



## What is computer?

electronic

- A computer is a programmable device that accepts raw data as input and processes it with a set of instructions (a program) to produce the result as output.
- It renders output just after performing mathematical and logical operations and computers can also store data for later uses in appropriate storage devices, and retrieve whenever it is necessary.
- The term "computer" is derived from the Latin word "computare" which means to calculate.
- It is believed that the Analytical Engine was the first computer which was invented by Charles Babbage in 1837. Charles Babbage is also known as the father of the computer.

## ★ Computer software :-

- Software is a collection of instructions, procedures that performs different tasks on a computer system.
- Computer software is a programming code executed on a computer processor.

The code can be machine-level code or the code written for an operating system.

Software can be categorized into two types:-

- (i) System software
- (ii) Application software.

System software :-

System software operates directly on hardware devices of computer. It provides a platform to run an application. It provides and supports user functionality. Example of system software include operating systems such as windows, linux, unix, etc.

Application software :-

✓ An application software is designed for benefit of users to perform one or more tasks. Example of application software include microsoft word, excel, powerpoint, oracle etc.

★ Computer Hardware :-

The term hardware refers to mechanical device that makes up computer. Computer hardware consists of interconnected electronic devices that we can use to control computer's operation, input and output. Example of hardware are CPU, keyboard, mouse, hard-disk, etc.

## Types of Computers

Computers are of various types and they can be categorized in two ways on the basis of size and on the basis of data handling capabilities. On the basis of size, there are five types of computer :-

- (i) Super computer
- (ii) Mainframe Computer
- (iii) Mini computer
- (iv) Workstation
- (v) PC (Personal Computer)

### 1. Super computer :-

Supercomputer are the biggest and fastest computers. They are designed to process huge amount of data. A supercomputer can process trillions of instruction in a second. It has thousands of interconnected processors.

Supercomputer are particularly used in scientific and engineering applications such as weather forecasting, scientific simulations and nuclear energy research. The first supercomputer was developed by Roger Cray in 1976.

### 2. Mainframe computer :-

Mainframe computers are designed to support hundreds or thousands of users.

Simultaneously. They can support multiple programs at the same time. It means they can execute different processes simultaneously. These features of mainframe computers make them ideal for big organizations like banking and telecom sectors, which need to manage and process high volume of data.

3. miniframe or minicomputer.

It is a multiprocessing computer. It consists of two or more processors and can support 4 to 200 users at one time. miniframe computers are used in institute and departments for tasks such as billing, accounting and inventory management. A minicomputer lies between the mainframe and microcomputer as it is smaller than mainframe but larger than a microcomputer.

4. Workstation computer.

Workstation is a single user computer that is designed for technical or scientific applications. It has a faster microprocessor, a large amount of RAM and high speed graphic adapters. It generally performs a specific job with great expertise; accordingly, they are of different types such as graphics

workstation and engineering design workstation

## 5. Microcomputer

Microcomputer is also known as a personal computer. It is a general-purpose computer that is designed for individual use. It has a microprocessor as a central processing unit, memory, storage area, input unit and output unit. Laptops and desktop computer are example of microcomputer. They are suitable for personal work that may be making an assignment, watching a movie, or at office for office work.

on the basis of data handling capabilities there are three types of computers:-

- \* Analogue computer
- \* Digital computer
- \* Hybrid computer

### 1. Analogue computer

Analogue computer are designed to process analogue data. Analogue data is continuous data that change continuously and can't have discrete values. We can say that analogue computers are

used where we don't need exact values always such as speed, temperature, pressure, and current. Speedometer and mercury thermometer are examples of analogue computers.

## 2. Digital Computer

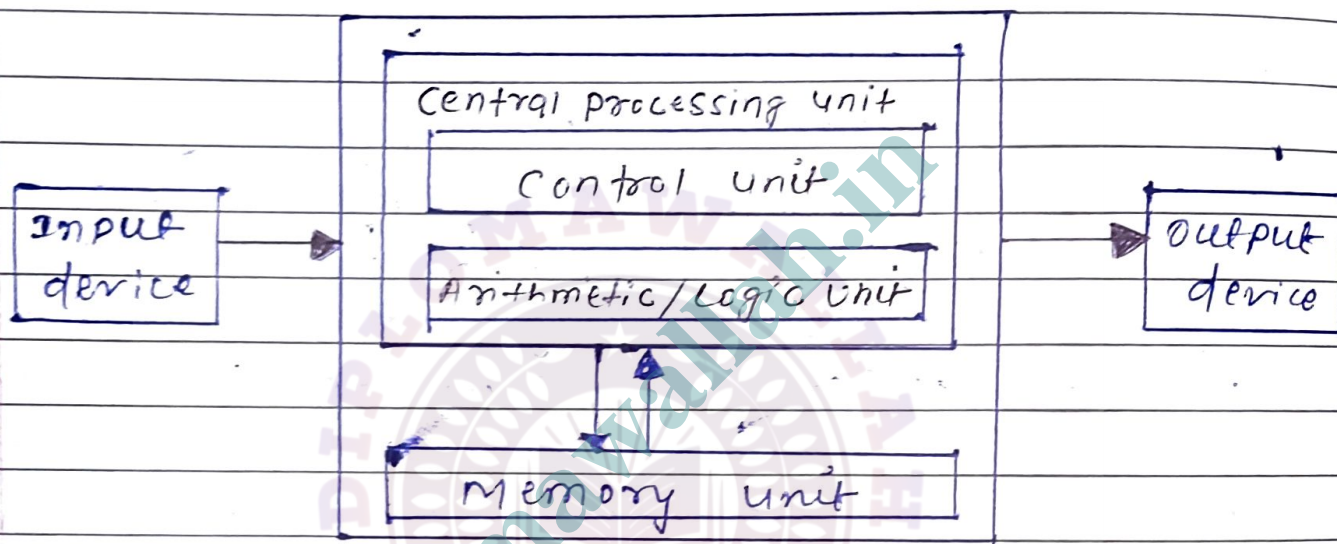
Digital computer is designed to perform calculation and logical operations at high speed. It accepts the raw as input in the form of digital or binary numbers (0 and 1) and processes it with programs stored in its memory to produce the output. All modern computer like laptops, desktops including smartphones that we use at home or office are digital computers.

## 3. Hybrid Computer

Hybrid computer has features of both analogue and digital computer. It is fast like an analogue computer and has memory and accuracy like digital computers. It can process both continuous and discrete data. It accepts analogue signals and convert them into digital form before processing. So, it is widely used in specialized applications where both analogue and digital data is processed. For example, a processor is used in petrol pumps that convert the measurement of fuel flow

into quantity and price. Similarly, they are used in airplanes, hospitals and scientific applications.

