Unit 1

Introduction to Computer

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Introduction

- ✓ A Computer is an electronic device, which **accept data** and **process it** and gives us **information** with **set of instructions** called **program**.
- ✓ A computer is a programmable machine, multiuse machine.
- ✓ The word computer is derived from the latin word **“computare”.**
- ✓ The computer as a system which is a combination of **hardware** and **software** joined together.

It has the ability to:

1. Accept data

2. Input, store and execute instructions.

3. Perform mathematical and logical operation on data.

4. Output results.

Functions of Computer

1) Inputting:

- ✓ The process which enter data inside computer system with the help of input devices is called inputting.
- ✓ In others words the process of entering data and instruction is called inputting.

2) Processing:

- ✓ The process which performs different mathematical operations and logical operations like (<,≤, ≥, ≠, >) is called processing.
- ✓ The computer performs all processing by “calculating,” and “comparing” the data stored in its memory (Random Access Memory).

Functions of Computer

Processing is done in two ways. They are as follows:

a. Mathematical Operation:

- ✓ The computer can perform any mathematical operation on data by adding, subtracting, multiplying and dividing (+,-,*,/) one set with another.

b. Logical operation:

- ✓ The computer can analyze and evaluate data by matching it with sets of known data that are included in the program or called in from storage.
- ✓ i.e. it compares two or more data either it is greater than, smaller than, greater or equal to, smaller or equal to and equals to((<, ≤, ≥, ≠, >).

Functions of Computer

3) Outputting:

- ✓ The process of giving information or results after processing and storing is called outputting.
- ✓ It is shown by output devices such as monitor. i.e. The process which display result to the user is called outputting.

4) Storing:

- ✓ The process which helps to store data and information is called storing.
- ✓ The computer is able to store (save) data and programs permanently and retrieve it when required.
- ✓ A system's size is based on how much disk storage it has. The more disks, the more data are immediately available.

Functions of Computer

5) Controlling:

- ✓ The CPU of a computer is responsible for controlling devices attached with computer.
- ✓ i.e. Controlling is the function of controlling all the input and output devices, application programmes and memory units.

Data

- ✓ The raw facts, measurements, or materials are called data which are collected from different areas to get information.
- ✓ These are also observations, old records. Data is plural form of Datum.

For example: A,50,B,40……. are data. These does not give any meaning, so data are raw facts.

