both combined makes a Computer system.

- 1.**Hardware**: Input & Output Devices, Processor ,Memory etc.

- 2.**Software**: Operating System

Hardware + Software= Computer System

Hardware:

Computer Hardware refers to the various physical electronic components that are used for various operations of computer System.

Hardware is useless without Software to run on it.

External H/W examples:

Monitor, Keyboard, Printer, Scanner etc.

Internal H/W examples:

CPU, Modem, R AM, Sound-Video Card

Software:

Software is a set of instructions to tell the computer hardware what to do. Also gives services to users.

Software is useless unless there is hardware to run it on.

Computer use itself: System S/W

Example : Operating system

User use : Application S/W

Example : Word processing ,Photo editor etc.

Computer System: Operations

| Operation	Description
Take Input	**The process of entering data and instructions into the computer system.**
Store Data	**Saving data and instructions so that they are available for processing as and when required.**
Processing Data	**Performing arithmetic, and logical operations on data in order to convert them into useful information.**
Output Information	**The process of producing useful information or results for the user, such as a printed report or visual display.**
Control the workflow	**Directs the manner and sequence in which all of the above operations are performed.**
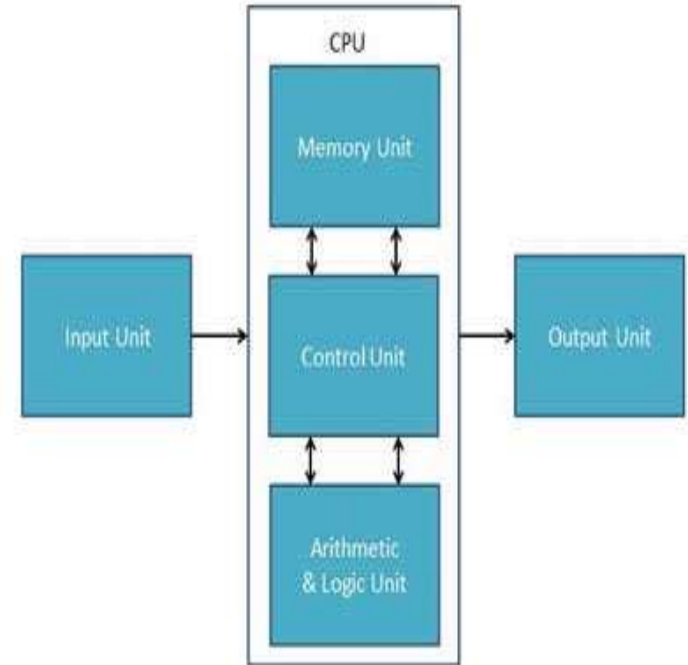
Why Computer use Binary number ?

☐ Most of circuitry in computers act as switches that control electrical signals, and the only required states for the switches are "on" and "off." This requirement means they only need 2 numbers to represent each state, 0 and 1.

0 ⇒ OFF
1 ⇒ ON
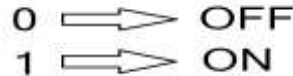
☐ Computers use voltages and since voltages changes often, no specific voltage is set for each number in the decimal system. For this reason, binary is measured as a two-state system i.e. on or off.

☐ Only Two clearly distinct states (0,1) that provide a safety range for reliability.

☐ Least amount of necessary circuitry, which results in the least amount of space, energy consumption, and cost.

☐ A major reason computers use the binary system is that the two-state system is the number system best suited to the optical and magnetic storage components of the computer.

Characteristics of Computer

Automatic

☐ Computer is an automatic machine which works without the intervention of the user.

☐ The user is required to give the data and utilize the result but the process is **automatic**. ..

High Speed

☐ The computer has units of speed in microsecond, nanosecond, and even the picosecond.

☐ It can perform millions of calculations in a few seconds as compared to man who will spend many months to perform the same task

Accuracy

☐ The calculations are 100% error free.

☐ Computers perform all jobs with 100% accuracy provided that the input is correct.

Diligence

☐ It can work continuously without any error and boredom.

☐ It can perform repeated tasks with the same speed and accuracy.

Characteristics of Computer

Versatility

- This machine can be used to solve the problems related to various fields.

- At one instance, it may be solving a complex scientific problem and the very next moment it may be playing a card game

Storage Capability

- It can store large amount of data.

- It can store any type of data such as images, videos, text, audio, etc.

Communication

- Using network computer can connect and communicate their information with other devices.

Dependency

- It functions as per the user's instruction, thus it is fully dependent on humans.

Characteristics of Computer

Characteristics of Computer...

No IQ...

- Not a thinking machine
- Not Intelligent
- Never does a task at its own
- Follow human Instructions

Characteristics of Computer...

No Feeling...