### Basic structure of computer.



A computer device is made up of various elements which help in its effective functioning and processing. There are five basic components of computer.

1. Input unit
2. Output unit
3. Memory unit
4. Control unit
5. Arithmetical and logical unit

## Input Unit

The input unit consists of input devices that are attached to the computer. These devices take input and convert it into binary language that the computer understands. Some of the common input devices are keyboard, mouse, joystick, scanner etc.

## Central Processing Unit (CPU)

CPU is considered as the brain of the computer. CPU performs all types of data processing operations. It stores data, intermediate results, and instruction (program). It controls the operation of all parts of the computer.

\* Arithmetic and Logic Unit (ALU): The ALU allows arithmetic (add, subtract etc) and logic (AND, OR, NOT etc) operations to be carried out.

\* Control Unit (CU) :- The control unit coordinates and controls the data flow in and out of CPU and also controls all the operations of ALU, memory registers and also input/output units.

The control unit also provides the timing and control signals required by other computer components.



## output unit

The output unit consists of output devices that are attached with the computer. It converts the binary data coming from CPU to human understandable form. The common output device are monitor, printer, plotter etc.

## Memory unit

The memory unit consists of RAM, sometimes referred to as primary or main memory. Unlike a hard drive (secondary memory), this memory is fast and also directly accessible by the CPU.

## Generations of computer.

The First generation of computers - (the 1940s - 1950s) (vacuum tube).

- \* The main <sup>electronic</sup> component used in the computers of the 1940s to 1950s era were vacuum tubes.
- \* The main memory storing units were magnetic tapes and magnetic drums.
- \* The machine language / binary level was used as the programming language.
- \* The sizes used to be very large which could take up entire rooms.

and the speed was very slow.

\* The only input/output devices were paper tape and punched cards.

\* Around 100 different vacuum tube were used in order to produce the computer.

\* Examples are UNIVAC1, ENIAC, IBM 701 and IBM 650 etc.

The Second Generation of Computers :-  
(1950s - 1960s) (Transistor)

\* The main electronic component used in the computers of the 1950s to 1960s era were transistors.

\* The main memory storing units were magnetic tape or disk and magnetic core.

\* The assembly language was used as the programming language.

\* The size were smaller as compared to those of the first generation and they used to consume low power and generate less heat.

\* There was an improvement in speed.

\* The input/output devices were magnetic tape and punched cards.

\* Examples are IBM 1401, IBM 7094, AND IBM 7090, UNIVAC 1107 and so on.

### The Third Generation of Computer - (the 1960s - 1970s) (Integrated circuits)

- \* The main electronic components used in the computers of the era 1960s to 1970s were integrated circuits ICs.
- \* The memory storing units were the magnetic disk or tape and a large magnetic core.
- \* High level language such as BASIC, COBOL, Pascal were used as the programming language.
- \* The sizes were smaller and efficient and the computers were called minicomputers.
- \* There was an improvement in reliability and speed as compared to the second generation of computers.
- \* The input/output devices were keyboards, magnetic tape, monitor, printer etc.
- \* Examples are IBM 370, IBM 360, UNIVAC 1108 and so on.

### The Fourth Generation of Computers :- (1970s - Present) (Microprocessors)

- \* The main electronic components used in the fourth generation of computers are microprocessors and very large scale integration (VLSI)

- \* When thousands of transistors are attached to a single microchip, it is known as VLSI.
- \* Semiconductor memory storage units such as RAM, ROM etc. were introduced.
- \* High-level language such as C#, JAVA, Python, JavaScript are used as programming languages.
- \* The sizes are smaller and the speed has improved. The input/output devices are a monitor, mouse, keyboard, printer and so on.
- \* Examples are STAR 1000, APPLE II, IBM PC and so on.

The - Fifth Generation of computer.

(present and the future) (Artificial intelligence).

- \* The main electronic components that are used in the present generation of computer is Artificial intelligence which uses the parallel processing method and the Ultra - Large Scale integration (ULSI)
- \* The fifth generation of computers understands the natural human language.
- \* The speeds are really fast and the sizes are also small.
- \* The fifth-generation computers are portable and have a huge storage capacity.

\* The input/output devices are keyboards, monitor, touchscreen pens, printers, light scanners and so on.

\* Examples are laptops, desktops, tablets, smartphones etc.

What is EBCDIC code?

EBCDIC stands for Extended Binary Coded Decimal Interchange code. It is an 8-bit binary code used in digital systems to represent alphanumeric data in digital form.

Since, it is an 8-bit code, hence it can represent total  $2^8 = 256$  possible characters. Therefore, it is able to represent 128 more characters than standard ASCII code, which is a 7-bit code.

The EBCDIC code was developed by IBM (International Business Machine) and is mainly used in IBM's mainframe computer systems.

EBCDIC code was primarily designed to be used in large computers for alphanumeric data transmission.

Applications of EBCDIC Code.

□ EBCDIC was mainly used in mainframe computers used in the field of finance and banking.

□ EBCDIC code was also used in .

mainframe systems employed in government and healthcare sector.

- EBCDIC Code is used in control systems used in manufacturing industries.
- systems used for batch processing also use EBCDIC code for data representation.

### ASCII Code :-

ASCII stands for American Standard code for information interchange, a character encoding standard that assigns unique numerical values to letters, digits, punctuation marks, and other symbols.

- The ASCII code is an alphanumeric code used for data communication in digital computers.
- The ASCII is a 7-bit code capable of representing  $2^7$  or 128 numbers of different characters.

Why do we need ASCII value representation?

Computers don't understand letters and symbols the way humans do. Instead, they process information in the form of binary code, which consists of 0s and 1s. This is where ASCII values come into play.

ASCII values serve as a bridge between human-readable text and computer-readable binary code. Each character, whether it's a letter, number, or symbol, is assigned

a unique ASCII value ranging from 0 to 127.

For example, the ASCII value of the uppercase letter 'A' is 65, while the lowercase letter 'a' has an ASCII value 97. Similarly, the digit '0' has an ASCII value of 48.

How Computer Use ASCII to Understand HUMAN TEXT?

Suppose you want to send a text message to your friend that reads, "Hello!" When you type this message on your phone or computer, each character is converted into its corresponding ASCII value. In this case, the ASCII values for "Hello!" are 72, 101, 108, 108, 111 and 33.

These numerical values are then translated into binary code which is transmitted to your friend's device. Upon receiving the message, their device converts the binary code back into ASCII values and finally displays the original text, "Hello!"

