

Unit-1 Introduction to Computer System

Information Technology (IT):-

Information technology is the use of any computers, storage, networking and other physical devices, infrastructure and processes to create, process, store, secure and exchange all forms of electronic data.

Some terms:-

⊗ Algorithm → Step by step way of problem solving description.

⊗ Flowchart → Graphical representation of algorithm.

⊗ What is information?

Ans. If Information is any knowledge that comes to our attention which could be voice, image, text or video.

⊗ What is data?

Ans. Data is the information when dealing with the machine.

1.1 Characteristics or Features of Computer:-

➤ Speed, Size and Cost:-

A computer can process data very fast, Some calculations that would have taken hours and days to complete can be completed in few seconds using the computer. The size of computer is portable

retrived → get or bring something from somewhere at right place and right time.

therefore we can easily take it from one place to another according to our need. Computer are cheaper in price and can be affordable by normal persons too.

ii) Accuracy and Reliability:-

Computers are accurate. They never make mistakes until the user provides right information. Computers are reliable because human brain could make mistake but computer does not.

iii) Diligence:-

Computers does not get tired even when they are used for a longer period of time. It can perform long and complex calculations with the same speed and accuracy from the start till the end.

iv) Storage Capability:-

Large volumes of data and information can be stored in computer and also retrived whenever required. So, computers have vast storage capability.

v) Versatility:-

Computer is versatile in nature. It can perform different types of tasks at a same time.

1.2 Advantages of computer

- i) Accurate and reliable than human beings.
- ii) Easier and faster than human beings.
- iii) Complicated problems can also be easily solved.
- iv) Computer is versatile in nature.
- v) Computers can be used in multiple fields.
- vi) Computers have high storage capability.

1.3 Disadvantages of computer:-

- i) Computers are expensive for ordinary people.
- ii) It is electronic machine so there may be danger of sock and physical damages.
- iii) It increases dependency on machine.
- iv) Computers increase piracy.
- v) It may cause leakage of data security.

14. Application areas of computer:-

- i) Banking
- ii) Commercial enterprises like keeping employee records, account payable etc.
- iii) Industries
- iv) Offices and Schools
- v) Health and medical field
- vi) Airports and Home.

1.5 History and Generation of Computers:-

The first developed computer was Abacus. The history of computers is divided into 3 eras:-

- i> Mechanical era
- ii> Electromechanical era
- iii> Electronic era.

The evolution of computer to the current state is defined in terms of the generations of computer. On the basis of their speed, size, components used, storage capacity, processing speed etc. computers are divided into 5 generations 1st Generation to 5th generation.

① First Generation (1940 to 1956): Using Vacuum Tubes

i> Hardware Technology:- The first generation of computers used vacuum tubes for circuitry. The input to the computer was through punched cards and paper tapes. The output was displayed as printouts.

ii> Software Technology:- The instructions were written in machine language. It used 0 and 1 for coding of instructions. It could solve 1 problem at a time.

iii> Computing Characteristics:- The computation time was in milliseconds.

iv) Physical Appearance:- These computers were enormous in size and required a large room for installation.

v) Application:- They were used for scientific applications as they were the fastest computing device of their time.

Examples:- UNIVAC, ENIAC, EDVAC etc.

Limitations.

- i) They required large number of vacuum tubes and thus generated a lot of heat.
- ii) They consumed huge amount of electricity and expensive to operate.
- iii) They required constant maintenance.
- iv) They were difficult to program since they used machine language.

(b) Second Generation (1956 to 1963): Using Transistors

i) Hardware Technology:- The second generation computers used transistors by replacing vacuum tubes of first generation computers. For circuitry. The input was still through punched cards and the output using printouts.

ii) Software Technology:- The instructions were written using assembly language. It used ADD for addition and SUB for subtraction for coding of instructions. It is easier to write instructions in assembly language as compared to machine language.

iii) Computing characteristics:- The computation time was in microseconds.

iv) Physical Appearance:- Transistors are smaller in size as compared to vacuum tubes, thus the size of computer was also reduced.

v) Application:- The cost of commercial production of these computers was very high, though less than the first generation computers. So, they were used in some places for commercial production.

Examples:- PDP-8, IBM 1401 and CDC 1604.

