

Computer science

[Technology](#), [Computer](#)



Today, computer technology has spread to every sphere of existence of modern man, from railway reservation to medical diagnosis, from TV programmer to satellite launching: from match-making to criminal catching everywhere we witness the elegance, sophistication and efficiency possible only with help of computers. Definitions: A computer is an electronic machine that accepts data from the user, processes the data by performing calculations and operations on it, and generates the desired output results. Computer performs both simple and complex operations, with speed and accuracy.

The computer is an electronic device which converts raw data into valid (or) meaningful information. Computer is a fast operating electronic device which automatically accepts and stores input data, processes them and produces results under the direction of a detailed step by step program. Basic operations of computer: The computer has the following five basic operations to carry out any task. I) Input: It is the process of capturing or acquiring the information, or it is the raw data or information. By using this we can do any process.

II) Process: It is the transformation process to convert the Input In to output.

III) Output: It is the result, which comes from the transformation process or It is the outcome of the process. ; v) Storing: It is the process of saving the

data or Information or Instructions, so that they can be retained and

retrieved whenever required. V) Controlling: It is the process of directing the manner and sequence in which all the operations are to be performed.

Characteristics of computers: The characteristics of computers are listed below: 1.

Speed: Speed is the most important characteristics of a computer. The computer can calculations that would have taken hours and days to complete otherwise, can be completed in a few seconds using the computer. For example, calculation and generation of salary slips of thousands of employees of an organization, weather forecasting that requires analysis of a large amount of data related to temperature, erasure and humidity of various places, etc. The following are the measurements by which the speed of a computer is measured. Mill second $\times 10^{-3}$ second 1 micro second $\times 10^{-6}$ second 1 nana second $\times 10^{-9}$ second 1 Pico second $\times 10^{-12}$ second We do not measure speed in seconds or in Mill seconds today, we measure speed in nana second and Pico second.

2. Accuracy: Computer provides a high degree of accuracy. The computers are perfect, accurate and precise. It never makes any mistake. Accuracy signifies the reliability of the hardware components of a computer. For example, the computer can accurately give the result of division of any two numbers up to 10 decimal places. .

Automatic: The computer works automatically, once programs are stored and data given to it. Constant supervision not required. Individual instructions are transferred one after another automatically for execution. Once the program is in the computer memory, the individual instructions are then transferred one after other to the control unit for execution. The CPU follows these instructions until it meets the last instructions.

Diligence (Endurance): When used for a longer period of time, the computer does not get tired or fatigued.

It can perform long and complex calculations with the same speed and accuracy from the start till the end.

5. Storage capability: Large volumes of

data and information can be stored in the computer and also retrieved whenever required. A limited amount of data can be stored, temporarily, in the primary memory. Secondary storage devices like hard disk, floppy disk, magnetic tapes and compact disk can store a large amount of data permanently. 6. Versatility: Computer is versatile in nature. It can perform different types of tasks with the same ease.

At one moment you can use the computer to prepare a letter document and in the next moment you may play music or print a document. The computer can be put to various jobs and has applications in various fields. Computers have been playing key role in fields such as Space Exploration, Weather Banking etc. GENERATION OF COMPUTER The generation of computers in terms of: The technology used by them (hardware and software), Computing characteristics (speed, i.e., number of instructions executed per second), Physical appearance, and Their applications. Currently there are five generations of computer.

They are 1) First Generation (1940 to 1956): Using Vacuum Tubes) Second Generation (1956 to 1963): Using Transistors 3) Third Generation (1964 to 1971): Using Integrated Circuits 4) Fourth Generation (1971 to Present): Using Microprocessors 5) Fifth Generation (Present and Next): Using Artificial Intelligence First Generation (1940 to 1956): Using Vacuum Tubes I) Hardware Technology: The first generation of computers used vacuum tubes for circuitry and magnetic drums for memory. The input to the computer was through punched cards and paper tapes.

The output was displayed as printouts. It) Software Technology: The instructions were written in machine language. Machine language uses So and Is for coding of the instructions. The first generation computers could solve one problem at a time. lii) 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 devices of their time. I) Examples: 0 UNIVAC = UNIVersal Automatic Computer 0 MANIAC = Electronic Numerical Integrator And Calculator ADVANCE = Electronic Discrete Variable Automatic Computer Second Generation (1956 to 1963): Using Transistors Transistors replaced the vacuum tubes of the first generation of computers. Transistors allowed computers to become smaller, faster, cheaper, energy efficient and reliable. The second generation computers used magnetic core technology for primary memory. They used magnetic tapes and magnetic disks for secondary storage. The input was still through punched cards and the output using printouts.