## Applications of ASCII.

- \* **Text Representation** :- ASCII is primarily used to encode text characters, including letters, digits, punctuation marks, and control characters. This allows for consistent text representation across different systems.
- \* **Data Transmission** :- ASCII is often used in protocols for data transmission, such as HTTP and SMTP, where text data needs to be sent and received reliably.
- \* **Programming Languages** :- Many programming language (like C, Java and Python) use ASCII for writing source code. Keywords, variable names, and other identifiers are represented using ASCII characters.
- \* **File Formats** :- Various file formats such as plain text file (.txt), HTML and CSV rely on ASCII encoding to represent data in a human-readable format.

## Keyboard :-

Keyboard is the most common and very popular input device which helps to input data to the computer. The layout of the keyboard is like that of traditional typewriter, although there are some additional keys provided for performing additional functions.

Keyboards are of two sizes 84 keys or 101/102 keys, but now keyboards with 104 keys or 108 keys are also available for windows and internet.

## Mouse :-

Mouse is the most popular pointing device. It is a very famous cursor-control device having a small palm size box with a round ball at its base, which senses the movement of the mouse and sends corresponding signals to the CPU when the mouse buttons are pressed.

Generally, it has buttons called the left and the right button and a wheel is present between the buttons.

Date: \_\_\_\_\_  
Page: \_\_\_\_\_

A mouse can be used to control the position of the cursor on the screen, but it cannot be used to enter text into the computer.

Advantages;

- \* easy to use
- \* not very expensive
- \* moves the cursor faster than the arrow keys of the keyboard.

✓ Joystick

Joystick is also a pointing device, which is used to move the cursor position on a monitor screen.

Joystick can be moved in all four directions.

The function of the joystick is similar to that of a mouse. It is mainly used in computer aided designing (CAD) and playing computer games.

### Light Pen

✓ Light pen is a pointing device similar to a pen. It is used to select a displayed menu item or draw pictures on the monitor screen. It consists of a photocell and an optical system placed in a small tube.

### Scanner

✓ Scanner is an input device, which works more like a photocopy machine. It is used when some information is available on paper and it is to be transferred to the hard disk of the computer for further manipulation.

Scanner captures images from the source which are then converted into a digital form that can be stored on the disk. These images can be edited before they are printed.

## Microphone :-

Microphone is an input device to input sound that is then stored in a digital form.

The microphone is used for various applications such as adding sound to a multimedia presentation or for mixing music.

## Bar Code Readers

Bar code Reader is a device used for reading bar coded data (data in the form of light and dark lines). Bar coded data is generally used in labelling goods, numbering the books, etc. It may be a handheld scanner or may be embedded in a stationary scanner.

## Printer :-

A printer is a hardware output device that is used to generate hard copy and print any document. A document can be of any type such as a text file, image, or the combination of both. It accepts input command by users on a computer or on other devices to print the documents.

## Types of Printer.

### • Laser Printer.

Laser printer make use of light or a focused beam for transferring the text and image on the paper. Inside the laser printer, a cylindrical drum is present known as photoreceptor on which laser beams are fired. This is done as the paper passes through the printer. The laser printing machine prints image and texts on the photoreceptor. One can use a laser printer for getting instant print during emergencies.

### • Inkjet printer

It is widely used by home and business computer users that prints characters by spraying the ink using magnetic plates on the paper.

It contains a paper feed assembly, ink cartridge, print head, stabilizer bar and belt.

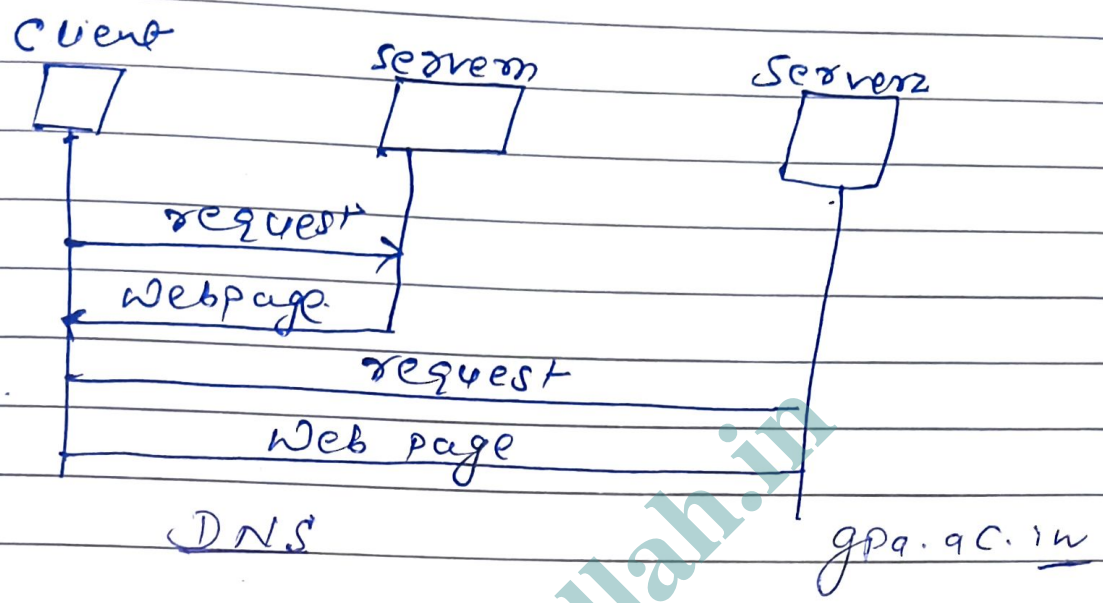
It stores the ink in cartridges, and uses separate cartridge to print several types of color documents. These colors are a combination of cyan, magenta, yellow and black color. These types of printer ~~of~~ have the ability to create high quality pictures.

#### • Dot Matrix Printers :-

Dot matrix printers are also known as impact matrix printing. Dot matrix printers use a printing process in which the ink will be applied on the surface of the paper/layout. The pins in the dot matrix printer strike a ribbon which is coated by ink and force the contact in between the ribbon and the paper. This creates a small dot on the paper and the final dot matrix image is created when these individual dots are combined.

It is less used, as its printing speed is slow and generates lower quality images. Dot matrix printers are also being used in POS terminals, service companies (couriers).

oriented), Cash registers and ATMs etc.



