



JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE

Year & Semester - B.Tech I year (I Semester)

Subject - Programming for Problem Solving

Presented by - Ms. Abhilasha

Designation - Asst. Professor

Department - Computer Science (First Year)

VISSION OF INSTITUTE

**To become a renowned centre of outcome based learning,
and work towards academic, professional, cultural and
social enrichment of the lives of individuals and
communities**

MISSION OF INSTITUTE

- ❖ **Focus on evaluation of learning outcomes and motivate students to inculcate research aptitude by project based learning.**
- ❖ **Identify, based on informed perception of Indian, regional and global needs, the areas of focus and provide platform to gain knowledge and solutions.**
- ❖ **Offer opportunities for interaction between academia and industry.**
- ❖ **Develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders may emerge.**

Programming for Problem Solving : Course Outcomes

Students will be able to:

CO1: Understand concept of low-level and high-level languages, primary and secondary memory. Represent algorithm through flowchart and pseudo code for problem solving.

CO2: Represent and convert numbers & alphabets in various notations.

CO3: Analyze and implement decision making statements and looping.

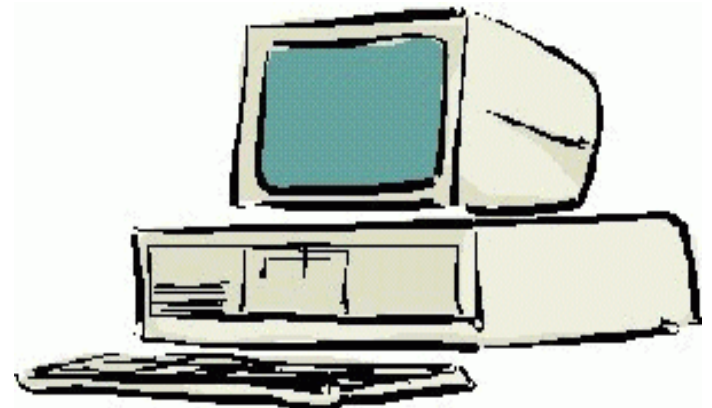
CO4: Apply pointers, memory allocation and data handling through files in 'C' Programming Language.

UNIT 1: Fundamentals of Computer

- Introduction
- Stored Program Architecture of Computers
- Evolution of Processors ,Storage Device- Primary Memory and Secondary Storage
- Working Principle of Primary Storage devices, Random, Direct, Sequential access methods
- Concept of High-Level, Assembly and Low Level programming languages
- Representation Algorithm through Flowchart and Pseudo-code

Introduction

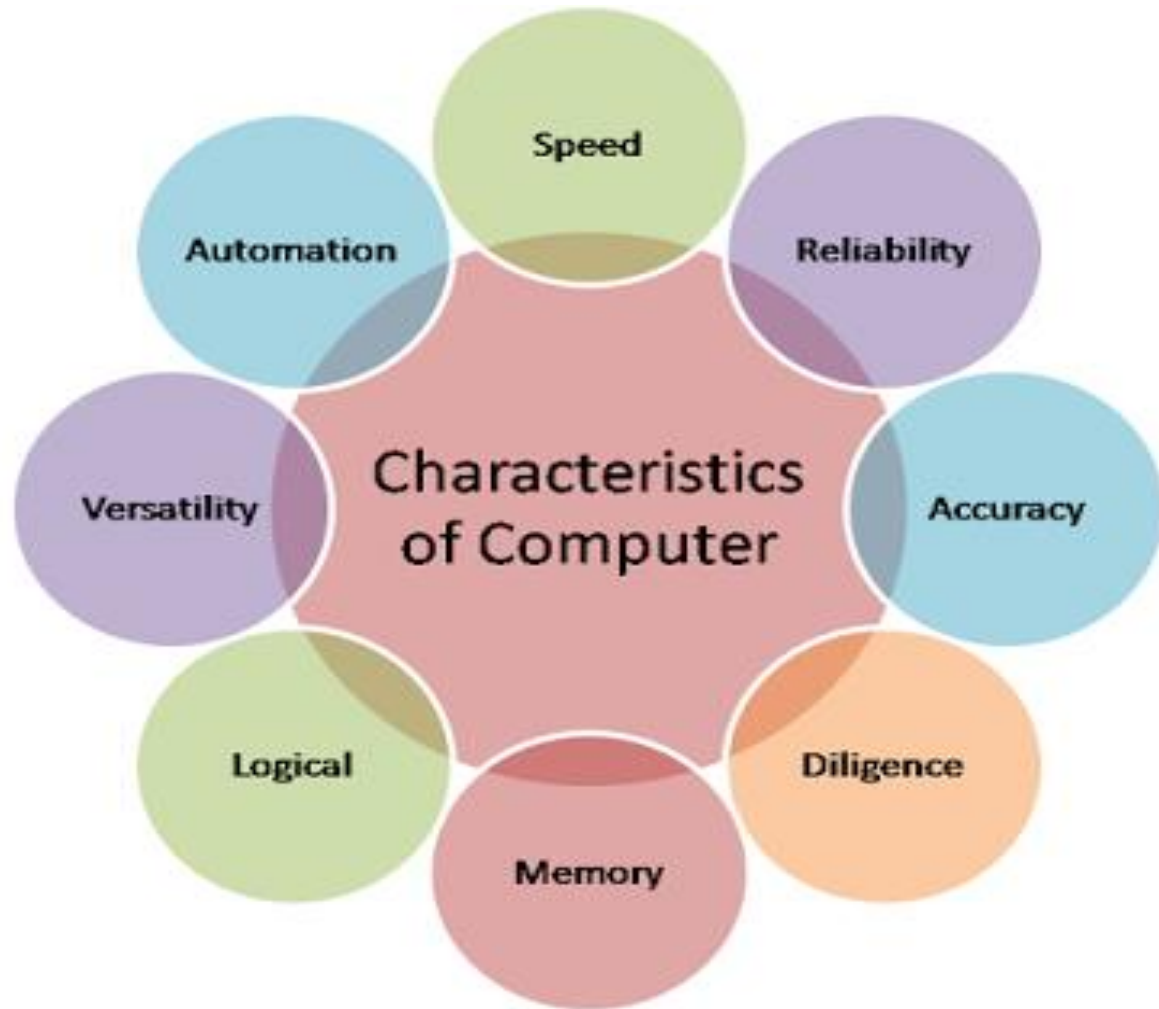
- A computer is a programmable machine designed to perform arithmetic and logical operations automatically and sequentially on the input given by the user and gives the desired output after processing.
- Computer components are divided into two major categories namely hardware and software.
- Hardware is the machine itself and its connected devices such as monitor, keyboard, mouse etc.
- Software are the set of programs that make use of hardware for performing various functions.