Information

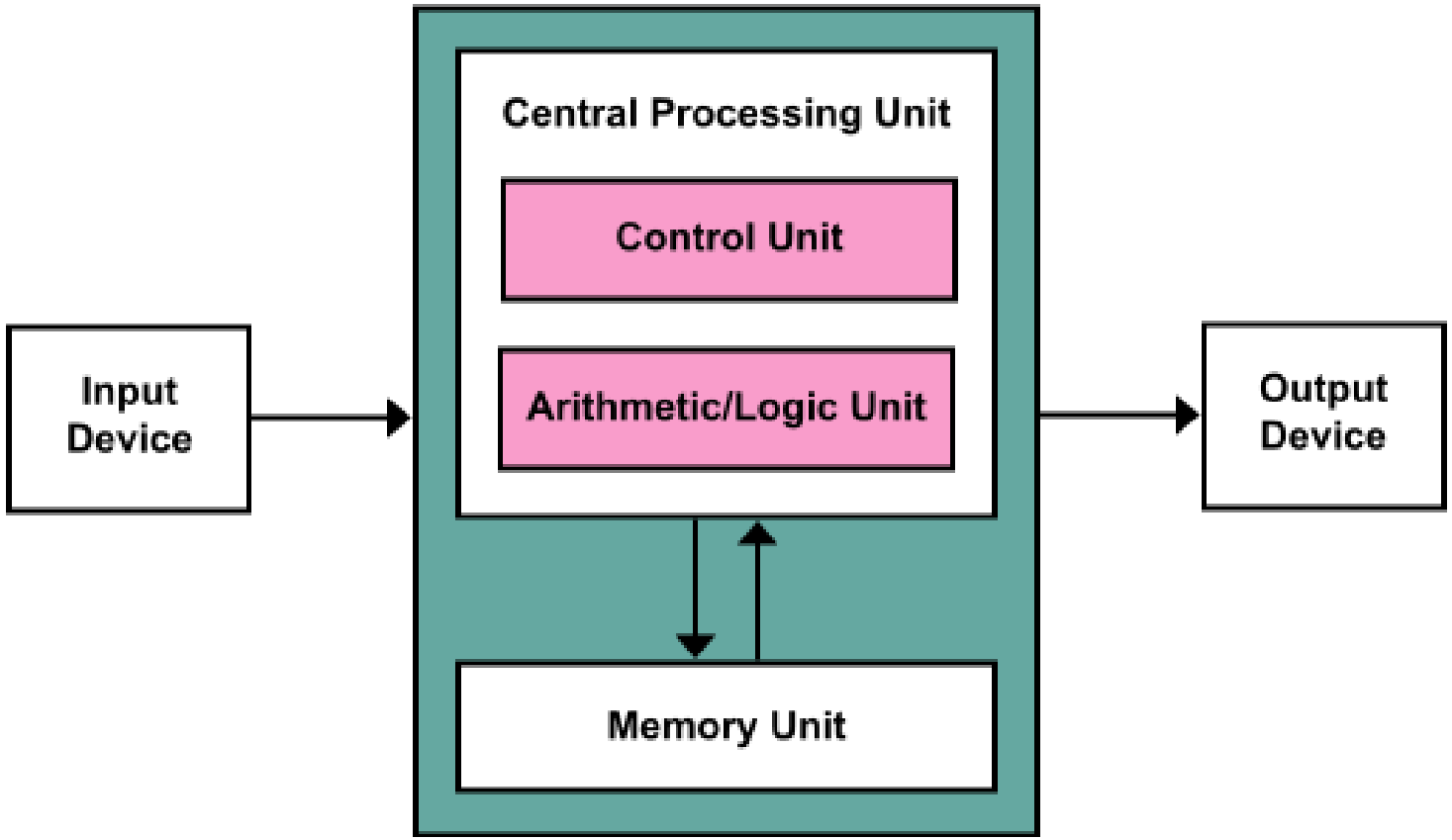
- ✓ The proceeded data which are in meaningful form are called information.
- ✓ Data are regarded the most fundamental forms of information. Data are arranged and processed to get information.

Information (Example)

Section	Number of Students
A	50
B	40

It shows that in section A, there are 50 Students and in section B, there are 40 students and so on.

Anatomy of Computer



Anatomy of Computer

- ✓ Refers to basic parts of computer systems
- ✓ Parts that work together to input, process, store, and output data.

1. **Input Devices**

- ✓ Used to enter data and instructions into the computer
- ✓ Convert user input into machine-readable form

Examples: Keyboard, Mouse, Scanner, Microphone, Webcam, Touchscreen, etc.

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Anatomy of Computer

2. **Processing Unit (CPU)**

- ✓ CPU stands for **Central Processing Unit**
- ✓ Known as the **brain of the computer**
- ✓ Performs all **calculations and decision-making**

Parts of CPU:

a. ALU (Arithmetic Logic Unit)

- Performs arithmetic operations (addition, subtraction)
- Performs logical operations (comparison)

b. Control Unit (CU)

- Controls and coordinates all activities
- Directs data flow between devices

Anatomy of Computer

Parts of CPU:

c. Registers

- ✓ Small, fast memory inside CPU
- ✓ Stores temporary data during processing

Anatomy of Computer

3. Memory Unit

- ✓ Memory Unit is a part of the computer that **stores data, instructions, and results**
- ✓ It helps the CPU to **process data efficiently**
- ✓ Also called **Storage or Memory**

Functions of Memory Unit

- ✓ Stores input data before processing
- ✓ Stores instructions and programs
- ✓ Stores intermediate results during processing
- ✓ Stores final output results

Anatomy of Computer

4. Output Devices

- ✓ Output devices are hardware components that **display or produce processed information**
- ✓ They convert **machine-readable output into human-readable form**

Functions of Output Devices

- ✓ Show results of processing
- ✓ Present information in visual or audio form
- ✓ Help users understand processed data

Classification of Computer

1. Digital Computer

- ✓ A computer which uses binary **digits 0's and 1's** are called digital computer.
- ✓ They convert the data into **binary digits (0's and 1's)** and all operations are carried out on these digits at extremely fast rate.
- ✓ A digital computer basically knows how to count the digit and add the digits.
- ✓ Digital computers are much faster than analog computers and far more accurate.
- ✓ Digital computers have high storage or memory.
- ✓ They works upon discontinuous data. Digital computers are multipurpose and programmable and hence used for general purpose(can be used in many different application).