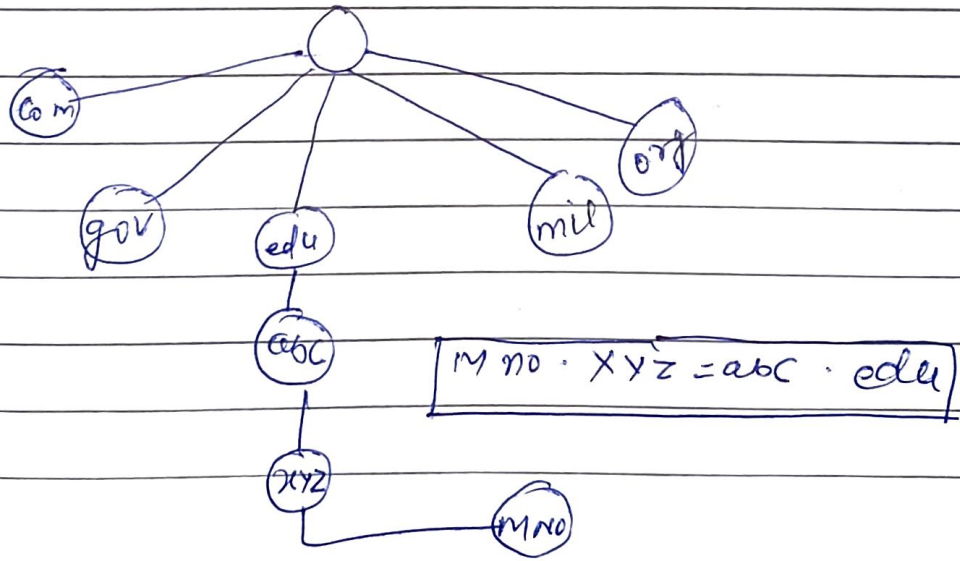
DNS (Domain Name System)



Domain name system refer to mapping of IP address.

- 1) Generic domain => org, edu, mil, com
- 2) Country " => in, US {gov, net}

Root level



Q What is a network ?

Ans: A network consists of two or more computers that are linked in order to share resources (such as printers and CDs), exchange files, or allow electronic communication. The computer on a network may be linked through cables, telephone lines, radio waves, satellites.

Some of the uses of computer networks are the following:

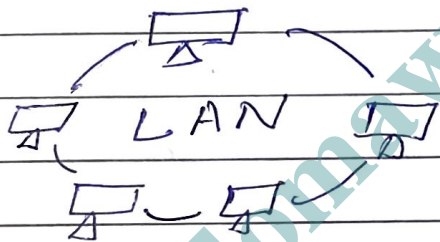
- \* Communicating using email, video, instant messaging etc.
- \* Sharing devices such as printers, scanners etc.
- \* Sharing software and operating programs on remote systems.
- \* Allowing network users to easily access and maintain information.

A computer network can be categorized by their size. A computer network is mainly of three types:-

- ✓ \* LAN (Local Area Network)
- ✓ \* MAN (Metropolitan Area Network)
- ✓ \* WAN (Wide Area Network)

## LAN (Local Area Network)

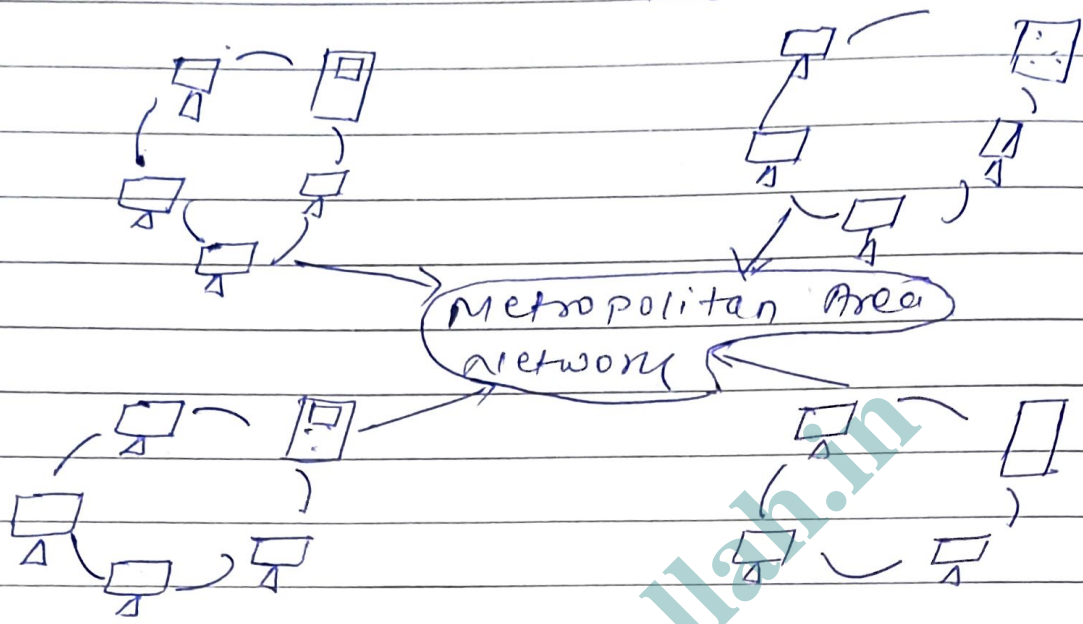
- \* Local Area Network is a group of computers connected to each other in a small area such as building, office.
- \* LAN is used for connecting two or more personal computers through a communication medium such as twisted pair, coaxial cable etc.
- \* It is less costly.
- \* The data is transferred at an extremely faster rate.
- \* Local Area Network provides higher security.
- \* For ex: home, school, library, college, office etc.



## MAN (Metropolitan Area Network)

- \* A metropolitan area network that is a network that covers a large geographical area by interconnecting a different LAN to form a large network.
- \* Government agencies use MAN to connect to the citizens and private industries.
- \* In MAN, various LANs are connected to each other through a telephone exchange line.

\* It has a higher range than Local Area Network (LAN).