Characteristics Of Computers

Characteristics of computer

- Speed
- Accuracy
- Diligence
- Storage capacity/memory
- Versatility
- Reliability
- Power of remembering
- Compactness



Characteristics of Computer

Cont...

Speed

Computers work at an incredible speed. A powerful computer is capable of performing about 3-4 million simple instructions per second.

Accuracy

In addition to being fast, computers are also accurate. Errors that may occur can almost always be attributed to human error (inaccurate data, poorly designed system or faulty instructions/programs written by the programmer)

Diligence

Unlike human beings, computers are highly consistent. They do not suffer from human traits of boredom and tiredness resulting in lack of concentration. Computers, therefore, are better than human beings in performing voluminous and repetitive jobs.

Storage Capacity

Today's computers can store large volumes of data. A piece of information once recorded (or stored) in the computer, can never be forgotten and can be retrieved almost instantaneously.

Cont..

Versatility

Computers are versatile machines and are capable of performing any task as long as it can be broken down into a series of logical steps. The presence of computers can be seen in almost every sphere – Railway/Air reservation, Banks, Hotels, Weather forecasting and many more.

Compactness :-

Day by day computer size is decreasing with new technology

Reliability:-

Computer will not do mistaken

It we give wrong input can we recalled at any time

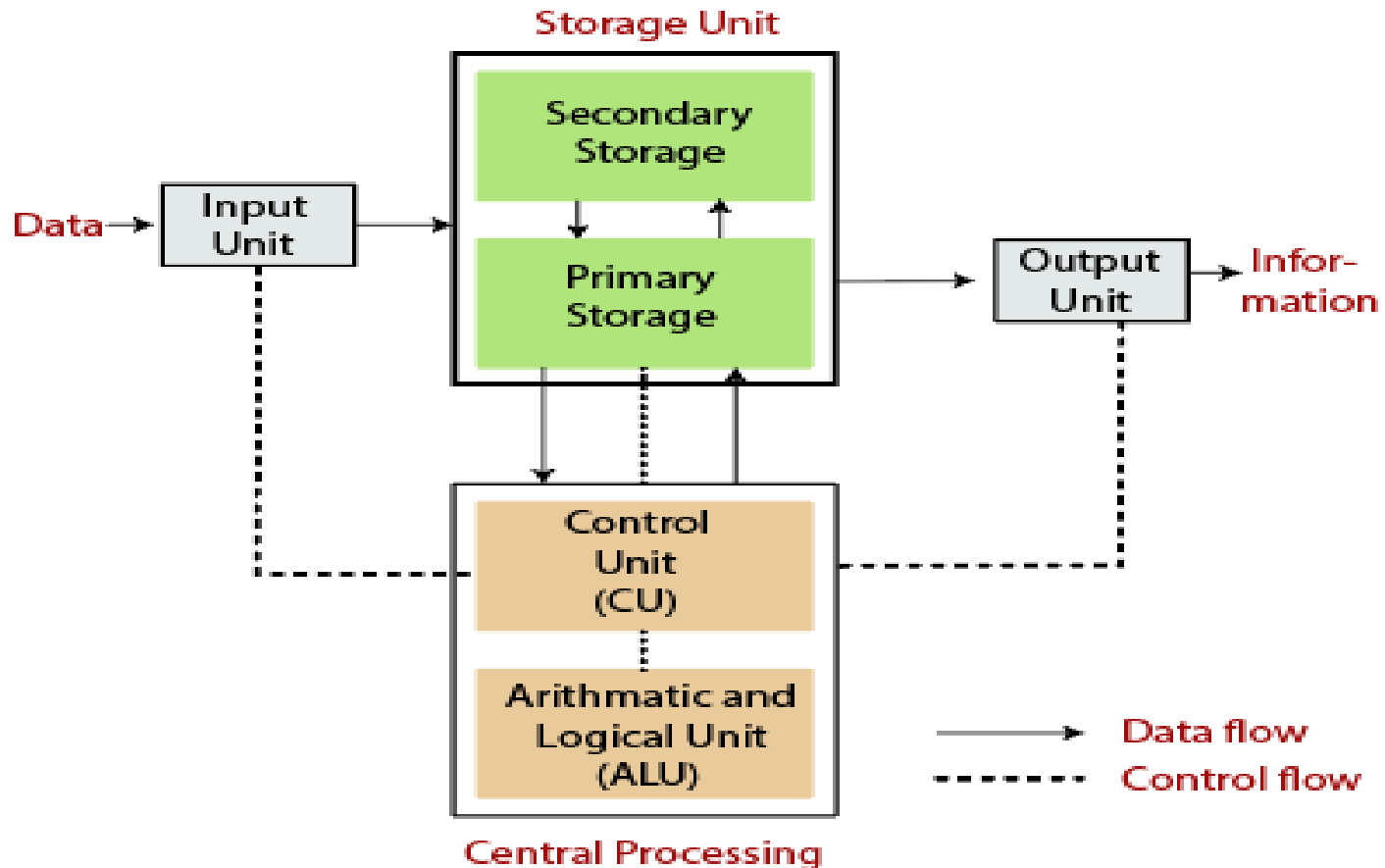
Power of remembering :-

The data stored in the computer can we recalled at any time

COMPUTER ORGANIZATION

- A computer system consists of mainly four basic units, input unit, storage unit, central processing unit, output unit.
- Central Processing unit further includes Arithmetic logic unit and control unit.

Block diagram of Computer



Functional Units:

Input Unit: This unit is used for entering data and programs into the computer system by the user for processing.

Storage Unit: The storage unit is used for storing data and instructions before and after processing.