Limitations:-

i) They generated a lot of heat but much less than the first generation computers.

ii) They required maintenance but less than the first generation computers.

© Third Generation (1964 to 1971): Using Integrated Circuits

i) Hardware Technology:- The third generation computers used the Integrated Circuit (IC) chips for circuitry. Use of IC chip increased the speed and the efficiency of computer. The keyboard was used for input and monitor was used instead of printouts.

ii) Software Technology:- The keyboard and the monitor were interfaced through the operating system. High level language were used for programming instead of machine language and assembly language.

iii) Computing Characteristics:- The computation time was in nanoseconds.

iv) Physical Appearance:- The size of these computers was quite small compared to the second generation computers.

v) Application:- Computers became accessible to mass audience.

Example:- IBM 370, PDP 11.

Limitations:

- i) Air conditioning was required.
- ii) Highly sophisticated technology required for the manufacturing of IC chips.
- iii) Tactile sensitivity is decreased.

④ Fourth Generation (1971 to present): Using Microprocessors

i) Hardware Technology:- The fourth generation computers use microprocessors. They use the Large Scale Integration (LSI) and the Very large Scale Integration (VLSI) technology. This generation use keyboard and mouse as input and printer and monitor as output.

ii) Software Technology:- Several new operating systems like MS-DOS and MS-Windows developed during this time. This generation of computer supported Graphical User Interface (GUI). High level programming languages are used for writing of programs.

iii) Computing Characteristics:- The computation time is in picoseconds.

iv) Physical Appearance:- They are smaller than the computers of previous generations. Some can fit even into the palm of hand.

v) Application:- They became widely available for commercial purposes. Personal computers became available to the home user.

Examples:- Intel 4004, Macintosh etc.

Drawback/Limitation:-

→ They can not understand the natural language, robotics etc.

② Fifth Generation (Present and Next): Using Artificial Intelligence

The goal of fifth generation computers is to develop computers that are capable of learning and self-organization. They use Super large Scale Integrated (SLSI) chips. The fifth generation computers are based on Artificial Intelligence (AI). They try to simulate the human way of thinking and reasoning. It includes areas like Expert System (ES), Natural language processing (NLP), speech recognition, robotics etc.

1.6 Classification of computer (On the basis of size).

① Mainframe Computers:- They operate Mainframe computers are computers used primarily by large organizations for critical applications such as census, industry etc. Mainframe computers are large and powerful systems generally used in ~~centralized databases~~ centralized databases.

Dumb terminal → A dumb terminal is an output device that accepts data from the CPU but can not store data of its own.

Intelligent terminal → A terminal that contains processing power that include memory and ~~processor~~ processor to perform special display operations is called intelligent terminal.

Examples: CDC 6600 and IBM E5000 series.

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(B) Mini computer:- Mini computers are digital computers. They have high processing speed and high storage capacity than the micro computers. These computers can support 4-200 users simultaneously. They are used for real-time applications in industries, research centres etc.
Examples - PDP 11, IBM (8000 series).

(C) Micro computers:- Micro computers are small, low-cost and single-user digital computer. They consist of CPU, input unit, output unit, storage unit and the software.

Examples - IBM PC and Apple Macintosh.

Categories

- i) Desktop Computer or Personal Computer (PC).
- ii) Laptop
- iii) Netbook
- iv) Tablet computer.
- v) Personal Digital Assistant (PDA)
- vi) Smart Phones.

(D) Super computers:- A super computer is a computer that performs at or near the currently highest operational rate for computers. The speed of super computers is measured in FLOPS (Floating point Operations per Second). Super computers are used in weather forecasting, climate research, aircraft design etc.

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PARAM is a series of super computer assembled in India.

Examples:- IBM Roadrunner, IBM Blue gene and Intel ASCI red.

⊗ Define analog computer & Give example.

Ans: The computer that uses continuously changable aspects of physical phenomena such as electrical, mechanical etc. is called ~~at~~ analog computer.

Examples. Planimeter, nomogram etc.

⊗ Define digital computer with example.

Ans: The computer that is used to process information with quantities using digits, usually the binary number system is called digital computer.

Examples. IBM PC, Apple Macintosh etc.

1.7 The computer system

Computer → A computer is an electronic device that accepts data as input, processes the input data by performing mathematical and logical operations on it and gives desired output.