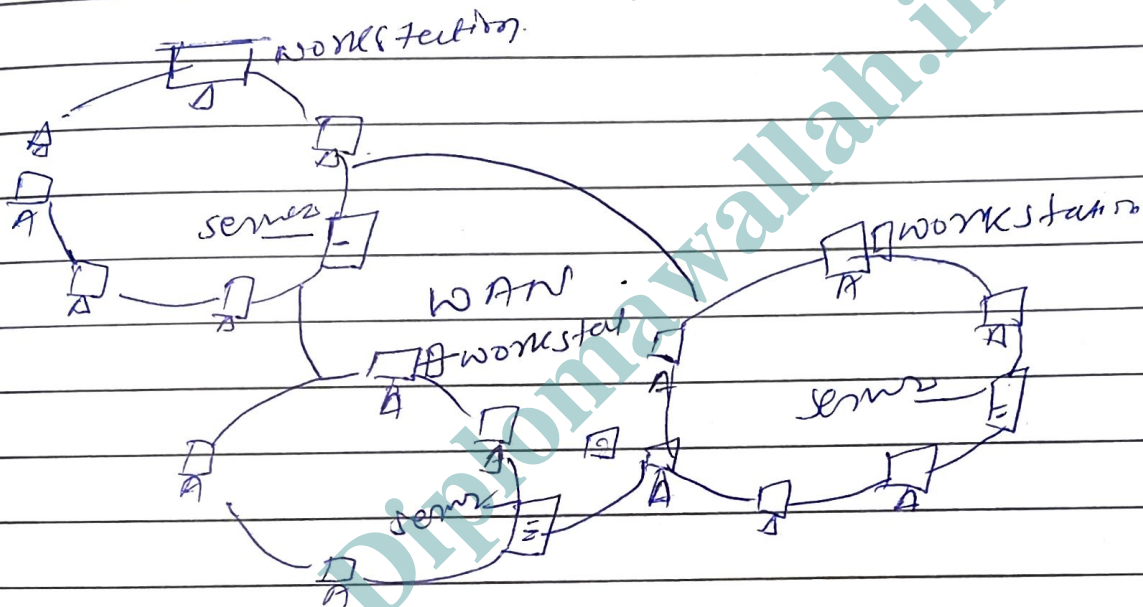
Uses of Metropolitan Area Network :-

- \* MAN is used in communication between the banks in a city.
- \* It can be used in an Airline Reservation.
- \* It can be used in a college within a city.
- \* It can also be used for communication in the military.

### WAN (Wide Area Network)

- \* A wide area network is a network that extends over a large geographical area such as states and countries.
- \* A wide area network is quite bigger network than the LAN.

- \* A wide area network is not limited to a single location, but it spans over a large geographical area through a telephone line, fibre optic cable or satellite links.
- \* The internet is one of the biggest WAN in the world.
- \* A wide area network is widely used in the field of business, government, and education.



### Internet?

Internet is a global network that connects billions of computers across the world with each other and to the world wide web. It uses standard internet protocol suite (TCP/IP) to connect billions of computer users world wide. It is set up by using cables such as optical fibers and other wireless and networking |

technologies. At present, internet is the fastest mean of sending or exchanging information and data between computers across the world.

### Advantages of the Internet :-

- \* Instant Messaging
- \* Get directions: Using GPS technology.
- \* online shopping
- \* pay bills
- \* online Banking
- \* online selling
- \* work from Home
- \* Entertainment
- \* Cloud computing
- \* Career building.

### World wide web :-

World wide web, which is also known as a web, is a collection of websites or web pages stored in web servers and connected to local computers through the internet.

These websites contain text pages, digital image, audios videos etc. Users can access the content of these sites from any part of the world over the internet using their devices such as computers, laptops, cell phones etc. The WWW, along

With internet enables the retrieval and display of text and media to your device.

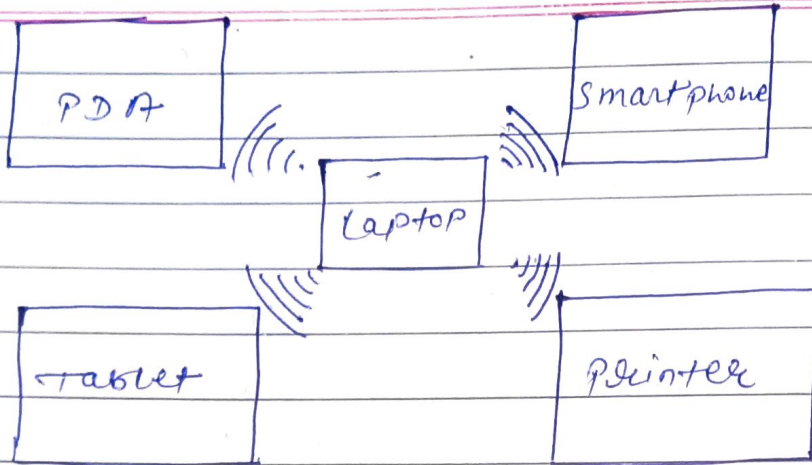
## Web Browser

Web Browser is an application software that allows us to view and explore information on the web. User can request for any web page by just entering a URL into address bar.

Web browser can show text, audio, video, animation and more. It is the responsibility of a web browser to interpret text and commands contained in the web page.

## Personal Area Network (PAN)

- \* This network is restrained to a single person, that is, communication between the computer devices is centered only on an individual's workspace.
  - \* PAN offers a network range of 1 to 100 meters from person to device providing communication.
  - \* Its transmission speed is very high with very easy maintenance and very low cost.
  - \* This uses Bluetooth technology
- Examples of PAN are USB, Computer, Phone, tablet, printer, PDA etc



### Compu Area network (CAN)

- \* CAN is bigger than a LAN but smaller than a MAN.
- \* This is a type of computer network that is usually used in place like a school or colleges.
- \* This network covers a limited geographical area that is, it spreads across several buildings within the campus.
- \* CAN mainly use Ethernet technology with a range from 1 km to 5 km.

### Local Area network (LAN)

- \* The two important technologies involved in this network are Ethernet and Wi-Fi.
- \* It ranges up to 2 km & transmission speed is very high with easy maintenance and low cost.

1.875 x 10<sup>8</sup>

By - momita rani giri<sup>malan</sup>



## Metropolitan Area Network (MAN)

# This network mainly uses ATM as the technology with a range from 5km to 50km.

## Wide Area Network (WAN)

It is not restrained to a single location but extends over many locations. WAN can also be defined as a group of local Area networks that communicate with <sup>each</sup> other with a range above 50 km.

