

UNIT-1

❖ OVERVIEW OF COMPUTER

Today computer systems are found everywhere in day-to-day life. Computers have become almost as common as televisions and play a major role. The term computer is derived from the word compute. Computer is an electronic device that takes data and instructions as input from user, processes data and provides useful information as output.

Characteristics of Computer:

1. **Speed:** The computer can process the calculations with at most speed than other.
2. **Storage Capacity:** The computer can provide large amount of space to store data, instructions, and software etc.
3. **Accuracy:** The computer can process the calculations with at most accuracy to provide effective results.
4. **Reliability:** The computers are reliable one why because, if any error occurs, those errors can be resolved to continue with execution.
5. **Versatility /Adaptability:** The computers can perform various tasks and can be used for different purposes.
6. **Diligence/Un-tiredness:** The computers can perform repetitive calculations any number of times with same level of accuracy.

Applications of Computer:

The unique capabilities and characteristics of a computer have made it very popular among its various users, including engineers,, managers, accountants, teachers, students and others. Some of key application areas of computer are Numeric Processing, Data Processing, Text Processing, Image Processing, Voice Recognition, Message Communication, E-learning

❖ ELECTRONIC COMPUTERS THEN AND NOW:

Computer is an electronic machine that can receive, store, transform and output data of all kinds (image, text, numeric, graphics and sound).

In the Past (during 1930 -1946) :

The electronic computers used vacuum tubes as their basic electronic component. These computers weighed around 30 tons and occupied 30 by 50 foot space. These Computers were expensive.

Example of such computer is ENIAC (Electronic Numeric Integrator and Calculator). These computers were used in mathematical computations, predicting weather and making atomic energy calculations.

At Present:

Advancement in technologies allowed designing and manufacturing of electronic computers with electronic components that can be packaged to the size of a postage stamp. In fact the entire circuitry of a computer processor can be packaged into a single electronic component called as microprocessor chip.

For example nowadays chips are embedded in pocket calculators, cameras, automobiles and much more. These computers weighed less and occupied less foot space. There was huge drop down of prices in computers compared to computers in the past. Example of such computer is laptops, palmtops, and desktops.

In another way

From ancient days to present time, the method of computing and computers has gone through several phases of technological developments. According to that, the computers can be

- (i) **Manual Computing Devices:** Before the invention of any computing device , the people involve manually in doing calculations. People carried out simple calculations on their fingers. Later they used stones, notches to perform calculations. At that time the devices invented for calculations are
- **Sand Table** (uses sand and stones for simple calculations)
 - **Abacus** (uses wooden frame, grooves with wires)
 - **Napier bones** (John Napier, Table like structure, multiplications and divisions)
 - **Punch card system**, etc.

(ii) **Automatic Computing Devices:** In this era, the people used different technology like vacuum tubes, transistors, and integrated circuits etc, and languages like machine, assembly and high level languages to

design and work with computers. All these devices occupy large space, require more power and dissipates large amount of heat. The different automated computing devices invented are

- **Difference Engine** (1812-22, Charles Babbage, Father of Computers, Working model)
- **Analytical Engine**(1823-33, Charles Babbage, Multiplication of 20 digit numbers -3m)
- **Electronic Computer** (1930, Dr. John Atanastoffy and Clifford Berry)
- **ENIAC**(Electronic Numerical Integrator And Calculator, uses vacuum tube technology)

(iii) Modern Computing Devices:

(a) **Based on Size and Performance:**

Personal Computers: These computers are used by single person at a time either in house or office and other places for performing simple computations and for preparing presentations.

Mainframes: These computers are used especially in places where large real-time processing is involved. Eg., banking networks, corporate reservation systems for motels, airlines etc.

Super Computers: These computers are the fastest mainframes that are used in research laboratories and for weather forecasting and much more.