- Follow human/programmer Instructions
- Never decides at its own will
- No taste
- No knowledge
- No emotion

Mini Computers — Desktop Computers — Gaming Computers — Laptop Computers

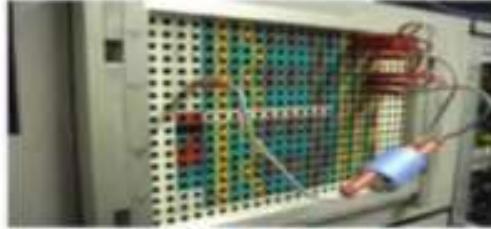# Classifications of Computers

Computers are classified and categorized into three types of categories according to their specific number of functionalities.

I- By Type   II- By Size   III- By Function

Analog Computer

Source: www.computerhope.com

Digital Computer

Source: https://encrypted-tbn2.gstatic.com

Hybrid Computer

18

Types of Computer

Computer has been divided into three sub categories which they have various number of functionalities Corresponded to them

I- Analog computer   II- Digital Computer   III- Hybrid Computer

Analog Computer

EXAMPLES OF ANALOG COMPUTER

- An analog computer is a computer which is used to process analog data. i.e. continuously varying data.

- Analog computers store data in a continuous form of physical quantities like température, pressure, voltages, etc. and perform calculations with the help of measures.

- Analog computers are excellent for situations which require data to be measured directly without converting into numerals or codes.

- Analog computers, although available and used in industrial and scientific applications like control systems and aircraft.

- Real-time operation and simultaneous computation is possible with the help of analog computers.

- The Antikythera mechanism is generally considered to be the world's oldest known analog computer.

Digital Computer
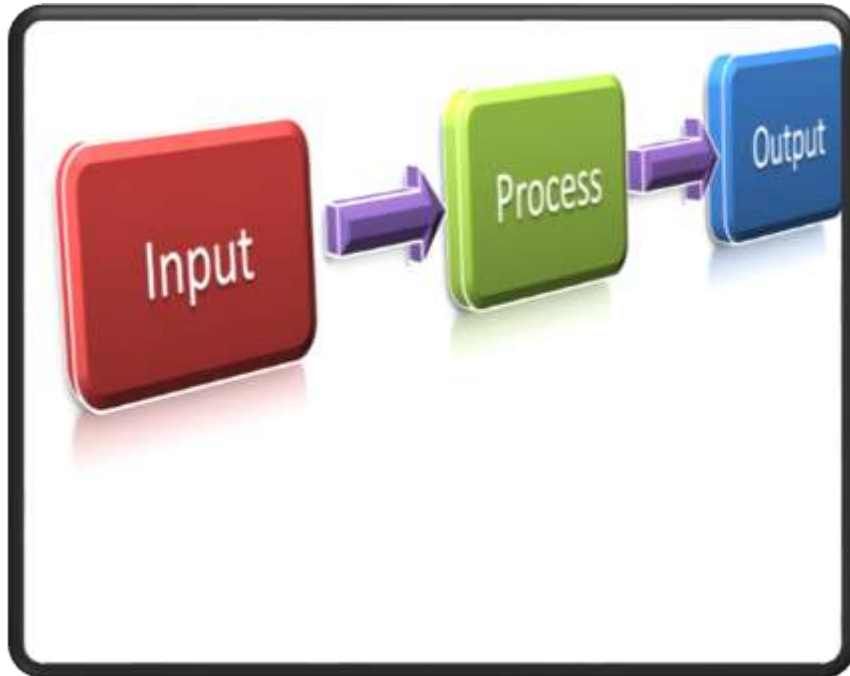
- Digital computer is most commonly used type of computer. A computer that performs calculations and logical operations with quantities represented as digit, usually in the binary number system.

- Digital machines work on numbers. Each variable is converted into numbers and each number into binary form, i.e. 0 and 1.

- Electronic Numerical Integrator and Computer(**ENIAC**) ,1946,was considered first digital computer.

- All modern computers, laptops, and Smartphones are all digital computers.

Hybrid Computer

Hybrid Computer

The computer which have qualities of both digital & analog computers are called hybrid computer.

Hybrid computer has the speed of analog & the accuracy of digital computer.

- ❑ A Hybrid computer is a type of computer that offers the functionalities of both a digital and an analog computer.

- ❑ The digital component normally serves as the controller and provides logical and numerical operations, while the analog component often serves as a solver of differential equations and other mathematically complex equations.

- ❑ Hybrid computers are well known for their ability to blend analog and digital features of computers.

- ❑ Advantages include the availability of both analog and digital computations within a single unit and an efficient processing speed.