Output Unit: The output unit is used for storing the result as output produced by the computer after processing.

Processing: The task of performing operations like arithmetic and logical operations is called processing. The Central Processing Unit (CPU) takes data and instructions from the storage unit and makes all sorts of calculations based on the instructions given and the type of data provided. It is then sent back to the storage unit. CPU includes Arithmetic logic unit (ALU) and control unit (CU)

Arithmetic Logic Unit: All calculations and comparisons, based on the instructions provided, are carried out within the ALU. It performs arithmetic functions like addition, subtraction, multiplication, division and also logical operations like greater than, less than and equal to etc.

Control Unit: Controlling of all operations like input, processing and output are performed by control unit. It takes care of step by step processing of all operations inside the computer.

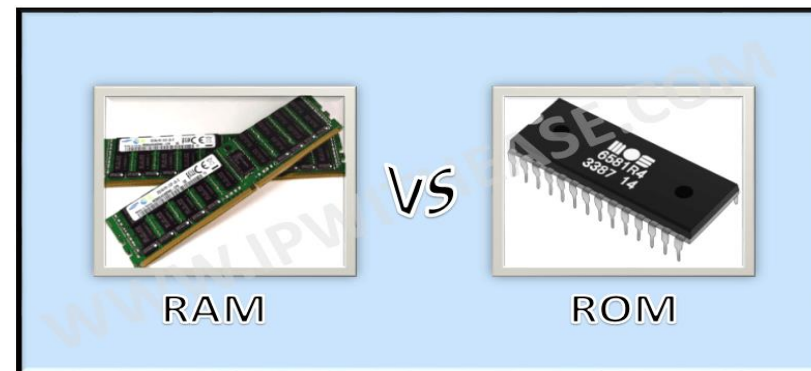
Memory

Computer's memory can be classified into two types; primary memory and secondary memory

Primary Memory can be further classified as RAM and ROM.

RAM or Random Access Memory is the unit in a computer system. It is the place in a computer where the operating system, application programs and the data in current use are kept temporarily so that they can be accessed by the computer's processor. It is said to be 'volatile' since its contents are accessible only as long as the computer is on. The contents of RAM are no more available once the computer is turned off.

ROM or Read Only Memory is a special type of memory which can only be read and contents of which are not lost even when the computer is switched off. It typically contains manufacturer's instructions. Among other things, ROM also stores an initial program called the 'bootstrap loader' whose function is to start the operation of computer system once the power is turned on.



Secondary Memory

RAM is volatile memory having a limited storage capacity. Secondary/auxiliary memory is storage other than the RAM. These include devices that are peripheral and are connected and controlled by the computer to enable permanent storage of programs and data.