(b) **Based on computing technology:**

High Performance Work Station Computers: These computers run faster and efficient

Touch Computing Devices: User gives input and data through touch sensitive elements (Examples: ATMs etc)

(c) **History / Generations of computing technology:**

The history of computers can be divided into generations, with each generation defined by a technological breakthrough

Generation 0 (1642-1940):

- **Technology** – Mechanical gears, hand-crank, dials and knobs (Gears and Relays)
- **Speed** – Very slowest computing devices
- **Programming Languages** – No specific languages, instead of that patterns used
- **Examples** – Analytical Engine, Difference Engine
- **Disadvantages** – Very Large, Bulky and noisy.

First Generation (1940-1956):

- **Technology** – Vacuum Tubes
- **Speed** – Slowest computing devices
- **Programming Languages** – Machine level language
- **Examples** – EDSAC ,EDVAC
- **Disadvantages** – Large, Bulky and difficult to program

Second Generation (1956-1963):

- **Technology** -- Transistor
- **Speed** – Faster than first generation
- **Programming Languages** – Assembly level language
- **Examples** – IBM-1401, IBM-1620
- **Disadvantages** – High cost and limited to special purpose tasks

Third Generation (1964-1975):

- **Technology** – Integrated circuits (ICs)
- **Speed** – Faster than second generation
- **Programming Languages** – High level languages
- **Examples** – IBM-360, HoneyWell-6000
- **Disadvantages** -- Limited storage capacity

Fourth Generation (1975-1989):

- **Technology** - VLSI (Very Large Scale Integration Circuits)
- **Speed** – Faster than third generation
- **Programming Languages** – High level languages
- **Examples** – IBM PC series , Apple Series
- **Disadvantages** – Difficult to manufacture

Fifth Generation (1989 – till date):

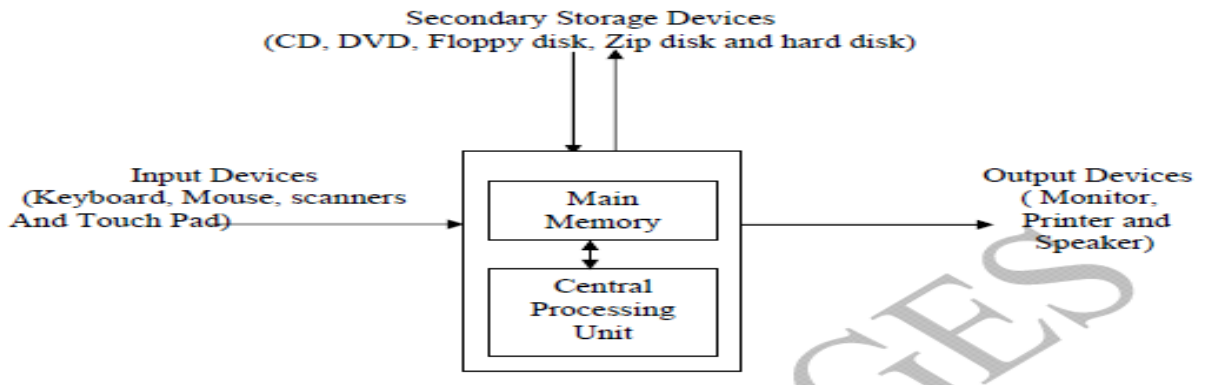
- **Technology** – ULSI (Ultra Large Scale Integrated Circuits)
- **Speed** – Fastest of all times
- **Programming Languages** – HLL , Integrated Development Environment (IDE)
- **Examples** – Laptop , PDA (Personal Digital assistance)
- **Disadvantages** – Lack of human like Intelligence

❖ COMPUTER HARDWARE:

The physical devices that a computer is made of are referred to as the computer's hardware. These devices work together and performance depends on Hardware. A Computer Hardware System consists of:

Input devices, Output devices, Processor or Central Processing Unit (CPU), Memory (Main memory, Secondary storage devices)

Below is given a block diagram that shows the interconnection between the hardware components of a computer.



In the above diagram, the solid line with arrow mark shows the direction of information flow. Below are sequences of steps that take place for program execution.