- ❑ The first desktop hybrid computing system was the Hycomp 250, released by Packard Bell in 1961

Mini computer

Super computer

Micro computer

Mainframe computer

Computer by size (Sub-category of Digital Computers)

Computer has been categorized into four others types according to its size.

I- Microcomputer   II- Minicomputer III- Mainframe computer   IV. Supercomputer

Microcomputer

❑ A Microcomputer is a Computer with a Central Processing Unit (CPU) as a Microprocessor.

❑ It is Designed for individual use, a microcomputer is smaller than a mainframe or a minicomputer.

❑ Microcomputer contains a CPU on a microchip called microprocessor, a memory system, a bus system, a I/O system typically housed in a PCB called Motherboard.

❑ PC or Desktop, Notebook, Laptop etc.

Type of Micro Computer
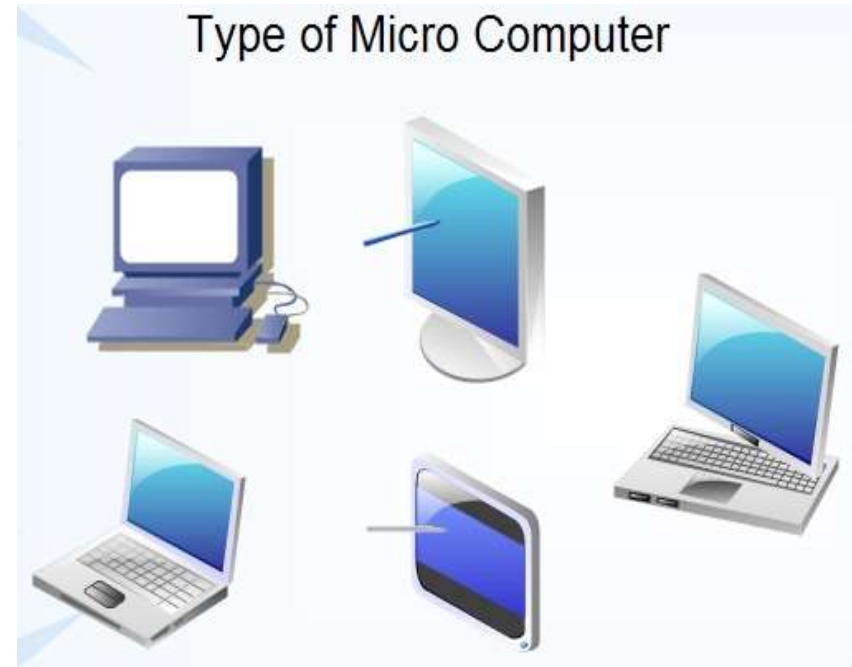
Minicomputer

❑Compare to mainframe these are midrange computers, small in size and more compact and less expensive.

❑They are designed for computerization of data, scientific research, industrial process, data collection and telephone switches.

❑ Minicomputers are multiprocessing system and can support up to 200 user at a time but the power of processing is not as great as the mainframe and supercomputers.

❑ Examples of Minicomputers
> IBM System/3
> Honeywell 200
> TI-990

MINICOMPUTER

A minicomputer is a medium-sized computer that is more powerful than the microcomputer. An important distinction between the microcomputer and a minicomputer is that a minicomputer is usually design to serve multiple users simultaneously. A system that support multiple users is called a multiterminal, time-sharing system. Minicomputer are the popular computing systems among research and business organizations today. They are move expensive than microcomputer.

Mainframe Computer

❑ Mainframes are a type of computer that generally are known for their large size, amount of storage, processing power and high level of reliability.

❑ They are primarily used by large organizations for mission-critical applications requiring high volumes of data processing.

❑ Nearly all mainframes have the ability to run (or host) multiple operating systems.

❑ A single mainframe can replace dozens or even hundreds of smaller servers.

❑ **IBM zSeries, System z9 and System z10 servers.**

Mainframe

What is a mainframe?
• a mainframe is a large, expensive, multi–user computer capable of simultaneously processing for hundreds or thousands of users.

Who uses a mainframe?
• almost everyone uses a mainframe, if you have used an automated teller machine (ATM) you have used a mainframe.

•Mainframe computers plays a central role in banking, finance, health care and other private enterprises.

Super Computer

❑ Supercomputers are primarily are designed to be used in enterprises and organizations that require massive computing power.

❑ A supercomputer incorporates architectural and operational principles from parallel and grid processing, where a process is simultaneously executed on thousands of processors or is distributed among them.

❑ Today's supercomputers consists of tens of thousands of processors that are able to perform billions and trillions of calculations or computations per second.