They used the concept of a stored program, where instructions were stored in the memory of computer. It) Software Technology: mnemonics like ADD for addition and SUB for subtraction for coding of the instructions. It is easier to write instructions in assembly language. High-level programming languages, such as early versions of COBOL and FORTRAN were also developed during this period. lii) Computing Characteristics: The computation time was in microseconds. 'v) Physical Appearance: Transistors are smaller in size compared to vacuum tubes, thus, the size of the

computer was also reduced.) Application: The cost of commercial production of these computers was very high, through less than the first generation computers. The transistors had to be assembled manually in second generation computers. Vi) Examples: PDP-8 IBM 1401 CDC 1604 Third Generation (1964 to 1971): Using Integrated Circuits The third generation computers used the Integrated Circuits(LLC) chips. In an ICC chip, multiple transistors are placed on a silicon chip. Silicon is a type of semiconductor. The use of ICC chip increased the speed and the efficiency of computer, manifold.

The keyboard and monitor were used to interact with the third generation computer, instead of the punched card and printouts. It) Software Technology: The keyboard and monitor were interfaced through the operating system. Operating system allowed different applications to run at the same time. High-level languages were used extensively for programming, instead of machine language and assembly language. Iii) Computing Characteristics: The computation time was in nanoseconds. The size of these computers was quite small compared to the second generation computers. V) Application: Computers became accessible to mass audience.

Computers were produced commercially, and were smaller and cheaper than their predecessors. IBM 370 PDP 11 They use the Large Scale Integration (LSI) and the Very Large Scale Integration (AVAILS) technology. Thousands of transistors are integrated on a small silicon chip sing LSI technology. AVAILS allows hundreds of thousands of components to be integrated in a small chip. This era is marked by the development of microprocessor.

Microprocessor is a chip containing millions of transistors and components, and, designed using LSI and AVAILS technology. This generation of computer gave rise to personal computer (PC).

Semiconductor memory replaced the earlier magnetic core memory, resulting in fast random access to memory. Secondary storage device like magnetic disks became smaller in physical size and larger in capacity. The linking of computers is another key development of this era. The computers were linked to form networks that led to the emergence of the internet. This generation also saw the development of pointing devices like mouse, and handheld devices. It) Software Technology: Several new operating systems like the MS-DOS and MS-Windows developed during this time.

This generation of computers supported Graphical User Interface (GU'). GUI is a user friendly interface that allows user to interact with the computer via menus and icons. High-level programming languages are used for the writing of programs. lii) Computing Characteristics: The computation time is in picoseconds. V) Physical Appearance: They are smaller than the computers of the previous generation. Some can even fit into the palm of the hand. V) Application: They became widely available for commercial purposes.

Personal computers became available to the home user. ') Examples: The Intel 4004 chip was the first microprocessor. The components of the computer like Central Processing Unit (CPU) and memory were located on a single chip. In 1981, IBM introduced the first computer for home use. In 1984, Apple introduced the Macintosh. Fifth Generation (Present and Next): Using Artificial Intelligence The goal of fifth enervation computing is to

develop computers that are capable of learning and self- organization. The fifth generation computer uses Super Large Scale Integrated (SILLS) chips that are able to store millions of components on a single chip.

These computers have large memory requirements. This generation of computers uses parallel processing that allows several instructions to be executed in parallel, instead of serial execution. Parallel processing results in faster processing speed. The Intel dual-core microprocessor uses parallel processing. The fifth generation computers are based on Artificial Intelligence (AI). They try to simulate the human way of thinking and reasoning. AI includes areas like Expert System (ES), Natural Language Processing (NLP), speech recognition, voice recognition, robotics, etc.

The digital computers that are available nowadays vary in their sizes and types. The computers are broadly classified into four categories based on their size and type: Microcomputers, Minicomputers, Mainframe computers, Supercomputer. Fast Expensive Complex Large Supercomputers, Mainframe Computers, Slow Cheap Simple Small. Figure: Classification of computers based on size and type) Microcomputers: Microcomputers are small, low-cost and single-user digital computer. They consist of CPU, input unit, output unit, storage unit and the software.