Secondary storage devices are of two types; magnetic and optical. Magnetic devices include hard disks and optical storage devices are CDs, DVDs, Pen drive, Zip drive etc.

		
CD ROM	FLASH DRIVE	FLOPPY DISK
		
HARD DISK	ZIP DRIVE	MAGNETIC TAPE

Cont...

Hard disk

Hard disks are made up of rigid material and are usually a stack of metal disks sealed in a box. The hard disk and the hard disk drive exist together as a unit and is a permanent part of the computer where data and programs are saved. These disks have storage capacities ranging from 1GB to 80 GB and more. Hard disks are rewritable.

Compact Disk

Compact Disk (CD) is portable disk having data storage capacity between 650-700 MB. It can hold large amount of information such as music, full-motion videos, and text etc. CDs can be either read only or read write type.

Digital Video Disk

Digital Video Disk (DVD) is similar to a CD but has larger storage capacity and enormous clarity. Depending upon the disk type it can store several Gigabytes of data. DVDs are primarily used to store music or movies and can be played back on your television or the computer too. These are not rewritable













Input / Output Devices:

Input Devices

Input device is any peripheral (piece of computer hardware equipment to provide data and control signals to an information processing system such as a computer or other information appliance.

Input device Translate data from **form** that humans understand to one that the computer can work with. Most common are keyboard and mouse

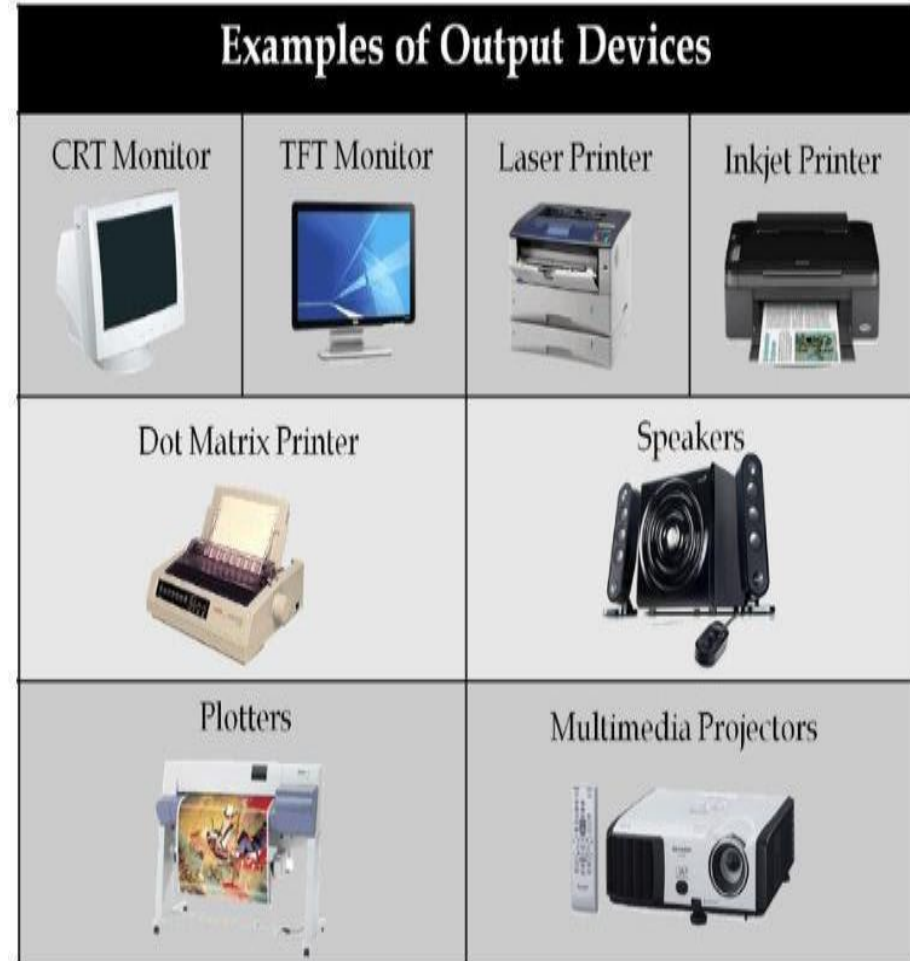
Examples of Manual Input Devices

Keyboard 	Numeric Keypad 	Pointing Device 	Remote Control 
Joystick 	Touch Screen 	Scanner 	Graphics Tablet 
Microphone 	Digital Camera 	Webcams 	Light Pens 

Output devices

Output devices

An output device is any piece of computer hardware equipment used to communicate the results of data processing carried out by an information processing system (such as a computer) which converts the electronically generated information into human-readable form.



COMPUTER SOFTWARE

Computer software is the set of programs that makes the hardware perform a set of tasks in particular order. Hardware and software are complimentary to each other. Both have to work together to produce meaningful results. Computer software is classified into two broad categories; system software and application software.