## Data Communication.

# Data communication are the exchange of data between two devices via some form of transmission medium. Such as a wire cable. For data communications to occur the communicating devices must be part of a communication system made up of a combination of a hardware (physical equipments) and software (program).

http - hyper text transfer protocol

DNS - Domain name system

SMTP - Simple mail transfer protocol

MIME

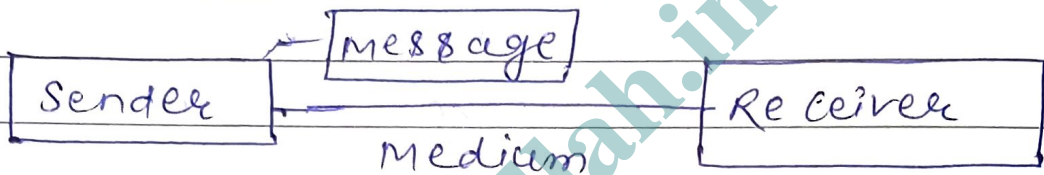
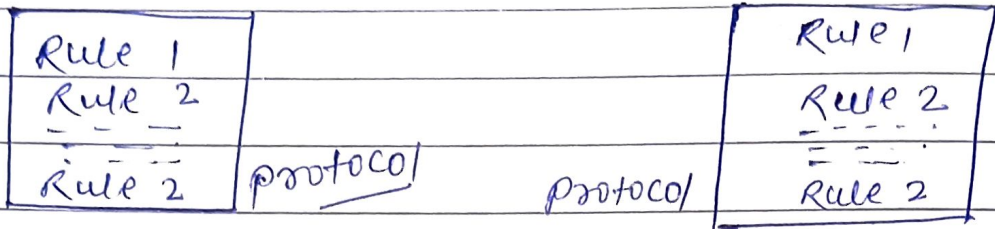
FTP

Data - port no 20

File transfer protocol (21)

gmail is a type of email

#. Components of data Communication.  
A data communication system has five components :-



(i) Message

The message is the information (data) to be communicated; for example:- information include text, audio, picture & video etc

(ii) Sender

The sender is the devices that sends the data message. It can be a computer, workstation, video camera & soon.

(iii) Receiver

The receiver is the device that receives that data message. It can be computer, workstation, TV and so on.

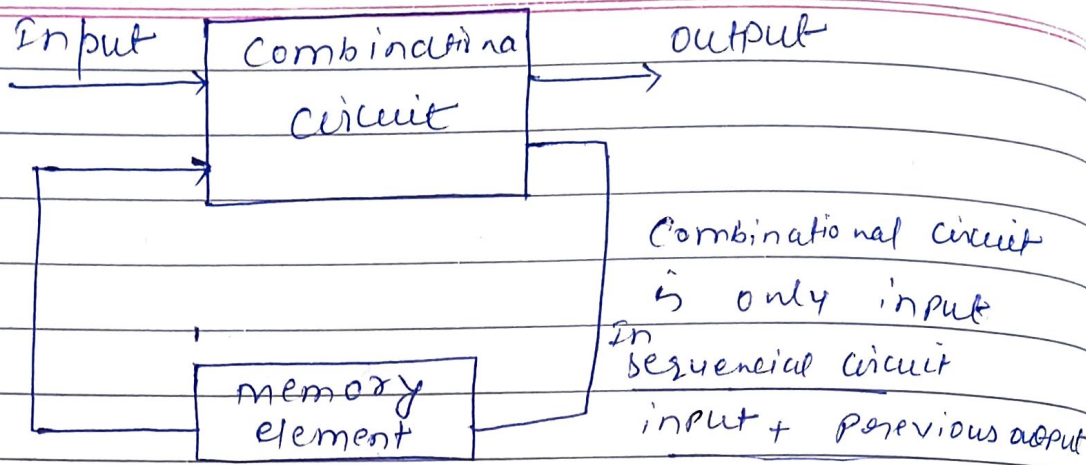
#### (iv) Transmission medium.

The transmission medium is the physical path by which a message travel from sender to receiver.

Some example of transmission media include twisted-pair cable, Co-axial cable, fiber optics, Cable & radio wave.

#### (v) Protocol

A protocol is a set of rules that govern data communication. It represents an agreement between the communicating devices. Without a protocol two devices may be connected but not communicating just as a person speaking french cannot be understood by a person who speaks only hindi.



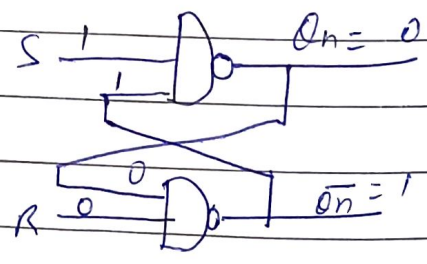
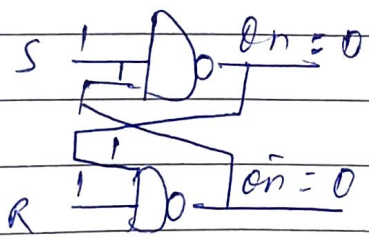
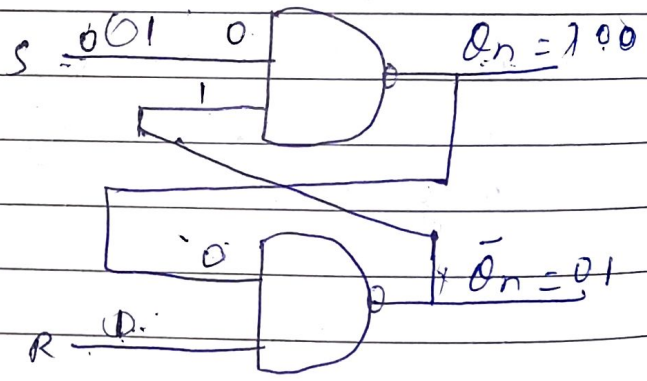
- ① Latch
- ② Flipflop
- ③ Register  $\rightarrow$  hold intermediate data (collection of flip flop)
- ④ Counter - works counting.

Latch :-

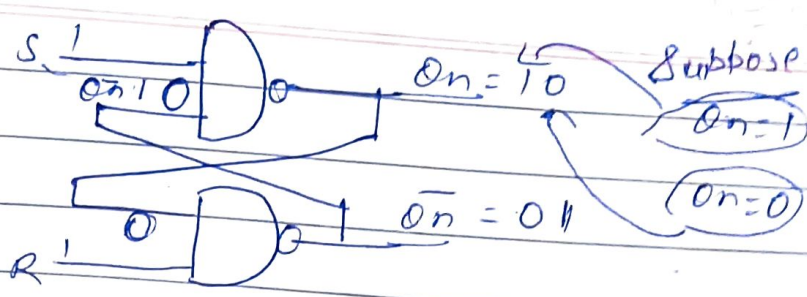
SR latch using NAND gate.

Set (10)	Reset (01)	$Q_n$	$\bar{Q}_n$
0	0	invalid	
0	1	1	(set)
1	0	0	(Reset)
1	1	HOLD	

If any one input is 0 the output will be 1.

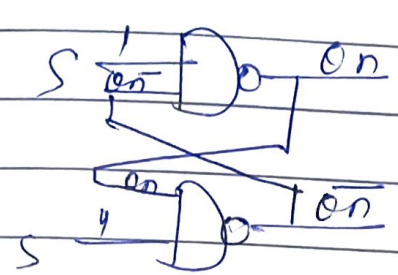


Latch is a sequential circuits.



