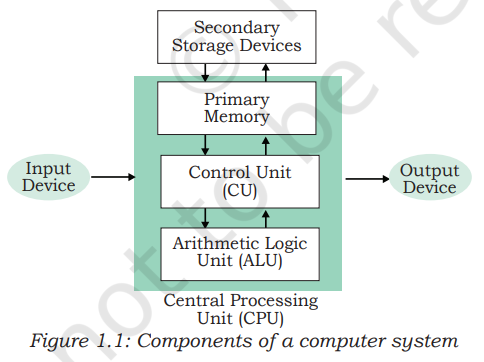
* **Computer**



* A computer is
* An electronic device
* that can be programmed to accept data (input),
* process it and generate result (output).
* And store the information for future use
* **Computer System**
* A computer along with additional hardware and software together
* Computer system **=** computer **+** additional hardware **+** additional software
* A computer system primarily comprises
* a central processing unit (CPU),
* memory,
* input/output devices and
* storage devices.
* All these components function together as a single unit
* to deliver the desired output.
* **CPU - Central Processing Unit**
* Known as
  + Brain of the computer
  + Processor
  + Micro-processor
* electronic circuitry of a computer
  + that carries out the actual processing
* Receives instructions & data through programs
  + Then the CPU fetches the program and data from the memory
  + performs arithmetic and logic operations as per the given instructions
  + and stores the result back to memory
* **IC - Integrated Circuits**
* a CPU can be placed on one or more microchips called integrated circuits (IC).
* The ICs comprise semiconductor materials.
* **Register**
* At the time of processing
  + the CPU stores the data & instructions
    - in its local memory
    - called registers.
* Are part of the CPU
* are limited in size and number.
* Different Registers are
  + Used for storing data & instructions or immediate results
* **Main component of CPU**
* A CPU has 3 main component
  + Registers
  + ALU ( Arithmetic Logic Unit )
  + CU ( Control Unit )
* **ALU - Arithmetic Logic Unit**
* A CPU has 3 main component
* performs all the arithmetic and logic operations
  + that need to be done as per the instruction in a program.
* **Registers**
* Most Modern ALUs have a small amount of special storage units
  + called registers
  + That can be accessed faster than main memory.
* **CU - Control Unit**
* Organizes the computer to work as single unit.
* Generates control signals for various devices
* Controls
  + sequential instruction execution,
  + interprets instructions and
  + guides data flow through
    - the computer’s memory,
    - ALU and
    - input or output devices.
* **Input Devices**
* which control signals are sent to a computer
* convert the input data into a digital form
  + that is acceptable by the computer system
* **Ram - Main Memory**
* Data entered through input device
  + is temporarily stored in the main memory of the computer system.
* **secondary memory**
* For permanent storage and future use,
  + the data as well as instructions are stored permanently
    - in additional storage locations
    - called secondary memory
* **Some examples of input devices**
  + keyboard,
  + braille keyboards
  + Scanner
  + OCR
  + Microphone
  + Web cam
  + Graphics tablets
  + Barcode reader
  + Game pad
  + Voice search
  + mouse,
  + OMR
  + MICR
  + joystick
  + touch screen,
* **Braille Keyboards**
* Used to help the visually impaired people
  + For entering data into a computer.
* **Voice Search**
* To search the web
  + Where we can input the search string through our voice
* **Keyboard**
* Send data into the computer
  + depends on the key pressed by user
* **Mouse**
* Controls a cursor in a graphical user Interface
* Can move and select text , files , folders , etc on our computer
  + According to the user input
* **Scanner**
* Optically reads document , file or image
  + And then change it into digital signal
  + And sends to the computer
* **OCR - Optical Character Recognition**
* Reads printed text and send to computer
* **OMR - Optical Mark Recognition / Reader**
* Reads mark on a document
  + And send to computer
* **MICR - Magnetic Ink Character Reader**
* Generally finds application in banks to process cheques
* **Microphone**
* Receives audio generated by some input source
  + And send to computer
* **Web Cam**
* Sends the capture image to a computer.
* **Graphics Tablets**
* Used to draw using hand
* **Track balls**
* An upside down mouse
  + Encased within a socket
* Cursor control device
* Barcode Reader
* Used to read the barcode of various items
  + And sends to the computer
* **Gamepad or Joypad**
* Input controller for video games
* **Joystick**
* Used to control video games
* **Output Devices**
* receives data from a computer system
  + for display, physical production, etc.
* converts digital information into human understandable form
* **Some examples of Output devices**
  + Printer
  + Monitor
  + Braille Display Monitor
  + Speakers
  + Projector
  + USB drive
  + Facsimile
  + Modems
  + CD raw drives
  + Touch Screens
  + Headsets
* **Braille Display Monitor**
* useful for a visually challenged person
  + to understand the textual output
    - generated by computers
* **Printer**
* used to get output in physical (hardcopy) form.
* Three types of commonly used printers are
  + inkjet,
  + laserjet and
  + dot matrix.
* **3D-printer**
* which is used to build physical replica of a digital 3D design.
* used in manufacturing industries to create prototypes of products.