- The information flow first starts with the programmer or user keying in the program or instructions through the input device (keyboard).
- The program is stored in any one of the secondary storage device.
- The program in the secondary storage device should be transferred to main memory before it can be executed.
- The Central Processing Unit analyses the instructions in the program and accordingly accepts data from the programmer through the input device if required for the program or performs arithmetic calculations if required for the program.
- The input data keyed by the programmer is stored in main memory for further processing.
- After successful execution of the program, the results are stored once again in main memory which can be further displayed through any one of the output device.

(i) Input Devices:

Any data the computer collects from people and from other devices is called *input*.

The hardware component that collects the data is called an *input device*. These input devices are electromechanical device, which translates data/instructions into machine readable form and gives to processor. These devices act as interface between user and computer. Common input devices are:

- Keyboard
- Mouse
- Scanner
- Microphone
- Digital came/Web came

(a) Key Board:

It operates a lot like a typewriter, but has many additional keys that let it do special things a typewriter can't. A keyboard typically has 101 or 105 keys or more. Each key (or combination of keys) of the key board sends a code to the computer. The code is interpreted and converted to the corresponding ASCII or Unicode number. Different type of keys available in key board are:

- Alphanumeric keys (a, b,...z; A,B,...Z; 0,1,2...9)
- Cursor movement keys (up, down, left, right)
- Numeric keys (0,1,2.....9)
- Functional keys (F1,F2,F3,.....F12)
- Modifier keys (Insert, Del, Backspace)
- Space Bar, Escape key, Enter key, Caps Lock)
- Special keys (Page up, Page down, shift key....) and etc.

(b) Mouse:

It is a pointing device which is used to control the movement of a mouse pointer on the screen to make selections from the screen. A mouse has one to five buttons. The bottom of the mouse is flat and contains a mechanism that detects movement of the mouse. It's called a mouse because of its shape. There are two kinds of mice.

- Some use a roller ball that allows the mouse to roll around a flat surface.
- A laser mouse doesn't have a roller ball. It uses a laser light that makes the pointer to move in specific direction.

The mouse movements are Vertical & Horizontal. The mouse buttons can be Clicked, Double Clicked, Rolled (Wheel).

(c) Scanner:

Convert documents and images as digitized images of any color. The scanner uses the color description of the dots to produce digitized images. Types of scanners are Flatbed, Drum, Slide and Handheld Scanners.

(d) Microphones: It is used to convert sound signals to digitized audio signals.

(ii) Processor (or) Central Processing Unit(CPU):

It is the heart of the computer system. The central processing unit (CPU) contains electronic circuits that cause processing to occur. The CPU interprets instructions to the computer, performs the logical and arithmetic processing operations (uses The arithmetic/logic unit), and causes the input and output operations to occur. It controls and coordinates all operations (uses the control unit).

CPU consists of

- | | |
|---|----------------------|
| -- Motherboard (Buses, Clock, Microprocessor, ROM etc) | -- Hard Drive |
| -- Sound Card and Video Card | -- Power Supply |
| -- Memory Card (RAM Chips) | -- BIOS Chip |
| -- NIC Card | |

The Motherboard:

The motherboard ties everything together! It allows every part of your computer to receive power and communicate with each other to process a task.

Sound and Video Cards:

Sound and Video Cards contain special circuits that allow your computer to play sounds and display graphics on your monitor.

Memory Card -- RAM (Random Access Memory) ROM (Read-Only Memory) :

RAM cards will remember what you tell them and can even change to remember new information. But, when the computer is turned off, it forgets everything you did! That's why you always save your work!

ROM is good at remembering, but cannot change it's mind. It holds the information that was built into it!

Power Supply & FAN:

The power supply converts the alternating current (AC) line to the direct current (DC) needed by the computer. Computers put out a LOT of heat and need the fan to keep them from overheating

Network Interface Card:

A NIC card (Network Interface Card) allows your computer to attach a network and to the internet

Bios chip:

A BIOS chip (Basic Input Output System) is a very important computer component. In simple terms, the BIOS chip wakes up the computer when you turn it on and reminds it what parts it has and what they do!