Program → A computer program is a collection of instructions that performs a specific task when executed by a computer.

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Software → Software is a set of instructions that tell the computer about the tasks performed and how these tasks are performed.

Hardware → The collection of physical parts of a computer system ~~like~~ such as keyboard, mouse, hard disk etc. is called hardware.

Data → Data are raw facts processed or stored by a computer.

ALU → The part of computer that performs all arithmetic computations, such as addition, multiplication etc. is called ALU. ALU stands for Arithmetic Logic Unit.

CU → The ~~part of~~ component of CPU that directs the operation of the processor is called CU. CU stands for Control Unit.

CPU → The processing unit of computer is called CPU. CPU stands for Central Processing Unit.

MU → The part of computer system that stores data and information is called MU. MU stands for Memory Unit.

Working of computer.

- i) Input:- The computer accepts input data from the user via an input device like keyboard. The input data can be characters, word, text, sound, images, document etc.
- ii) Process:- The computer processes the input data. For this, it performs some actions on the data by using the instructions or program given by the user of the data. During processing the data, instructions and output are stored temporarily in the computer's main memory.
- iii) Storage:- The input data, instructions and output are stored permanently in the secondary storage devices like disk or tape. The stored data can be retrieved later, whenever needed.
- iv) Output:- The output is the result generated after the processing of data. The output may be in the form of text, sound, image, document etc. The computer may display output on monitor and can send output to the printer for printing.

Components of Computer Hardware

The computer system hardware comprises of three main components they are described below:-

i) Input/Output unit:-

The user interacts with the computer via the I/O unit. The input unit accepts the data from user and the output unit provides the processed data i.e. the information to the user. The input is provided to the computer using input devices like keyboard, mouse etc.

ii) Central Processing Unit (CPU):- The processing unit of computer that controls, coordinates and supervises the operations is called CPU.

CPU consist of Arithmetic Logic Unit (ALU) and Control Unit (CU). ALU performs all the arithmetic and logic operations on the input data and CU controls the overall operations of the computer.

iii) Memory Unit:- The part of computer system that stores data and information is called memory unit. There are two types of memory in memory unit primary and secondary. The input data is stored in primary memory before processing. The data, programs and the output are stored permanently in the memory unit of computer.

APPLICATION OF COMPUTERS

- i) Education → Computers are widely used nowadays for imparting education. Educators use computers to prepare notes and presentations of their lectures. Computers are used to provide distance education using the e-learning software, and to conduct online examinations.
- ii) Entertainment → Computers have had a major impact on the entertainment. The user can download and view movies, play games, chat, book tickets etc. The users can also listen to music, download and share music etc.
- iii) Sports → A computer can be used to watch a game, view the scores, improve the game, play games, and create games. They are also used for the purposes of training players.
- iv) Advertising → Computer is a powerful advertising media. Advertisement can be displayed on different websites, electronic-mails can be sent and reviews of a product by different customers can be posted.

Besides these computers are used in home, medicine and medical field, science and engineering, banks, airports etc.

History of Computer :-

Until the development of the computers based on vacuum tubes, there had been several developments in the computing technology. The history of such developments is as follows:-

i) Calculating machines :- A calculating machine is a device used to perform automatically the basic operations of arithmetic.

ABACUS was the first mechanical calculating device for counting of large numbers.

ii) Napier's Bones :- Napier's Bones was a mechanical device built for the purpose of multiplication in 1617 AD by an English mathematician John Napier.

iii) Slide Rule :- It was developed by an English mathematician Edmund Gunter in the 16th century. Using the slide rule one could perform operations like addition, subtraction, multiplication and division. It was used extensively till late 1970s.

iv) Pascal's Adding and Subtraction Machine :- It was developed by Blaise Pascal. It could add and subtract. The machine consisted of wheels, gears and cylinders.

v) Leibniz's Multiplication and Dividing Machine:-

It was mechanical device that could both multiply and divide. The German philosopher and mathematician Gottfried Leibniz built it at around 1673.

vi) Punch card system:- It was developed by Jacquard to control the power loom in 1801. It could recognize the presence of hole in the punched card as binary one and absence of the hole as binary zero. The 0's and 1's are the basis of the modern digital computer.