

CHAPTER ONE:

1. INTRODUCTION

1.1 Definition of a Computer

The word computer is derived from the Latin word “computare” which means to compute.

Definition 1:

A computer is an Electronic data processing device that is capable of performing Arithmetic and Logical operations. More than that a computer can choose, copy, move, position and perform other non-arithmetic operations on the many alphabetic, numeric and other symbols that humans use to represent things.

⊖ Arithmetic operations are Addition, Subtraction, Multiplication, Division, etc.

⊖ Logical operations are: And, Or, Not, Compare, etc.

Definition 2:

An electronic symbol manipulating system that's designed and organized to automatically accept and store input data, process them and produce the output, that results under the direction of a detailed step-by-step stored program.

Definition 3:

Artificial Intelligence the fast-growing computer research division defines the same computer as **“Computer is similar to human being but, without thinking power”**. That means a computer can think equivalent to a human being in certain aspects, the major difference between a computer and human being is **thinking power**, by giving this power as a set of instructions to a computer, called ARTIFICIAL INTELLIGENCE, a human can find a solution to any of his problems.

1.2 Computers Vs Human beings

Humans have rather poor memory; he needs certain support apart from their abilities and capacities. Because of poor memory and mental tiredness, humans lack in accuracy, speed, and reliability, that is why human needs computer as their additional support.

Differences between Human Attitude and computer Attitudes

Human	Computer
Can Think by itself	Cannot think by itself
Gets Mental Tiredness	Never gets Tiredness
May do mistake	Can't do mistake by itself
Has limited speed	Very High Speed
Has limited Memory	More Amount of memory
Accuracy may be missing	Accuracy Never missing

NB: “Ability of a Human to do anything a computer can do but a computer cannot do everything a human can do” is a true statement based on the following table.

Operations Performed by a Computer	Corresponding Actions Performed by a Human
✓ Hold instruction in internal storage	✓ Remember a set of instructions
✓ Read data in machine-readable form	✓ Read data in written or printed form and memorize it or file it.
✓ Perform arithmetic Computations	✓ Can perform arithmetic operations

✓ Make comparisons	✓ Can make comparisons
✓ Retrieve any data from internal memory or secondary storage	✓ Remember data or retrieve data from a file
✓ Output the results on an output device	✓ Speak or Write the result on paper

1.3 Importance of Computer

- ❖ Computers are very important in every aspect of our lives.
- ❖ Computer usage is growing and bounds in business, industry, government, colleges, schools and other places.
- ❖ The offices where we work, the stores in which we shop, the schools we attend, the banks that handle our money, even the device we use in our homes are being radically altered by computers.
- ❖ Computers are now used in all aspects of education, both administration, and teaching.
- ❖ Whether it is for school or home, work or play, a computer can save your time and money, increase your productivity, and process information with speed and accuracy.

Computers can use in the following terms:

Accounting:

- General Ledger preparation
- Payroll preparation
- Accounts payable, invoicing.

General Shops:

- Small calculations like Billing
- Stock maintenance

Airlines and Railways:

- Time Keeping

- Reservation of Tickets

Hospital:

- To store patient information
- To store doctors information
- Medicine information

Colleges and Universities:

- Students Details Maintenance
- Staff Details Maintenance
- Students Attendance Calculation

Education:

- Learning through games
- Educational tutorials

Etc.

1.4 HISTORY of Computers

1. The earliest mechanical computing device was the Abacus, named after the Chinese scientist Abacus, during 1200 A.D.
2. Later during 1614, a Scottish nobleman John Napier developed a tool called Napier's Bones as an aid for multiplication.
3. By 1642, the French philosopher and mathematician, Blaise Pascal developed a rotating wheel calculator, the predecessor of the later desk calculator.
4. During the period 1792 - 1871, a British mathematician and engineer, who is considered to be the Father of today's computer - Charles Babbage built a working model of a machine - the Difference Engine. Later the design of the Difference Engine was developed as an Analytical Engine.
5. During the 1880s, a statistician Herman Hollerith designed and developed Hollerith machine for processing the census data. The Hollerith machines used punched cards for data processing.

6. The first Electronic Calculator was developed by John Vincent Atanasoff in the late 1930s and along with Clifford Berry a prototype of the Atanasoff-Berry computer was constructed during 1939.
7. A fully electronic computer, the ENIAC (Electronic Numerical Integrator And Calculator) was built from 1943 to 1946 at the University of Pennsylvania.
8. In 1953, IBM announced a medium-sized computer, IBM650.
9. In the middle of the 1960s, the Digital Equipment Corporation released its first PDP-1 computer.

1.5 Generations and Classification of Computers

1.5.1 Generations of Computers

People have been processing data and information in some form since prehistoric times. However, it was the development of the computer that revolutionized information processing. The first **large scale electronic computer** the grandparent of today's handheld machines, was the Electronic Numerical Integrator and Computer/Calculator (ENIAC), which became operational in 1946. ENIAC contained approximately 18000 light bulb size electronic vacuum tubes, weighed 30 tons and occupied about 1500 square feet of floor space.

From the start, computers have been developed through four so-called generations or stages, each characterized by smaller size, more powerful and less expensive than its predecessor.