SYSTEM AND APPLICATION
SOFTWARE SOFTWARE

System Software:

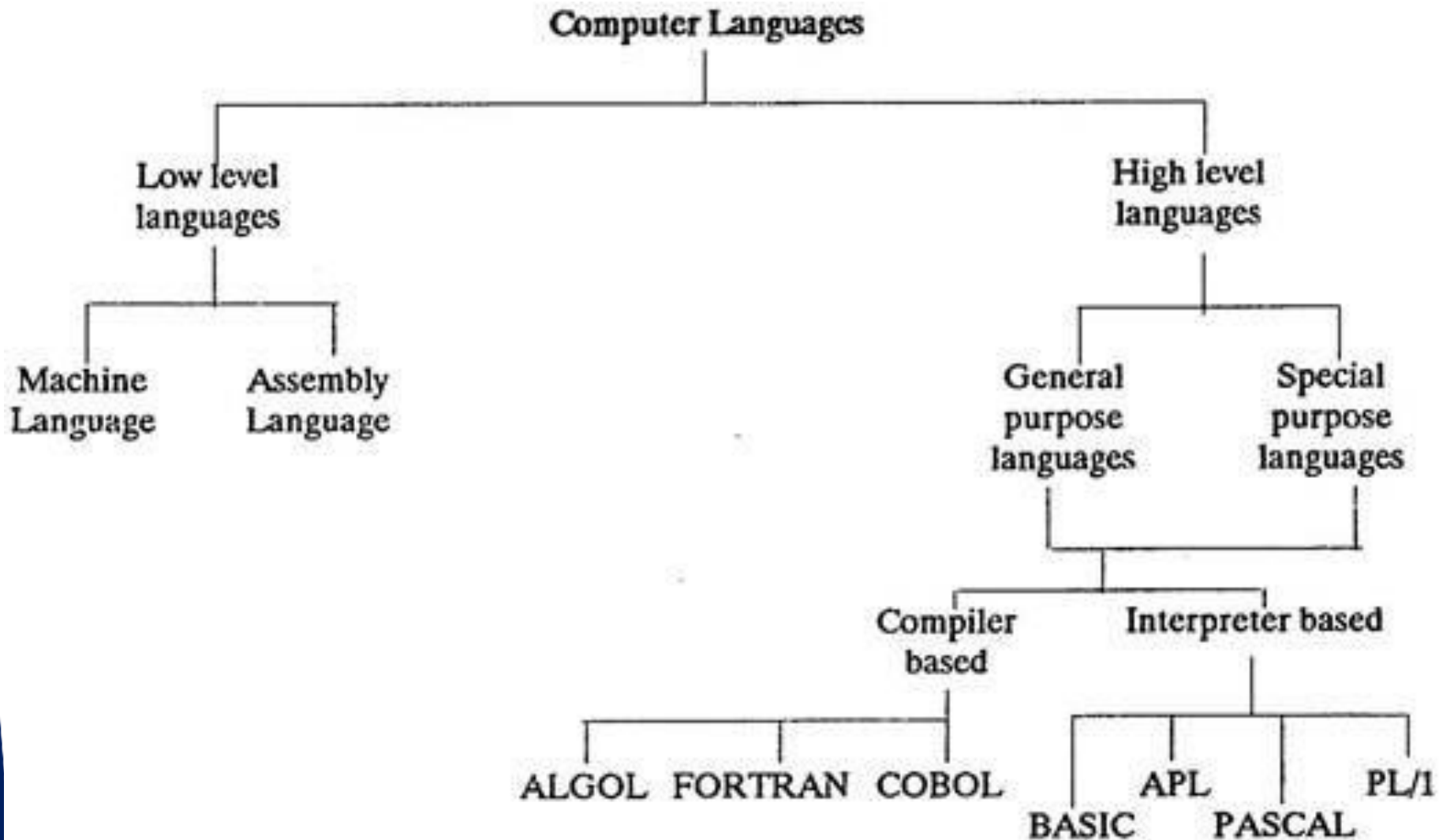
System software consists of a group of programs that control the operations of a computer equipment including functions like managing memory, managing peripherals, loading, storing, and is an interface between the application programs and the computer. MS DOS (Microsoft's Disk Operating System), UNIX are examples of system software.

Application software:

Software that can perform a specific task for the user, such as word processing, accounting, budgeting or payroll, fall under the category of application software. Word processors, spreadsheets, database management systems are all examples of general purpose application software.



COMPUTER LANGUAGE



Cont...

1. Machine Language

Machine language or machine code is the native language directly understood by the computer's central processing unit or CPU. This type of computer language is not easy to understand, as it only uses a binary system, an element of notations containing only a series of numbers consisting of one and zero, to produce commands.

2 .Assembly Level Language

Assembly Level Language is a set of codes that can run directly on the computer's processor. This type of language is most appropriate in writing operating systems and maintaining desktop applications. With the assembly level language, it is easier for a programmer to define commands. It is easier to understand and use as compared to machine language.