(iii) Memory:

The memory stores data, instructions and results either temporarily or permanently. It plays vital role in the computer. So it is considered the “**brain**” of the computer. All memory devices can be divided into

1. **Primary storage devices :** Stores programs, data and results
 - (a) Main memory (RAM, ROM)
 - (b) Internal process memory (cache memory)
2. **Secondary storage devices :** Stores all Software, and other information
 - (a) Magnetic storage devices (Floppy disks)
 - (b) Optical storage devices (CDs, DVDs)
 - (c) Magneto-optical storage devices

(a). Main Memory:

Main memory stores programs, data and results. There are two types of memory namely **RAM** (Random Access Memory) and **ROM** (Read Only Memory).

RAM: This memory is used for temporary storage of program, data and results when they are being executed by the computer. It is volatile in nature which means the program or data will be lost if power is switched off.

-Static RAM

-Dynamic RAM

ROM: This memory consists of predefined instructions defined by the manufacturer and are usually executed during system start up. It is non volatile in nature which means instructions are not lost if power is switched off. It is read only memory.

-ROM

-PROM

-EPROM

-EEPROM

-FLASH MEMORY

b) Cache Memory

Cache memory is a small, fast and expensive memory that stores the copies of data that to be accessed frequently from the main memory. There are usually two types of cache memory found in the computer system

-Primary cache (L1 cache)

-Secondary cache (L2 cache)

2. Secondary Storage Devices

Computers need additional storage devices other than the main memory for two reasons. First, because the program, data or instructions are to be stored in a permanent area so that it can be retained when required and second, It can store more information than main memory.

Some of the frequently used secondary storage devices are hard disk, magnetic tape, floppy disk, zip disk, CD (Compact Disc) and DVD (Digital Video Disk). Each of these disks storage capacity varies from MB (Mega Bytes) to GB (Giga Bytes). Below is list showing storage capacities in terms of bytes and also showing the memory capacity of secondary storage devices.

- **Floppy Disks**

- 3.5-inch disks store 1.44M of data

- Must be formatted, organized in terms of Tracks and Sectors

- **Hard Disks**
 - Spins at 5,400 – 7,200 rpm (revolutions per minute)
 - Can store anywhere between 10G – 500GB+ of data
- **CD's—Compact Discs**
 - Available in a variety of formats—CD-ROM, CD-R, CD-RW
 - A typical CD holds about 650 ,720 MB of data
- **DVD's- Digital Video Discs**
 - Available as DVD-ROM, DVD-R, DVD-RW
 - Can hold 2 GB, 4.7 GB of data
- **Zip Drives** -- high capacity floppy disk drive;
 - Zip disks can hold from 100 MB – 250 MB of data
- **USB Flash Drive**
 - Storage capacity between 32 MB – 4 GB

Data Representation Units:

- Bit -- 0 or 1 bit
- Byte -- 8-bits (1 word)
- Kilobyte -- 1 thousand bytes (1 KB = 1,000 bytes) - $2^{10} \sim 10^3$ bytes
- Megabyte -- 1 million bytes (1MB =1,000,000 bytes)- $2^{20} \sim 10^6$ bytes
- Gigabyte -- 1 billion bytes (1GB=1,000,000,000bytes)- $2^{30} \sim 10^9$ bytes
- Terabyte -- 1 trillion bytes – $2^{40} \sim 10^{12}$ bytes
- Pet byte -- 1 quadrillion bytes – $2^{50} \sim 10^{15}$ bytes
- Exabyte -- 1 quintillion bytes
- Zeta byte -- 1 sextillion bytes
- Yota byte -- 1 septillion bytes

Organization of the Memory:

Memory of the computer is an ordered sequence of storage locations called **memory cells**. Each cell is identified by **unique address** which can be used to store or access the information. The **contents** of the memory cell can contain any type of data or instructions. The size of the memory cell usually varies from computer to computer. It is represented as **bytes**. Few computers use 1 byte for 1 memory cell, few use 2 bytes and some more use either 4 or 8 or 16 bytes or even more.