Example: Digital Clock, Personal Computer (PC) etc.

Classification of Computer

2. Analog Computer

- ✓ The computer which is used to measure physical magnitudes (such as-voltage , temperature, current and pressure) is called analog computer.
- ✓ Analog computers works with the natural or physical values. i.e. these computers works with continuous data.
- ✓ The accuracy of analog computer is low and there is very low or do not have storage or memory.
- ✓ Analog computer operates by measuring rather than counting.
- ✓ Analog computers are mostly used in scientific and engineering applications. E.g:- speedometer, voltmeter etc.

Characteristics of Computer

a) Speed:

Computers can calculate at very high speeds. As the power of computer increases, the speed also increases. The smallest unit of time in the human experience is realistically the **second**. For example A microcomputer can execute a million of instruction per second.

b) Storage:

A computer can **store large amount of data**. i.e the storage capacity of computer is high. The data can be stored and retrieved according to the need of the user.

c) Accuracy:

In addition to being fast, computers are very accurate which means that the accuracy of computer is very high. The accuracy of a computer is consistently high and the degree of a accuracy of a computer depends upon its design.

Characteristics of Computer

d) Diligence:

A computer can perform repetitive task without being bored, tired and losing concentration. It can continuously work for several hours without human intervention after the data and programs are fed to it.

e)Versatility:

Computers are very versatile machines. They can perform activities ranging from simple calculations to complex operations. They can perform different tasks depending upon different programs fed to them.

f) Automation:

The automation characteristics of a computer is that it finishes any task automatically. computers can be programmed to perform a series of complex tasks involving multiple programs.

History of Computer

The history of computers is categorized into three main eras, each marked by significant technological advancements:

1. Mechanical Calculation Era:

- **Abacus (3000 BC):** The first counting device, used for addition and subtraction.
- **Napier’s Bones (1614):** A device for multiplication and division using rectangular cards with diagonal divisions.
- **Slide Rule (1620):** Based on logarithms, used for easy calculations.
- **Pascaline (1642):** Developed by Blaise Pascal, this mechanical calculator performed basic arithmetic using gears.
- **Stepped Reckoner (1671):** Gothfried Von Leibnitz's calculator could perform advanced arithmetic, including square roots.

History of Computer

1. Mechanical Calculation Era: (Contd..)

- **Jacquard’s Loom (1802):** Introduced the concept of programmable punch cards for weaving.
- **Difference and Analytical Engines (1822, 1833):** Charles Babbage’s mechanical computers laid the foundation for modern computing, earning him the title "Father of the Computer."
- **Lady Augusta Ada:** Created the first computer program and is considered the "First Programmer."
- **Boolean Algebra (19th Century):** George Boole's binary logic (0s and 1s) became the basis for digital computing.
- **Hollerith’s Tabulating Machine (1886):** Processed census data using punch cards, leading to the founding of IBM.

History of Computer

2. Electromechanical Computers Era:

- **Mark-I (1937):** Developed by Howard Aiken, this large electromechanical computer used vacuum tubes and consumed significant electricity.
- **ABC (1942):** The first electronic digital computer, invented by Atanasoff and Berry, used vacuum tubes and punch cards.

History of Computer

3. Electronic Computers:

- **ENIAC (1946):** Built for the U.S. Army, it was the first general-purpose electronic computer, using 17,468 vacuum tubes.
- **John Von Neumann (1945):** Introduced the stored-program concept, allowing programs to be modified and stored in memory.
- **EDSAC (1949):** The first stored-program computer.
- **EDVAC (1952):** Used discrete variables for improved storage.
- **UNIVAC (1961):** The first commercial general-purpose digital computer.

Assignment:

Q. What is the full form of ENIAC, EDSAC, EDVAC and UNIVAC?

Generations of Computer

1) The first Generation computers (1945-55)

- The first generation computers were very slow ,very large size and consumed a lot of power and produced large amount of heat.
- All these computer uses vacuum tube circuitry and programming was a difficult task.
- Storage devices: magnetic drum (2KB memory)
- Input Methods: punched cards, Output devices: punched cards, Line Printers.
- Application: scientific purposes.
- The first generations computers are as follows: **ENIAC(Electronic Numerical Integrator And Calculator), UNIVAC(Universal Automatic computer), EDVAC (Electronic Discrete variable Automatic Computer)** etc.