* used in the medical field, particularly for developing body organs
* **Monitor**
* Is responsible for receiving data from a computer
  + and displaying that information as text or images for users
* **Speakers**
* Receives sound signal from a computer
  + and then plays that sound signals
  + and thus we hear audio.
* **Projector**
* Gets data from a computer
  + and display or projects the same information onto a screen or wall .
* Cannot directly accept a data from a user
  + and send that data to another device.
* **Evolution Of Computer**
* **Abacus - 500 BC**
* Computing is attributed
  + to the invention of ABACUS
  + almost 3000 years ago.
* It was a mechanical device
  + capable of doing simple arithmetic calculations only
* **Pascaline - 1642**
* Blaize Pascal
  + invented a mechanical calculator
  + known as Pascal calculator or Pascaline
  + to do addition and subtraction of two numbers directly
  + and multiplication and division through repeated addition and subtraction.
* Pascaline (mechanical calculator) = Blaize Pascal = in 1642 = airthmetic calculations
* **Analytic Engine - 1834**
* Charles Babbage
  + invented analytical engine,
  + a mechanical computing device for
    - inputting,
    - processing,
    - storing and
    - displaying the output,
  + which is considered to form the basis of modern computers.
* analytical engine (mechanical computing device) = Charles Babbage = in 1834= inputting , processing , storing and displaying the output = form the basis of modern computers
* **Tabulating Machine - 1890**
* Herman Hollerith designed a tabulating machine
  + for summarising the data stored on the punched card.
* It is consider to be the first step towards programming.
* tabulating machine (programmable machine) = Herman Hollerith = in 1890 = the data stored on the punched card = first step towards programming
* **Turing Machine - 1937**
* The Turing machine concept was a
  + general purpose programmable machine
  + that was capable of solving any problem
    - by executing the program
    - stored on the punched cards.
* Turing machine = 1937 = general purpose programmable machine (tabulating machine) = capable of solving any problem = by executing the program = stored on the punched cards
* **EDVAC/ENIAC - 1945**
* John Von Neumann introduced
  + the concept of stored program computer
  + which was capable of storing data & program in the memory.
* The EDVAC and then the ENIAC computers
  + were developed based on this concept.
* concept of stored program computer = John Von Neumann = in 1945 = capable of storing data & program in memory = developed based on this concept -> EDVAC -> then ENIAC
* **Von Neumann architecture**
* It consists of a
  + Central Processing Unit (CPU)
    - for processing arithmetic and logical instructions,
  + a memory
    - to store data and programs,
  + input and output devices and
  + communication channels
    - to send or receive the output data.
* Electronic Numerical Integrator and Computer (ENIAC) is the
  + first binary programmable computer based on Von Neumann architecture.
* **Von Neumann architecture** = consist CPU (for airthmetic & logical ops..) , memory (to store data) , I/O device, communication channels (to send or receive the output data) .
* **ENIAC** = Electronic Numerical Integrator and Computer = first binary programmable computer = based on Von Neumann architecture
* **Transistor - 1947**
* Vacuum tubes were
  + replaced by transistors
  + developed at Bell Labs,
  + using semiconductor materials.
* Vacuum tubes = replaced by transistors = in 1947 = developed at Bell Labs = using semiconductor materials
* **IC - Integrated Circuit - 1970**
* An Integrated Circuit (IC)
  + is a silicon chip
  + which contains entire electronic circuit on a very small area.
* The size of computer drastically reduced because of ICs.
* Integrated Circuit (IC) = silicon chip = which contains entire electronic circuit on a very small area
* During the 1970s,
  + **Large Scale Integration (LSI)** of electronic circuits allowed
    - integration of complete CPU on a single chip,
    - called microprocessor.
* **Moore’s Law predicted**
  + exponential growth in the number of transistors
  + that could be assembled in a single microchip.
* **Very Large Scale Integration (VLSI)**
* In 1980s,
  + the processing power of computers
    - increased exponentially
    - by integrating around 3 million components
    - on a small-sized chip
    - termed as VLSI .
* **LSI** = Large Scale Integration = integration of complete CPU =on a single chip
* **Moore’s Law =** predicted = exponential growth in the number of transistors = assembled in a single microchip
* **VLSI** = Very Large Scale Integration = integrating around 3 million components =on a small-sized chip
* **SLSI =** Super Large Scale Integration = fabricate high density of transistors and other components (approx 106 components) = on a single IC
* **Super Large Scale Integration (SLSI)**
* fabricate high density of transistors and other components (approx 106 components)
  + on a single IC
  + called Super Large Scale Integration (SLSI)
* **first personal computer (PC).**
* IBM introduced
  + its first personal computer (PC)
  + for the home user
  + in 1981
* Apple introduced Macintosh machines in 1984.
* The popularity of the PC
  + surged by the introduction of Graphical User Interface (GUI)
    - based operating systems by Microsoft like windows and
  + others in place of GUI with only command line interface, like UNIX or DOS.
* **World Wide Web (WWW)**
* Around 1990s, the growth of World Wide Web (WWW)
  + further accelerated mass usage of computers and
  + thereafter computers have become an indispensable part of everyday life.