All information in the memory of the computer is usually stored as bits but for our convenience in the pictorial representation given below the contents of the memory cells are represented in a form which we can understand.

Memory cells

contents	-27	A	Add	0.02	266
Address	1001	1002	1003	1004					1020

Storage and Retrieval of information in Memory

To store a value the computer sets each bit of the memory cell to either 0 or 1. For Example to store A in a memory cell the bits are set as **01000001** if one byte of memory is allocated to memory cell. (i.e., for the character A the **ASCII** (American Standard Code for Information Interchange) code is 65 which is converted to bits as **01000001**)

To retrieve a value the computer copies the patterns of 0's and 1's stored in the memory cell to another storage area for processing.

(iv) Output Devices:

Any data the computer produces for people or for other devices is called *output*. The hardware component that formats and presents the data is called an *output device*.

The output devices are Electromechanical, Electronic type of devices, which translates data/results into user understandable form. These devices also act as interface between computer and user.

Common output devices are

- Monitors (CRT'S ,LCD'S ,LED,S) -- Printer
- Plotter -- Speaker

(a) Monitor (Visual Display Unit):

The monitor looks like a TV and produces visual representation of text and graphical information. The VDU produces a soft copy of your output. The monitors are characterized by size and Resolution (Expressed in terms of Pixels). Screen was divided into pixel or dots.

1 pixel = 3 bytes of color (RGB) +1 byte alphabet character

(b) Printer:

The printer transfers the electronic text displayed on the screen onto the paper sheet.

The printer produces a hard copy of your output. The printers are characterized by dots per inch (DPI) or pages per minute (PPM). Common types of printers are

1. Impact printers
 - Dot matrix printers
2. Nonimpact printers (B&W and color)
 - Ink jet
 - Laser

- An inkjet printer usually prints in color. It prints by squirting out small dots of ink onto the paper.
- A laser printer uses a laser beam to create an image that is transferred to paper. It uses toner and a drum. The ink is powder.

(c) Plotter:

The plotters are used to print large documents, engineering and constructional drawings, images(Banners).Plotters uses multiple inkjets(ink pens) to produce quality images. Common types available are : Drum, Flat-bed, Ink-jet, Electrostatic

(d) Audio Speakers:

Speakers can be connected to your computer so you can hear very realistic sound effects and wonderful music. Some computers monitors come with built in speakers. These are electro-mechanical transducer devices. These devices require Device drivers (Built-in / separately).

❖ **COMPUTER SOFTWARE:**

Computer Software refers to a set of computer programs that are required to enable the hardware components work together to solve a problem. Computer Program is set of instructions written in a programming language that tells the computer how to accomplish a task. Computer Instruction is a simple command given to solve a problem.

Types of Softwares:

- (i) System Software (ii). Application Software (iii). Programming Languages

(i) System Software:

It is used to control and co-ordinate hardware components and manage their tasks. And the available system software are

- (a) System Management /Support software:** Used to manage hardware and software

Example: OS, Device Drivers, Utility programs (Anti-Virus)

Operating System(OS):

It tells the computer how to perform the functions of loading, storing and executing an application and how to transfer data. It is a collection of programs that act as an interface between the user of the computer and computer hardware

Examples: DOS, UNIX.(command line interface), Windows (graphical user interface).

- (b) System Development/Programming Software:** Used for developing and executing application Software **Example:** Language Translator, Linker, Compiler, Interpreter, Debugger

(ii) Application Software:

It is used to develop the user required programs that tell a computer how to produce information. Commonly used applications are Word processing, Spreadsheet, Database, Presentation, Financial, Email, and Taxing.

(a). Standard Application Software:

It is used to develop applications like word, power point, Database manager, Web browser etc., which are used for general processing tasks.

(b). Unique Application Software:

It is used to develop applications of specific needs like Tally for Accounts purpose

(iii) Computer Programming Languages:

To write a program for a computer, we must use a computer language. A vocabulary and set of grammatical rules for instructing a computer to perform specific tasks . Over the years computer languages have evolved from machine language to natural languages.