Although microcomputers are standalone machines, they can be connected together to create a network of computers that can serve more than one user. IBM PC based on Pentium microprocessor and Apple Macintosh are some examples of microcomputers. Microcomputers include 1 . Desktop Computer or personal Computer 2. Notebook Computers or Laptop 3. Net

book 4. Tablet Computer 5. Handheld Computer or Personal Digital Assistant (PDA) 6. Smart Phones 1 . Desktop Computer or personal Computer (PC): is the most common type of microcomputer. It is a stand-alone machine that can be placed on the desk.

Externally, it consists of three units - keyboard, monitor, and a system unit containing needs of a single user at home, small business units, and organizations. Apple, Microsoft, HP, Dell and Leno are some of the PC manufacturers. 2. Notebook Computers or Laptop: resemble a notebook. They are portable and have all the features of a desktop computer. The advantage of the laptop is that it is small in size, can be carried anywhere, has a battery backup and has all the functionality of he desktop. Laptops can be placed on the lap while working (hence the name). Laptops are costlier than the desktop machines. . Net book: These are smaller notebooks optimized for low weight and low cost, and are designed for accessing web-based applications. Starting with the earliest notebook in late 2007, they have gained significant popularity now. Notebooks deliver the performance needed to enjoy popular activities like streaming videos or music, emailing, web surfing or instant messaging. The word notebook was created as a blend of Internet and notebook. 4. Tablet Computer: has a feature of the notebook computer but it can accept input room a stylus or a pen instead of the keyboard or mouse. It is a portable computer.

Tablet computer are the new kind of PC's. 5. Handheld Computer or Personal Digital Assistant (PDA): is a small computer that can be held on the top of the palm. It is small in size. Instead of the keyboard, PDA uses a pen or a

stylus for input. Pads do not have a disk drive. They have a limited memory and are less powerful. Pads can be connected to the Internet via a wireless connection. Cassia and Apple are some of the manufacturers of PDA. Over the last few years, Pads have merged into mobile phones to create smart phones. . Smart Phones: are cellular phones that function both as a phone and as a small PC.

They may use a stylus or a pen, or may have a small keyboard. They can be connected to the Internet wirelessly. They are used to access the electronic-mail, download music, play games, etc. Blackberry, Apple, ETC, Monika and LOG are some of the manufacturers of smart phones. It) Minicomputers: Minicomputers are digital computers, generally used in multi-user systems. They have high processing speed and high storage capacity than the microcomputers. Minicomputer can support 4-200 users simultaneously. The user can access the minicomputer through their PC's or terminal.

They are used for real-time applications in industries, research centers, etc. PDP 11, IBM (8000 series) are some of the widely used minicomputers. Iii)

Mainframe computers: Mainframe computers are multi-user, multi-programming and high performance computers. They operate at a very high speed, have very large storage capacity and can handle the workload of many users. Mainframe computers are large and powerful systems generally used in centralized databases. The user accesses the terminal or a PC. A dumb terminal cannot store data or do processing of its own.

It has the input and output device only. An intelligent terminal has the input and output device, can do processing, but, cannot store data of its own. The

dumb and the intelligent terminal use the processing power and the storage facility of the mainframe computer. Mainframe computers are used in organizations like banks or companies, where many people require frequent access to the same data. Some examples of mainframes are CDC 6600 and IBM SHOES series. 'v) Supercomputer: Supercomputers are the fastest and the most expensive machines. They have high processing speed compared to other computers.

The most commonly used input devices are Keyboard - Standard keyboard includes Alphanumeric keys includes number keys and alphabet key
Function keys Perform specific tasks such as searching a file, help
Modifier keys such as shift and control keys modifies the casing style of a character
Cursor movement keys Include up, down, left, right keys - used to modify the direction of the cursor on the screen
Spacer shifts the cursor right by one position
Numeric key uses separate keypads for numbers and mathematical operators
Escape Key and some special keys such as Page Up, Page Down, Home, End, Insert, Delete
Mouse

Allows user to select elements on the screen such as tools, icons, buttons by pointing and clicking them Also known as pointing device - used to change the position of the cursor or pointer on the screen
Consists of two buttons and wheel at the top
o Left button - to select an element
o Right button - when clicking displays the special options such shortcut menus
o Wheel - to scroll down in a document or a web page
Scanner Converts the documents and images as the digitized images understandable by the computer system
The digitized images can be produced as black and white images,