❑ The Summit, in USA the fastest supercomputer in the world and The Pratyush is the fastest supercomputer in India. (*web source)

SUPERCOMPUTERS

- Supercomputers are the fastest computers available at any given time and are normally used to solve problems, which require intensive numerical computations. They are also very large in size.
- Examples of such problems are weather forecasting, fluid dynamics, nuclear simulations, animated graphics, theoretical astrophysics, and complex scientific computations.
- These computers are extremely expensive and the speed is measured in billions of instructions per seconds/floating point operations per second or **FLOPS.**
- In terms of computational capability, memory size and speed, supercomputers are the most powerful, are very expensive, and not cost-effective just to perform batch or transaction processing.

EVOLUTION OF COMPUTERS

GENERATION 1
1946-1959.

GENERATION 2
1959-1965

GENERATION 3
1965-1971

GENERATION 4
1971-1980

GENERATION 5
1980-onwards

FIRST GENERATION COMPUTERS

- 1. Use of Vacuum Tubes.

- 2. High Electricity Consumption.

- 3. Programming in Machine Language only.

- 4. Generated lot of heat so larger AC were needed for Cooling .

- 5. Lot of electricity failure occurred.

- 6. Slow input and output devices.

- 7. Huge size like a big room.

- 8. Unreliable and costly.

- 9. Example : ENIAC, EDVAC.

1. Transistors were used.
2. Core memory was developed.
3. Faster than first generation Computers.
4. First Operating System was developed.
5. Programming was in Machine Language & Assembly Language
6. Computers became smaller in size than the first generation computers
7. Computers consumed less heat & consumed less electricity
8. **IBM 1401 ,Honeywell 400**

THIRD GENERATION COMPUTERS

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1.Integrated Circuits developed

2.Power consumption was low

3.High level languages like cobol,fortran were used

4.It can perform calculations in nanoseconds.

5.Maintenance cost is low compared to the previous generation computers.

7.More reliable & Use Multiprogramming operating System

9. Example: IBM 360 and 370 series.

FOURTH GENERATION COMPUTERS

1. LSI & VLSI Technology used
2. Development of Portable Computers
3. RAID Technology of data storage
4. Used in Virtual Reality, Multimedia, Simulation
5. Computers started in use for Data Communication & Internet
6. Different types of memories with very high accessing speed & storage   capacity.
7. Domain Specific High level Programming such as SQL .
9. Example:STAR1000, CRAY-1(Super Computer)

1. VLSI technology became ULSI (Ultra Large Scale Integration) technology.

2. Parallel processing hardware and AI, Voice Recognition, Nano technology are the common face of this generation.

3. All the high-level languages like Java, .NET etc., are used in this generation.

4. More user-friendly interfaces with multimedia features

5. Availability of very powerful and compact computers at cheaper rates.

6. Concurrent Logic programming language like Prolog.

7. Example : Smartphones, PIM

32

Components of Computer

Input Unit

This unit contains devices with the help of which we enter data into the computer. This unit creates a link between the user and the computer. The input devices translate the information into a form understandable by the computer.

CPU (Central Processing Unit)

CPU is considered as the brain of the computer. CPU performs all types of data processing operations. It stores data, intermediate results, and instructions (program). It controls the operation of all parts of the computer.

CPU itself has the following three components −1.ALU (Arithmetic Logic Unit) 2.Memory Unit 3. Control Unit

Output Unit

The output unit consists of devices with the help of which we get the information from the computer. This unit is a link between the computer and the users. Output devices translate the computer's output into a form understandable by the users.

Components of Computer

Memory or Storage Unit

This unit can store instructions, data, and intermediate results. This unit supplies information to other units of the computer when needed. It is also known as internal storage unit or the main memory or the primary storage or Random Access Memory (RAM).

Its size affects speed, power, and capability. Primary memory and secondary memory are two types of memories in the computer.

Functions of the memory unit are –

- It stores all the data and the instructions required for processing.
- It stores intermediate results of processing.
- It stores the final results of processing before these results are released to an output device.
- All inputs and outputs are transmitted through the main memory

Components of Computer

<u>Control Unit</u>

This unit controls the operations of all parts of the computer but does not carry out any actual data processing operations. Functions of this unit are −

• It is responsible for controlling the transfer of data and instructions among other units of a computer.

• It manages and coordinates all the units of the computer.

• It obtains the instructions from the memory, interprets them, and directs the operation of the computer.

• It does not process or store data.

<u>ALU (Arithmetic Logic Unit)</u>

This unit consists of two subsections namely,1. Arithmetic Section and 2. Logic Section.

Arithmetic Section- Function of arithmetic section is to perform arithmetic operations like addition, subtraction, multiplication, and division. All complex operations are done by making repetitive use of the above operations.

Logic Section - Function of logic section is to perform logic operations such as comparing, selecting, matching, and merging of data.

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Thank You !

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