3 .High Level Language

High Level Languages are user-friendly languages which are similar to English with vocabulary of words and symbols. These are easier to learn and require less time to write. They are problem oriented rather than 'machine' based. Program written in a high-level language can be translated into many machine languages and therefore can run on any computer for which there exists an appropriate translator.

Cont...

Compiler & Interpreter

These are the programs that execute instructions written in a high-level language. There are two ways to run programs written in a high-level language. The most common is to compile the program; the other method is to pass the program through an interpreter.

Compiler

A compiler is a special program that processes statements written in a particular programming language called as source code and converts them into machine language or “machine code” that a computer’s processor uses. Compiler translates high level language programs directly into machine language program. This process is called compilation.

Interpreter

An interpreter translates high-level instructions into an intermediate form, which it then executes. Compiled programs generally run faster than interpreted programs. The advantage of an interpreter, however, is that it does not need to go through the compilation stage during which machine instructions are generated

Unit of Measurements

Storage measurements: The basic unit used in computer data storage is called a bit (binary digit). Computers use these little bits, which are composed of ones and zeros, to do things and talk to other computers. All your files, for instance, are kept in the computer as binary files and translated into words and pictures by the software (which is also ones and zeros). This two number system, is called a “binary number system” since it has only two numbers in it. The decimal number system in contrast has ten unique digits, zero through nine.

Computer Storage units

Size example

1 bit - answer to an yes/no question

1 byte - a number from 0 to 255.

90 bytes: enough to store a typical line of text from a book.

4 KB: about one page of text.

120 KB: the text of a typical pocket book.

3 MB - a three minute song (128k bit rate)

650-900 MB - an CD-ROM

1 GB -114 minutes of uncompressed CD-quality audio at 1.4

Mbit/s

8-16 GB - size of a normal flash drive

Bit	BIT	0 or 1
Kilobyte	KB	1024 bytes
Megabyte	MB	1024 kilobytes
Gigabyte	GB	1024 megabytes
Terabyte	TB	1024 gigabytes

Cont...

Speed measurement: The speed of Central Processing Unit (CPU) is measured by Hertz (Hz), Which represent a CPU cycle. The speed of CPU is known as Computer Speed.

CPU SPEED MEASURES	
1 hertz or Hz	1 cycle per second
1 MHz	1 million cycles per second or 1000 Hz
1 GHz	1 billion cycles per second or 1000 MHz

Algorithm

Algorithm can be defined as: “A sequence of activities to be processed for Getting desired output from a given input.”

Qualities of a good algorithm

- Input and output should be defined precisely.
- Each step in the algorithm should be clear and unambiguous.
- Algorithms should be most effective among many different ways to solve a problem.
- An algorithm shouldn't include computer code. Instead, the algorithm should be written in such a way that it can be used in different programming languages.

Cont...

Problem 1: Find the area of a Circle of radius r.

Inputs to the algorithm:

Radius r of the Circle.

Expected output:

Area of the Circle

Algorithm:

Step1: Read\input the Radius r of the Circle

Step2: Area $\text{PI} * r * r$ // calculation of area

Step3: Print Area

Cont...

Problem: Write an algorithm to add two numbers entered by the user.

Step 1: Start

Step 2: Declare variables num1, num2 and sum.

Step 3: Read values num1 and num2.

Step 4: Add num1 and num2 and assign the result to sum. $sum \leftarrow num1 + num2$