Types of Programming Languages:

1) Low Level Languages

(i) Machine Level Language:(1940s) --First Generation :

This is the language which the machine can understand. Statements will be written as combination of 0's and 1's. This language is not standardized and has the difficulty of writing separately for each machine. **Example:** 100101111001 010101000111

(ii) Assembly Level Language: (1950s)-- Second Generation :

This is the language in which the programming statements are written using mnemonic codes for performing operations. For example MUL A, where MUL is the mnemonic code signifying the multiplication operation.

Example: LOAD BASEPAY
ADD OVERPAY
STORE GROSSPAY

2) High Level Language: (1960s)-- Third Generation :

This is the language in which the programming statements look very much similar to that of English. It takes the advantage of running programs on any machine. Examples of such languages are C, C++, Java, COBOL, FORTRAN, Small talk, LISP, PROLOG etc.

Example: grossPay = basePay + overTimePay

NOTE:

Source File: It is a file comprising of program statements written either in high level language or assembly level language.

Object File: it is a file comprising of program statements in machine level language.

❖ MORE ABOUT SYSTEM DEVELOPMENT/PROGRAMMING SOFTWARE:

It provides tools to assist the programmer in writing computer programs. It includes Compiler, Interpreter, Assembler, Linker, Text editor etc.

Compiler: It is a type of translator/program that translates high level language program to machine level language program at a time. It works quickly compared to interpreter

Example: C, C++, FORTRAN, COBOL, Pascal

Interpreter: It is a type of translator/program that translates high level language statement to machine level language statement one by one. It works slowly compared to compiler

Example: basic, visual basic.

Assembler: It is a type of translator/program that translates assembly level language program to machine level language program. **Example:** masm, tasm.

Loader: This program copies the executable statements to memory and initiates the execution of instructions.

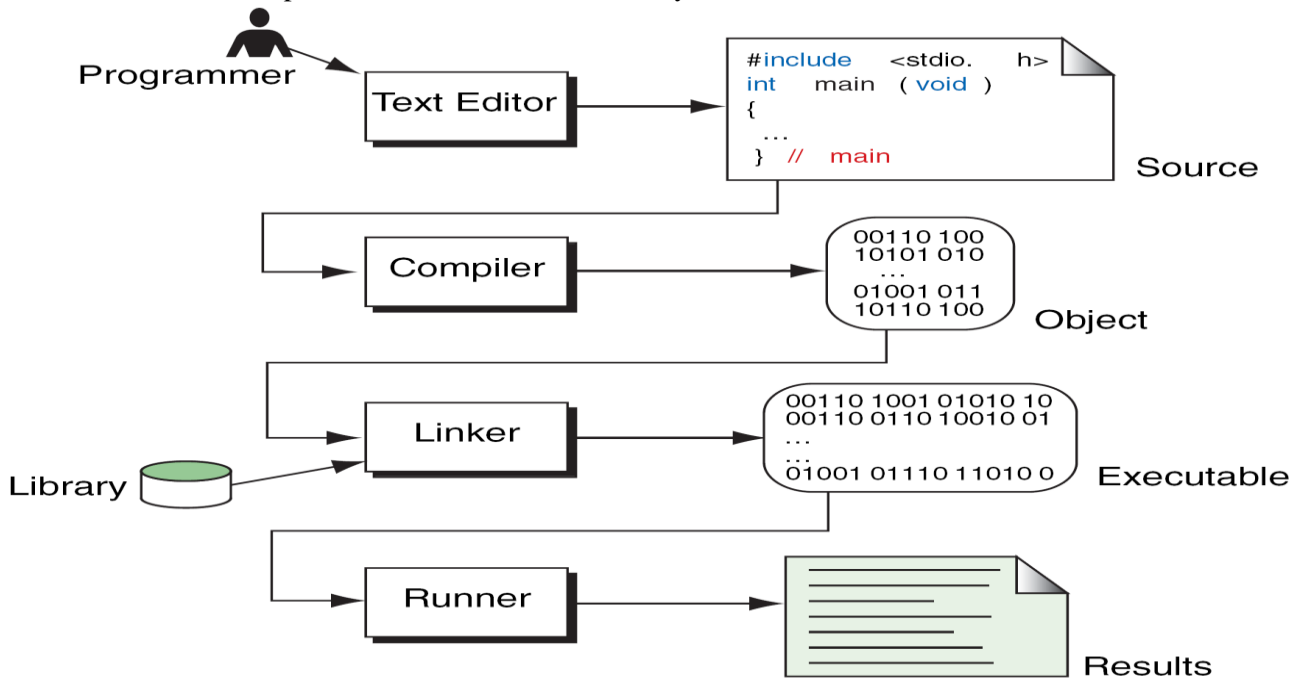
Linker: This program combines the pre-fabricated functions to the object file to create an executable machine file.