Generations of Computer

2) Second Generations Computers (1956-65)

- The second generation computers began with the advent of semiconductor transistor by Bell laboratories.
- Transistor were highly reliable compared to tubes.
- They occupied less space and required only 1/10 of the power required by tubes and were ten times cheaper than using tubes.
- These computers used transistor, were faster, more reliable, relatively smaller, consumed less power.
- These computer uses magnetic disk as storage devices.
- These computer uses high level programming languages such as **FORTRAN, COBOL, Algol and snobol** etc.

For example: **IBM 700, 1401, ATLAS etc.** are examples of second generations computers. These computers are used for Business and engineering purposes.

Generations of Computer

3) Third generations computers(1966-75)

- The third generation computers replaced transistor with “Integrated Circuits” known popularly as chips.
- These computers using integrated circuits proved to be highly reliable, relatively inexpensive and faster.
- These computers have CPU, large storage space.
- These computer uses high level programming languages.
- The third generations computers are IBM 360-370ICL-1900,NCR 395,CRAY-1 etc.
- These computers were used in educations, Research, small businesses as well as scientific and engineering purposes.

Generations of Computer

4) Fourth Generations Computers (1976-90)

- These computers uses the concept of **Very Large Scale Integrated(VLSI**) circuits.
- At that time the advent of microprocessor was introduced which is a single small CPU attached inside computer system.
- Data are entered through keyboard, and displayed using monitor.
- These computer uses high level programming languages such as C, C++, JAVA PROLOG etc.
- This generation computer has high processing speed, large storage capacity and much more powerful operating system.

E.g: IBM, PC, PENTIUM I, PENTIUM II and PENTIUM III etc.

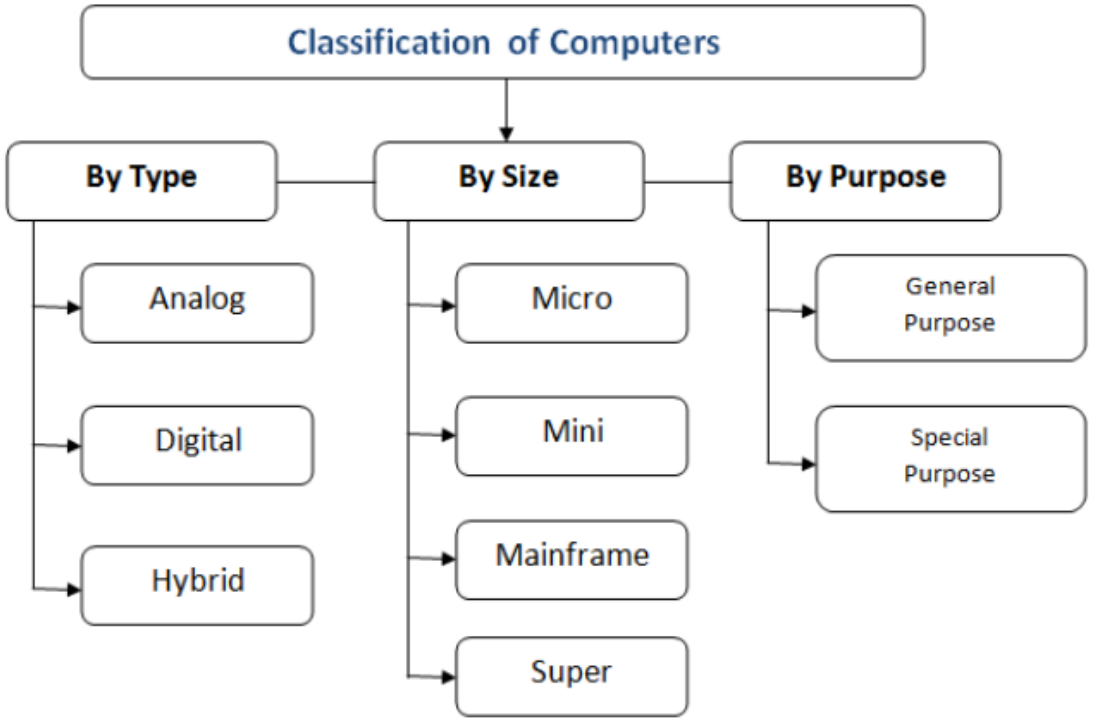
Generations of Computer

5) Fifth Generation (Present and Beyond)

- Fifth generations computers are only in the minds of advance research scientists and being tested out in the laboratories.
- These computers will be under **Artificial Intelligence (AI),** They will be able to take commands in a audio visual way and carry out instructions.
- Many of the operations which requires low human intelligence will be performed by these computers.
- Fifth generation computing devices, based on artificial intelligence, are still in development, though there are some applications, such as voice recognition, that are being used today.
- The goal of fifth-generation computing is to develop devices that respond to natural language input and are capable of learning and self-organization.