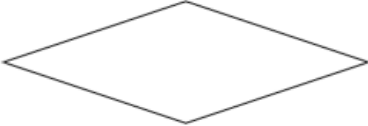


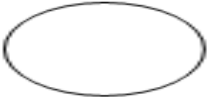




Step 5: Display sum

Step 6: Stop

FlowChart

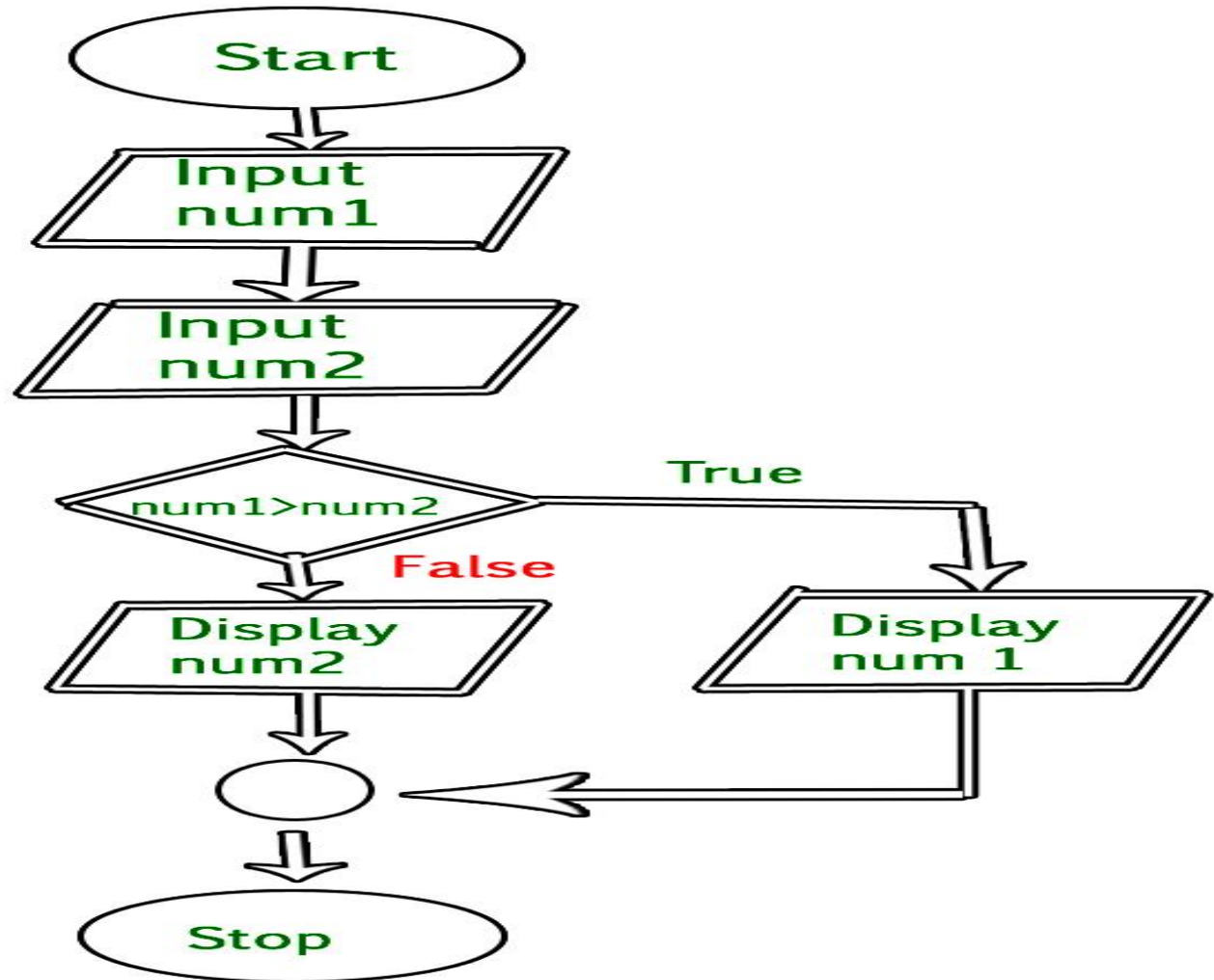
- The flowchart is a diagram which visually presents the flow of data through processing systems.
- This means by seeing a flow chart one can know the operations performed and the sequence of these operations in a system. Algorithms are nothing but sequence of steps for solving problems. So a flow chart can be used for representing an algorithm.
- A flowchart, will describe the operations (and in what sequence) are required to solve a given problem.

Basic Symbols used in Flowchart Designs

	Terminal/terminator	Indicates start/end of the flowchart or process
	Decision	Represents different decisions emerging from different points
	Action/Process	Represents an action or process
	Input/output	Holds the input/output information
	Connector	Indicates the flow connection to the next symbol
	Document	Indicates a report or a document
	Multiple document	Indicates multiple documents or reports
	Alternate	Indicates an alternate process to take place
	Preparation	Indicates preparation taken for the following step