FIRST GENERATION (1944 - 1958)

Computers of this generation were manufactured using vacuum tubes. These computers were highly unreliable as the vacuum tubes failed very frequently. Punched cards were **used for input and output**. These computers were very huge in size, produced an enormous

amount of heat, very slow and very, very expensive. ENIAC and UNIVAC

(Universal Automatic Computer) were examples of first-generation computers. ENIAC used 18,000 vacuum tubes for producing the results.

SECOND GENERATION (1959 - 1963)

By the early 1960s, transistors were developed and used in manufacturing computers. A transistor is an electronic switching device that alternatively allows or does not allow electronic signals to pass and it was comparatively smaller than the vacuum tube. Transistors consumed less power and produced less heat when compared to the vacuum tubes. This second-generation computer tended to be smaller in size, more reliable, and considerably faster than the first generation of computers. Magnetic cores and disk packs were introduced as storage devices. Programming languages like BASIC, FORTRAN, COBOL, etc. were used.

THIRD GENERATION (1964 - 1970)

During this period, the Integrated Chips very popularly known as ICs, started replacing the usage of individual transistors in manufacturing computers. Integrated Circuit is a complete circuit packed with hundreds of transistors and other electronic components on a small silicon chip. The size of the computers still got reduced with improved reliability and speed when compared to the previous generation of computers. The usage of RAM (Random Access Memory) and magnetic disks as the storage media became widespread.

FOURTH GENERATION (1971 - Now)

Due to the technological development, the Large Scale Integrated (LSI) and Very Large Scale Integrated (VLSI) circuits were developed which contained thousands to millions of transistors on a tiny chip. In 1971, Intel developed the microprocessor, which contained the entire CPU (the Control Unit, Memory Unit, and ALU) on a single chip, leading to the process of miniaturization – the development of smaller and smaller computers. As a result, the computers main memory capacity increased, the cost got decreased and speed also increased, which directly affected the types and usefulness of software that could be used.

Software applications like Word Processing, Electronic Spreadsheets, Database Management Programs, Painting, and Drawing programs, and so forth became commercially available giving more people reasons to use a computer.

FIFTH GENERATION

The fifth-generation computers are under development. These computers function with the Artificial Intelligence provided to it. Due to artificial intelligence, the computer will have the ability to learn by itself, can reason and make a decision with the knowledge it possesses.

1.5.2. Classification of Computers

Computers have come a long way since the first operational computer in the 1940s. Divisions among the types are increasing as technology improves. Let us classify the computers into two major categories as given below

- I. Based on the application of computers
- II. Based on the capacity and size of the microprocessor

I. Classification - Application wise

Based on the application of computers for various purpose, computers can be classified into three types

- (a) Analog computers
- (b) Digital computers
- (c) Hybrid computers

a) Analog Computers

Computers that use analog signals for calculating and transmitting data are called Analog computers. It can be defined as “A device that operates on data in the form of continuously varying physical quantities”. The values of the analog signals are continuously changing with states in between high and low. Analog data is calculated using the concept of “measuring values” like magnitude in terms of voltage, length, current. The analog data is transmitted in a continuous form that closely resembles the information it represents. Electrical signals on a telephone line are nothing but analog data representing the original voice. SLIDE RULER is an example of analog computers.

b) Digital Computers

The computers that use digital signals to calculate and transmit data are called Digital Computers. The word digital is derived from the word “digit”. The word digit simply means numeral. The digital signal has only two states in which it can be represented. They are ON and OFF or HIGH and LOW or 1 and 0. Digital data is calculated using the concept of “counting values”. The result obtained from the digital computer is more accurate when compared to analog computers. These computers manipulate digital data and perform arithmetic and logical operations. To facilitate the performance of digital computers intermediate languages such as BASIC, COBOL, FORTRAN, PASCAL, C, C++, JAVA, etc., have been developed.

Digital Computers are classified as :

- **General-purpose computers**

- A general-purpose computer is one that has the ability to store different programs of instructions
- Performs a variety of operations
- It is designed to do a wide variety of jobs rather than perform a specific activity.
- It is also called personal computers (PCs)

- **Special purpose computers**

- Designed to perform one specific task
- Instructions are built into, or permanently stored in the machine
- Specialization results in the given task are performed very quickly and efficiently
- It is inflexible and cannot be easily used to perform other operations.
- Nowadays, for example, new cars have such devices installed to monitor and control fuel, ignition and other systems.

c) Hybrid Computers

Computer systems that use both analog and digital mechanisms are called Hybrid Computers. Desirable features of analog and digital computers are combined to develop a hybrid computer. In a hospital, the intensive care unit, an analog device measures a patient's heart function, temperature, and other vital signs, these measurements are then converted into numbers and supplied to a digital component that monitors the patient's vital signs and signals to a nurse's station.