* **Short notes**
* **Pascaline** (mechanical calculator) = Blaize Pascal = in 1642 = airthmetic calculations
* **analytical engine** (mechanical computing device) = Charles Babbage = in 1834 = inputting , processing , storing and displaying the output = form the basis of modern computers
* **tabulating machine** (programmable machine) = Herman Hollerith = in 1890 = the data stored on the punched card = first step towards programming
* **concept of stored program computer** = John Von Neumann = in 1945 = capable of storing data & program in memory = developed based on this concept -> EDVAC -> then ENIAC
* **Von Neumann architecture** = consist CPU (for airthmetic & logical ops..) , memory (to store data) , I/O device, communication channels (to send or receive the output data) .
* **ENIAC** = Electronic Numerical Integrator and Computer = first binary programmable computer = based on Von Neumann architecture
* **Vacuum tubes** = replaced by transistors = in 1947 = developed at Bell Labs = using semiconductor materials
* **Integrated Circuit (IC)** = silicon chip = which contains entire electronic circuit on a very small area
* **LSI** = Large Scale Integration = integration of complete CPU =on a single chip
* **Moore’s Law =** predicted = exponential growth in the number of transistors = assembled in a single microchip
* **VLSI** = Very Large Scale Integration = integrating around 3 million components =on a small-sized chip
* **SLSI =** Super Large Scale Integration = fabricate high density of transistors and other components (approx 106 components) = on a single IC
* **first personal computer (PC)** = IBM -> in 1981 = Apple -> Macintosh machines -> in 1984
* **Computer Memory**
* Memory is used to store the data and instructions for processing in a computer system.
* Whenever we talk about the ‘memory’ of a computer system,
  + we usually talk about the “main or primary memory”.
* The secondary memory (also called storage device) is
  + used to store data, instructions and results permanently for future use.
* **Units Of Memory**
* 1KB = 1024Bytes 1PB = 1024TB 1MB = 1024KB 1EB = 1024PB
* 1GB = 1024MB 1ZB = 1024EB 1TB = 1024GB 1YB = 1024ZB
* KB=Kilobyte, PB=Petabyte, MB=Megabyte, EB=Exabyte,
* GB=Gigabyte, ZB=Zettabyte, TB= Terabyte , YB=Yottabyte
* **Types Of Memory**
* two types of memory —
  + primary and
  + secondary.
* **Primary Memory - RAM & ROM**
* essential component of a computer system
* Program and data are loaded
  + into the primary memory
  + before processing
* CPU interacts
  + directly with the primary memory
  + to perform read or write operation
* Two types of primary memory
  + (i) Random Access Memory (RAM)
  + (ii) Read Only Memory (ROM)
* **Random Access Memory (RAM)**
* Volatile
  + as long as the power is supplied to the computer,
    - it retains the data in it.
  + as soon as the power supply is turned off,
    - all the contents of RAM are wiped out
* Primary memory is an essential component of a computer system. Program and data are loaded into the primary memory before processing. The CPU interacts directly with the primary memory to perform read or write operation. It is of two types viz. (i) Random Access Memory (RAM) and (ii) Read Only Memory (ROM).
* RAM is volatile, i.e., as long as the power is supplied to the computer, it retains the data in it. But as soon as the power supply is turned off, all the contents of RAM are wiped out. It is used to store data temporarily while the computer is working. Whenever the computer is started or a software application is launched, the required program and data are loaded into RAM for processing. RAM is usually referred to as main memory and it is faster than the secondary memory or storage devices.
* On the other hand, ROM is non-volatile, which means its contents are not lost even when the power is turned off. It is used as a small but faster permanent storage for the contents which are rarely changed. For example, the startup program (boot loader) that loads the operating system into primary memory, is stored in ROM.
* **(B) Cache Memory**
* RAM is faster than secondary storage, but not as fast as a computer processor. So, because of RAM, a CPU may have to slow down. To speed up the operations of the CPU, a very high speed memory is placed between the CPU and the primary memory known as cache. It stores the copies of the data from frequently accessed primary memory locations, thus, reducing the average time required to access data from primary memory. When the CPU needs some data, it first examines the cache. In case the requirement is met, it is read from the cache, otherwise the primary memory is accessed.
* **(C) Secondary Memory - HDD, SSD, MicroSD**
* Primary memory has limited storage capacity and is either volatile (RAM) or read-only (ROM). Thus, a computer system needs auxiliary or secondary memory to permanently store the data or instructions for future use. The secondary memory is non-volatile and has larger storage capacity than primary memory. It is slower and cheaper than the main memory. But, it cannot be accessed directly by the CPU. Contents of secondary storage need to be first brought into the main memory for the CPU to access. Examples of secondary memory devices include Hard Disk Drive (HDD), CD/ DVD, Memory Card, etc., as shown in Figure 1.7. However, these days, there are secondary storage devices like SSD which support very fast data transfer speed as compared to earlier HDDs. Also, data transfer between computers have become easier and simple due to the availability of small-sized and portable flash or pen drives.