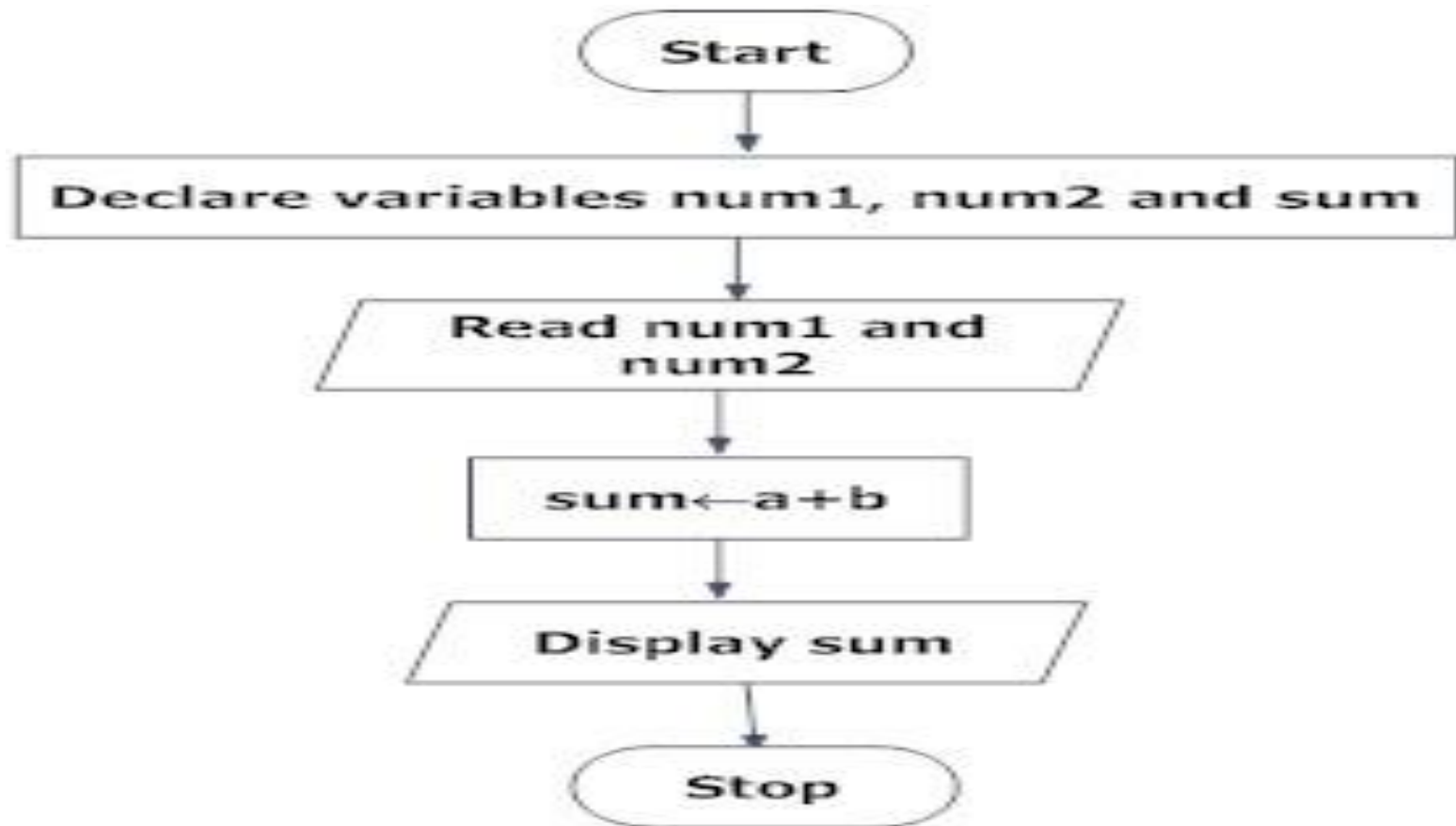
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Example: Draw a flowchart to input two numbers from user and display the largest of two numbers



Cont...

Example: Add two numbers entered by the user.



Pseudo Code

Pseudo code is a term which is often used in programming and algorithm based fields. It is a methodology that allows the programmer to represent the implementation of an algorithm. Simply, we can say that it's the cooked up representation of an algorithm.

Advantages of Pseudocode

- Improves the readability of any approach. It's one of the best approaches to start implementation of an algorithm.
- Acts as a bridge between the program and the algorithm or flowchart. Also works as a rough documentation, so the program of one developer can be understood easily when a pseudo code is written out. In industries, the approach of documentation is essential. And that's where a pseudo-code proves vital.
- The main goal of a pseudo code is to explain what exactly each line of a program should do, hence making the code construction phase easier for the programmer.

Cont...

Example 1: Write pseudo code that reads two numbers and multiplies them together and print out their product.

Read num1 , num2

Set multi to num1*num2

Write multi

Example 2: Write pseudo code that tells a user that the number they entered is not a 5 or a 6.

Read isfive

If(isfive = 5)

Write "your number is 5"

Else if (isfive = 6)

Write "your number is 6"

Else

Write "your number is not 5 or 6"

Algorithm vs Pseudocode vs Program

- An algorithm is defined as a well-defined sequence of steps that provides a solution for a given problem, whereas a pseudocode is one of the methods that can be used to represent an algorithm.
- While algorithms are generally written in a natural language or plain English language, pseudocode is written in a format that is similar to the structure of a high-level programming language. Program on the other hand allows us to write a code in a particular programming language.

Difference between algorithm and Flow chart

S.NO	ALGORITHM	FLOWCHART
1.	Algorithm is step by step procedure to solve the problem.	Flowchart is a diagram created by different shapes to show the flow of data.
2.	Algorithm is complex to understand.	Flowchart is easy to understand.
3.	In algorithm plain text are used.	In flowchart, symbols/shapes are used.
4.	Algorithm is easy to debug.	Flowchart it is hard to debug.
5.	Algorithm is difficult to construct.	Flowchart is simple to construct.
6.	Algorithm does not follow any rules.	Flowchart follows rules to be constructed.
7.	Algorithm is the pseudo code for the program.	Flowchart is just graphical representation of that logic.

Bibliography

- Computer Fundamentals by Priti Sinha Pradeep K.Sinha
Computer Fundamentals: Introduction to Computer, Uses of Computer, Main Components of Computer, Input Device, Output Devices, Hardware, Software, Operating System, and Internet by Steven Bright

<https://www.programiz.com/article/flowchart-programming>

https://www.qacps.org/cms/lib02/MD01001006/Centricity/Domain/847/Pseudo_Code%20Practice_Problems.pdf

<https://www.quora.com/What-is-a-computer-What-are-the-characteristics-and-limitations-of-computers>



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