Subpose  
 $Q_n = 1$   
 $Q_n = 0$

When  $S = 1, R = 1$ , then the condition is known as Hold Condition.

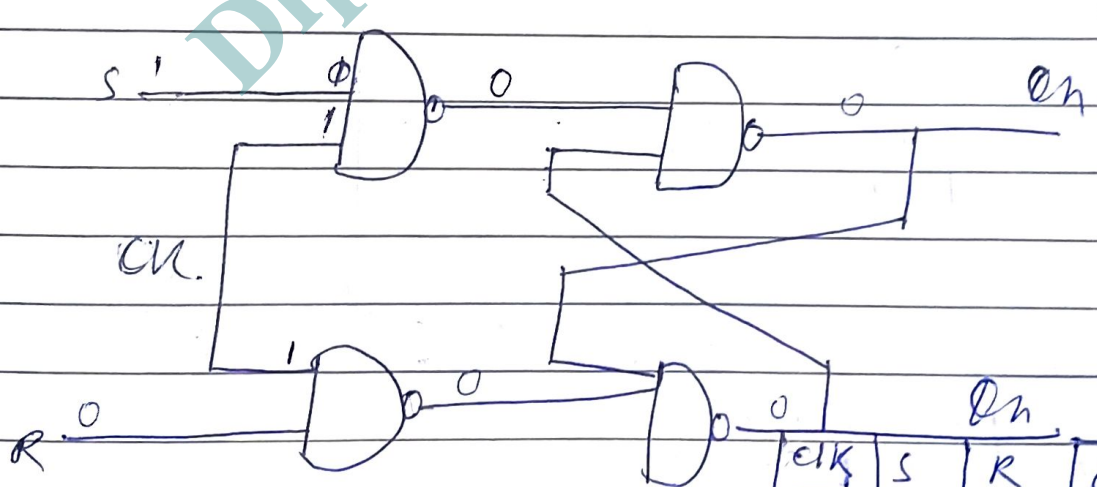


$$\overline{1 \cdot \overline{Q_n}} = \overline{1 + \overline{Q_n}} = 0 + Q_n = Q_n$$

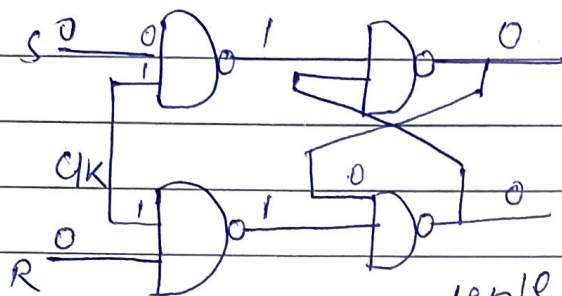
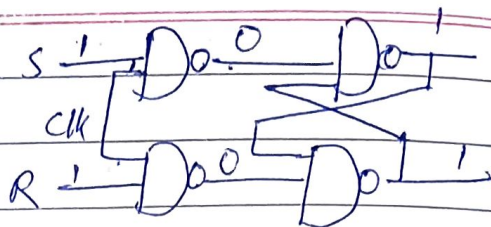
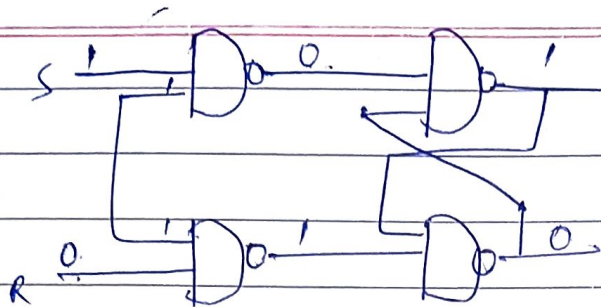
$$\overline{1 \cdot Q_n} = \overline{1 + Q_n} = 0 + \overline{Q_n} = \overline{Q_n}$$

Invalid:- When  $S = 0$  and  $R = 0$  then it is called invalid condition because the  $Q_n$  output is 1 and  $\overline{Q_n}$  output is also be 1.

### Flip - Flop :-



	$Q_n$		
$clk$	$S$	$R$	$Q(n+1)$
0 not trigger	X	X	$Q_n$
trigger	0	0	Hold
trigger	0	1	0
trigger	1	0	1
trigger	1	1	Invalid



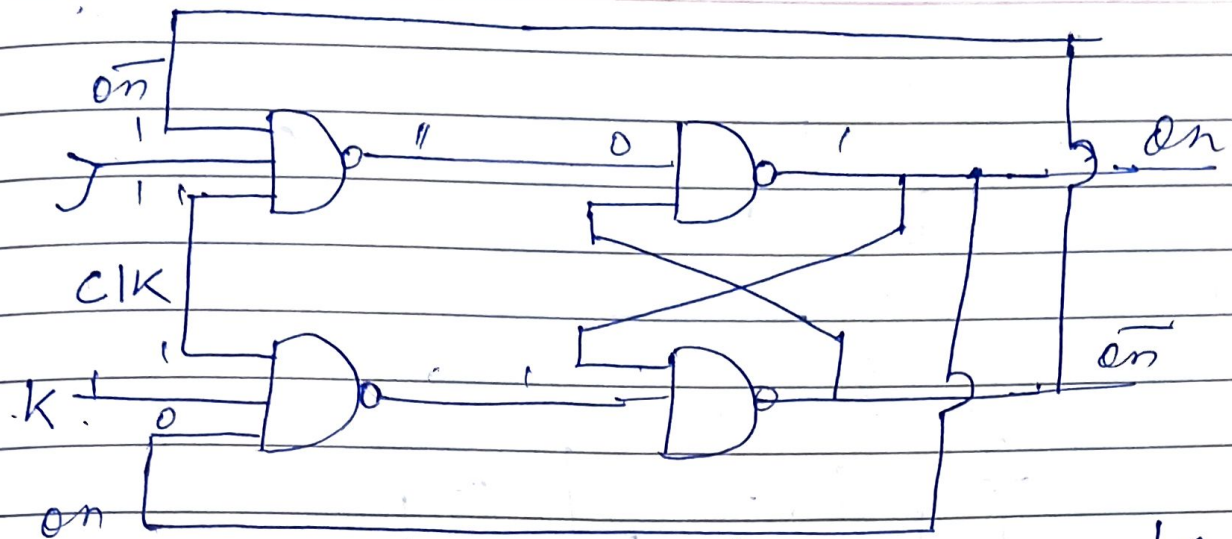
Hold = previous condition output

table.  
Characteristic of SR flip flop :-

input		output	
clk	S	R	Q <sub>n+1</sub>
trigger	0	0	0
trigger	0	0	1
"	0	1	0
"	0	1	0
"	1	0	1
"	1	0	1
"	1	1	0
"	1	1	X
"	1	1	X
not trigger	X	X	Q <sub>n</sub>