Classification of Computer

Computers are classified based on their application, work, size, capacity, speed, brand which are described as follows:



Classification of Computer

1. Based on Functionality (Types):

a. Analog Computers:

- Operate on continuous data and used for real-time processes.
- Example: Speedometers, old scientific instruments.

b. Digital Computers:

- Operate on discrete data (binary system).
- Examples: Modern PCs, smartphones.

c. Hybrid Computers:

- Combine features of both analog and digital systems.
- Example: Medical equipment like ECG machines.

Classification of Computer

2. Based on Size and Performance:

a. Microcomputers:

- Small, affordable, and designed for personal use.
- Examples: Desktop PCs, Laptops, Tablets, Smartphones.

b. Minicomputers:

- Mid-range in size and power, used by small businesses for tasks like database management.
- Example: Servers in small enterprises.

c. Mainframe Computers:

- Large, powerful systems capable of handling vast amounts of data and simultaneous users.
- Used by banks, airlines, and large corporations.

d. Supercomputers:

- The fastest and most powerful computers, used for complex computations like weather forecasting, scientific simulations, and cryptography.
- Example: IBM Summit, Fugaku.

Classification of Computer

3. Based on Purpose:

a. General-Purpose Computers:

- Designed to perform a wide variety of tasks.
- Examples: Personal computers, laptops.

b. Special-Purpose Computers:

- Built for specific tasks.
- Examples: ATMs, gaming consoles, scientific instruments.

🧠 Rapid Quiz (MCQ / True-False)

1. A computer can think like humans. (T/F)
2. CPU stands for _____.
3. Which is NOT an input device?
    1. Keyboard
    2. Mouse
    3. Monitor
    4. Scanner
4. First generation computers used _____ tubes.
5. Smartphone is an example of which type of computer?

Classworks

Q. Short Questions.

1. Define a computer in your own words.
2. Write any **four characteristics** of a computer.
3. Name the **four main units** of a computer.
4. What is the function of the memory unit?
5. Give two examples of computers based on **purpose**.
6. Which generation introduced **microprocessors**?

Classworks (Contd..)

Q. Long Answer Questions (Atempt All Questions)

1. Explain the **anatomy of a computer** with a neat diagram.
2. Describe the **types of computers** based on size and purpose.
3. Why can computers not think like humans?
4. Discuss the **applications of computers in education, health, and business**.

Representation of program in Computer

- ✓ A program is a collection of instruction written in specific programming language.
- ✓ It is used to instruct the computer to perform some specific tasks.
- ✓ The collection of program forms the software.
- ✓ The computer can represent and execute the program written only in machine language (binary based language).
- ✓ For the programs written in other programming language, it has to be translated into machine language in order to be understood by the computer.
- ✓ For translation, language translator like Assembler, Compiler and Interpreter can be used.

Applications of Computers

- ✓ **Education:** Online learning, research, and academic resources.
- ✓ **Business and Office Work**: Word processing, spreadsheets, communication, and accounting.
- ✓ **Entertainment:** Gaming, movies, animation, and music production.
- ✓ **Healthcare:** Medical records, diagnostics, and telemedicine.
- ✓ **Scientific Research:** Data analysis, simulations, and modeling.
- ✓ **Engineering and Manufacturing:** CAD, automation, and 3D printing.
- ✓ **Communication:** Social media, messaging, and VoIP.

Applications of Computers

- ✓ **Finance and Banking:** Online banking, stock trading, and financial management.
- ✓ **Transportation:** GPS navigation and autonomous vehicles.
- ✓ **Government and Public Services:** E-Government services and law enforcement.
- ✓ **Artificial Intelligence (AI) and Machine Learning:** Data analysis, prediction, and natural language processing.

Assignments

Refers to Separate Assignment files.