II. Classification - Capacity and size of Microprocessor

Computers are also classified into different types mainly based on processing and storage capacity. A Computer that is capable and used for general-purpose business applications like billing, accounting, maintaining stock information,..... cannot be used for very advanced applications like forecasting and analysis of weather phenomena, oil exploration, aircraft design, etc. And those computers used for the latter purpose mentioned above are not necessary to be used for the former purpose, for the reason, they are highly advanced and very expensive. Hence, computers can be classified as given below

- (a) Microcomputers
- (b) Minicomputers
- (c) Mainframe computers
- (d) Supercomputers

a) Microcomputers - are the smallest category of computers and also called Personal Computers (PCs). These computers that can either fit next to a desk (called the Desktop) or can be carried around (called the Laptop and Notebook). Microcomputers use a microprocessor as its important device. A microprocessor is a chip used to perform arithmetic and logical operations. These computers can be used either as a stand-alone machine or connected to a network. Microcomputers are used for general-purpose business applications such as invoicing, accounting, etc.

b) Minicomputers are bigger in size, faster in speed, have more memory capacity and expensive when compared to microcomputers. Minicomputers can be used for general purpose applications and as a server for small networks. These computers are a relatively small but

expensive computer with somewhat limited input and output capabilities. Minicomputers use large hard-disk units as online secondary storage.

c) Mainframe computers are more powerful in processing, faster in speed, have large memory, and very expensive when compared to micro and minicomputers. The word mainframe refers to mean the “Central Processor”. Their size varies depending on how many concurrent users they are serving – from a few hundreds to thousands when used in networks and has the capacity to support many powerful peripheral devices. Mainframe computers are used by multinational companies or by companies that have many branches all over the country like banks, airlines, insurance, etc.

d) Supercomputers are the largest, fastest, most expensive and very powerful computers available when compared to the types of computers discussed earlier. They occupy specially designed air-conditioned rooms and are often used for research and to process complex scientific applications like weather forecasting, oil exploration, aircraft design, mathematical research, etc. Unlike microcomputers, which generally have only one CPU, supercomputers have hundreds of processors

Characteristics of a computer

- Automatic
- Reprogrammable
- Data Processor
- Speedy

- Accurate
- Diligent
- Versatile
- Power of remembrance
- No IQ
- No feelings

Automat

- It carries out instructions with minimum human intervention

Reprogrammable

- It stores instructions in the form of programs, which can be changed to perform other tasks.

Data Processor

- It carries out operations on data to produce information.

Speedy

- It can perform its operations at very high speed usually measured in milliseconds, microseconds, nanoseconds, and picoseconds.

Accurate

- Its accuracy is high and its degree of accuracy depends on its design.
- Computer errors caused by incorrect input or unreliable programs are often referred to as Garbage-In-Garbage-out (GIGO).

Diligent

- It is free from tiredness.
- It can continuously work for hours without creating any error.

Versatile

- It is capable of performing almost any task, if the task can be reduced to a finite series of logical steps.

Power of remembrance

- It can store and recall any amount of information whenever desired.

No IQ

- It does only what it is programmed to do.
- It cannot take its own decision in any regard without programming.

No feelings

- Computers have no emotions.
- Their judgment is based on the instructions given to them in the form of programs that are written by human beings.

Data Vs Information

Data

Data is unprocessed fact and figure. Plain collected data, as raw facts cannot help in decision-making. However, data is the raw material that is organized, structured, and interpreted to create useful information systems.

Data is defined as 'groups of nonrandom symbols in the form of text, images, and voice representing quantities, action, and objects'.

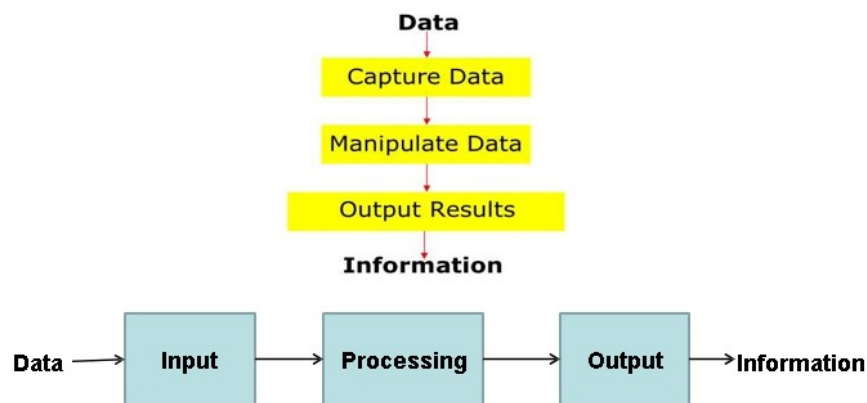
- Data is raw material used as input.
- Anything in raw form not like necessarily meaningful numbers, words and facts are known as data.

Information

Information is interpreted data; created from organized, structured, and processed data in a particular context.

- Information is processed data obtained as output after data processing.
- Information is a data that has been manipulated and organized in such a form that it can help people in taking necessary

Electronic Data Processing



decisions.

Information, Knowledge & Business Intelligence

Professor Ray R. Larson of the School of Information at the University of California, Berkeley provides an *Information Hierarchy*, which is:

- Data - The raw material of information
- Information - Data organized and presented by someone
- Knowledge - Information read, heard, or seen, and understood
- Wisdom - Distilled and integrated knowledge and understanding