IDE(Integrated Development Environment): It refers to the software that provides support for editing the program, compiling, linking and loading.

Running a C Program:

The following diagram shows flow of information in transforming the source file to executable machine file.

- Compiler/interpreter/assembler translates the source file to object file.
- Linker links the object file to pre-fabricated functions (system library) to create executable file.
- Loader /Runner copies the executable file to memory and initiates execution of instructions.



❖ ALGORITHM:

It is one of the techniques used to provide solution to the problem. It is defined as step by step procedure to achieve a desire results. After 9th century Abu Jafar Mohammed roughly spoke some words about an algorithm

- Algorithm is a set of rules for carrying out calculation either by hand or on a machine.
- Algorithm is a step by step procedure to achieve a desire results.
- Algorithm as sequential computational steps that transmit from input to output.
- Algorithm is a sequence of operations performing on data that have to be organized in data structure.
- Algorithm is an abstraction of program that is execute on physical machine.

(i) Characteristics / Properties of an Algorithm:

1. **Input:** Supply zero or more quantities externally
2. **Output:** At least one output should be produced.
3. **Definiteness:** Each and every instruction should be clear and unambiguous.
4. **Finiteness:** After execution of a program should terminate properly.
5. **Effectiveness:** The algorithm should be accurate and truthful in defining the solution.

(ii) Advantages of Algorithm:

1. The Algorithm helps in breaking down the problem solution into sequential number of steps.
2. It provides core solution to the problem.
3. It acts as blueprint for the problem solution.
4. It helps in developing the solution by using the programming language.
5. It is easy to identify and remove program logical errors.
6. The best solution for the problem can be identified by verifying the different algorithms.

(iii) Disadvantages of Algorithm:

1. Algorithm lacks visual representation of programming constructs.
2. In large algorithms, it is difficult to trace out the flow of program execution control
3. In large algorithms, it is difficult to find out the main program logic.

(iv) **Examples:**

Algorithm: - To calculate average marks.

Step 1: Start.

Step 2: Read marks in three subjects.(M1,M2,M3)

Step 3: Compute average $AVG = \frac{M1+M2+M3}{3}$

Step 4: Display the value of AVG.

Step 5: Stop.

(v) **Algorithm complexities:**

-Time complexities


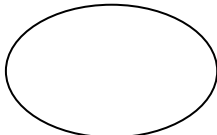


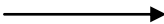


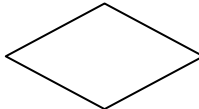
-Space complexities

Based on these complexities we can analyse the best case, average case, worst case.

❖ **FLOW CHART:**

A Flowchart can be defined as the pictorial/diagrammatic/visual representation of a process, which describes the sequence and flow of execution control of steps described in the algorithm/process. It increases the understand ability of the process

There are different symbols used to indicate the operational steps of an algorithm.

SYMBOL NAME	SYMBOL	SYMBOL PURPOSE
Rounded Rectangle or Flat oval or Ellipse		Indicates the beginning (start) and ending (stop) of the flowchart
Small Circle		Indicates connector. It is used in situations whenever it is needed to join two parts of the flowchart.
Rectangle		Indicates the process. It is used to represent computation or logic or assignment statements of an algorithm
Parallelogram		Indicates Input/output symbol. It is used to represent the step of algorithm whenever data is to be read or displayed
Lines with arrow mark		Indicates the flow lines. It indicates the direction of flow (Down, Up, Left, Right) .
Symbol of “AND” gate		Indicates delay symbol. It is used for adding delay to the process step.
Hexagon		Indicates Loop. It is used when iteration steps of algorithm is to be represented
Diamond symbol or Trapezium		Indicates decision symbol. It is used to represent selection steps of an algorithm.

(i) **Flowchart Design Rules:**

1. It must begin with “Start” and end with “Stop” symbol.
2. The process flow should be either form top-to-bottom or bottom-to-top.
3. The instructions specified in flow chart must be crisp and concise.
4. Two arrows must never intersect or cross each other.
5. A process symbol must have only one input and one output arrow.

(ii) Advantages of Flowcharts:

1. It helps in understanding the flow of program execution control in a easy way.
2. Developing the program code by referring its flowchart is easier one.
3. It helps in avoiding semantic errors.
4. It is easier to understand the pictorial representation than sequence of statements.

(iii) Disadvantages of Flowcharts:

1. Flowchart works well for small program design.
2. For large programs, the flowchart become very complex and confusing
3. Modification of a flowchart is difficult and requires almost entire work.
4. Excessive use of connectors in the flowchart creates confusion.
5. As flow chart consists of more symbols, it becomes little tedious to design flowchart.

❖ SOFTWARE DEVELOPMENT METHOD:

It is the systematic approach of solving a problem. It encompasses of the following steps:

- State the problem
- Analyze the problem
- Design the algorithm to solve the problem (Design the flow chart if required)
- Implement the algorithm
- Test and verify the completed program.
- Maintain and update the program.

State the problem: The user or the customer describes the problem and the programmer has to understand the problem and accordingly follows the next step.

Analyze the problem: The programmer after understanding the problem should identify the inputs, outputs and other requirements of the customer and also know the format of how results are to be displayed.

Design the Algorithm: The programmer having understood the problem, having identified the inputs, outputs and requirements of the problem frames the steps to be followed to provide solution to the problem. These steps are to be reviewed before moving on to the next step.

Design the Flowchart : The programmer can design the flow chart for the algorithm designed above for better understanding and implementation into a program.

Implement the Algorithm: The programmer transforms the algorithmic steps proposed by him to an implementation (programming) language of his like or to an implementation language as asked by the customer.

Test and verify the program: The programmer has to test the program with different combinations of input to ensure that the program produces the desired results and also to ensure that each statement of the program is executed at least once for some input or the other.

Maintain and Update the program: The programmer must be ready to make changes to the existing program if there is a request for change in requirements by the customer and also ensure that it works properly and successfully. The programmer must also ensure that the program is not hacked or not accessed by unauthorized users.

❖ APPLYING SOFTWARE DEVELOPMENT METHOD

Consider a simple example of how the software development methods are applied.

Problem Statement : To find the sum of two integer numbers and display the result.

Analyze the problem: For the above problem, two integer values are required as input and the sum of the two integer values is to be displayed as result.

Design the Algorithm: The following steps to be followed to provide solution to the above problem.

Step 1: start

Step 2: read integer value into a variable named one

Step 3: read integer value into a variable named two
Step 3: add the values one and two variables and store in result
 result=one + two
Step 4: print the value in result
Step 5: stop

Design the Flowchart: The following flow chart can be used for better understanding of the problem solution for the above problem.

Implement the Algorithm: Here the implementation language is C , The above Algorithm steps transformed to equivalent statements supported in C language

Program:

```
#include <stdio.h>
main()
{
    int one,two,result;
    printf("Enter two numbers");
    scanf("%d%d",&one,&two);
    result=one+two;
    printf("result=%d\n",result);
}
```

Test and verify the program & Maintain and Update the program: The above two steps are designed based on the problem and requirements of solution for the user.