JK flip flop  
(Jack Kilby)

JK



Truth table

J	K	$Q_{n+1}$
0	0	Hold
0	1	Reset
1	0	Set
1	1	Toggle

let	$Q_n$	$Q_{n+1}$
$Q_n = 0$ Hold	0	1
$Q_n = 1$	1	1
<u>toggle</u>		
$Q_n = 0 \Rightarrow$	0	1
$Q_n = 1 \Rightarrow$	1	0

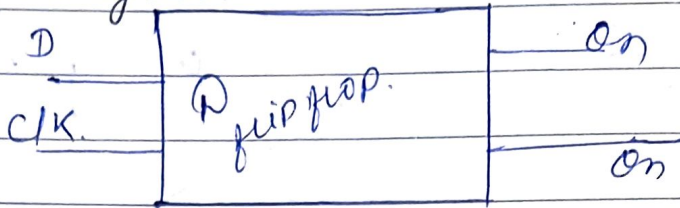
let  $Q_n = 0$  then  $Q_{n+1} = 1$

J	K	$Q_n$	$Q_{n+1}$
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

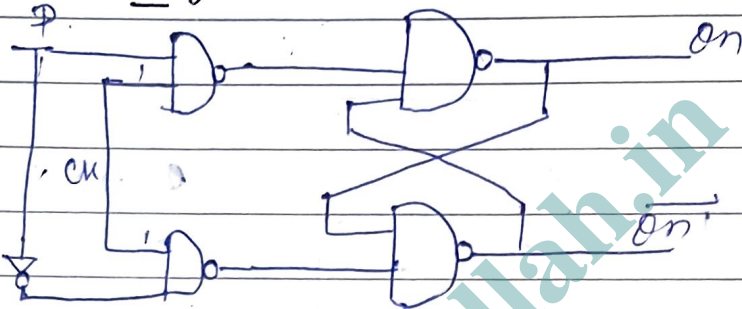
Hold  
Reset  
Set  
toggle

# D FLIP FLOP (Data flip flop)

Block diagram:



Circuit diagram



Truth table

D	Q <sub>n+1</sub>
0	0
1	1

same

Characteristic table

D	Q <sub>n</sub>	Q <sub>n+1</sub>
0	0	0
0	1	0
1	0	1
1	1	1

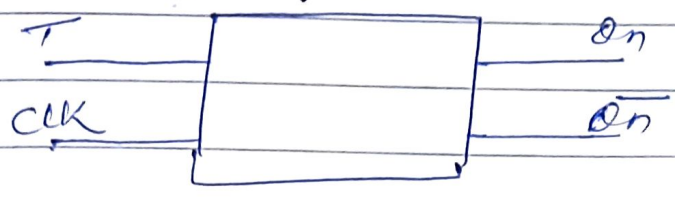
Characteristic table

When  $t=0$   $Q_{n+1} = Q_n$

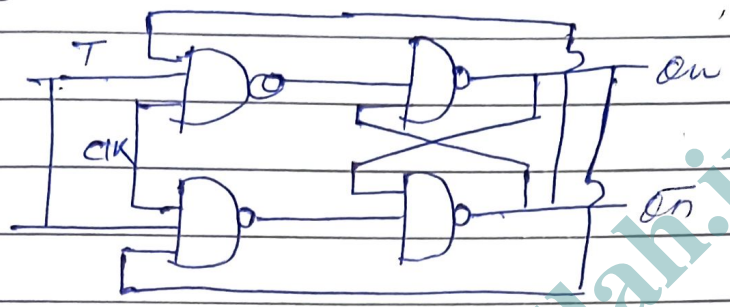
When  $t=1$   $Q_{n+1} = \overline{Q_n}$

T-flip flop (Toggle flip flop)

Block diagram



Circuit diagram



Truth table

T	$Q_{n+1}$
0	Hold
1	toggle

When	
$Q_n = 0$	$Q_{n+1} = 0$
$Q_n = 1$	$Q_{n+1} = 1$
$Q_n = 0$	$Q_{n+1} = 1$
$Q_n = 1$	$Q_{n+1} = 0$

Characteristic table

T	$Q_n$	$Q_{n+1}$	
0	0	0	} Hold
0	1	1	
1	0	1	} Toggle
1	1	0	



$L = n \text{ clock pulse}$   
 Reading total =  $n - 1$   
 total =  $(n \times 2) - 1$   
 If output = 4 clock pulse

$(1111)_{10}$

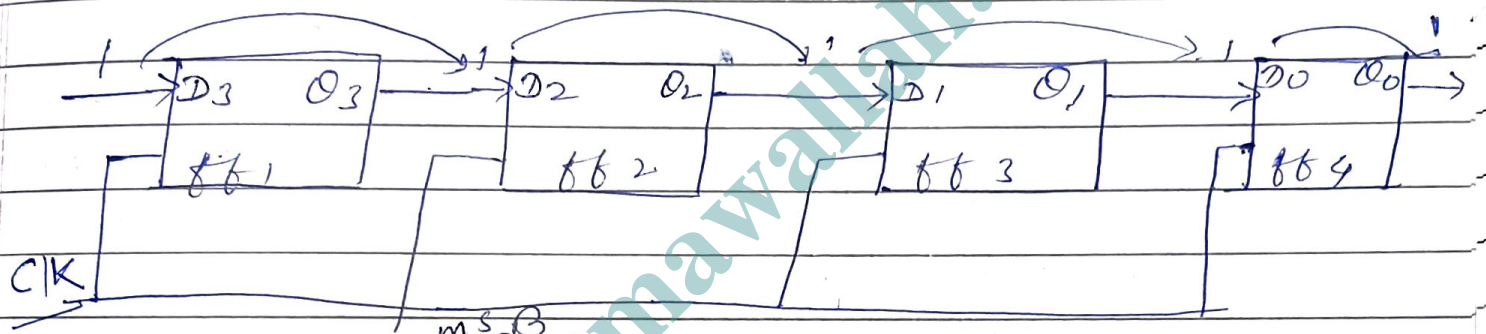
time trigger

### Types of Shift register

There are four types of shift register

- i) SISO - serial input Serial output
- ii) SIPO - serial input parallel output
- iii) PISO - parallel input serial output
- iv) PIPO - parallel input parallel output

### BLOCK DIAGRAM OF SISO.



data <sup>MSB</sup> [1111] <sup>LSB</sup>

loading = n  
(clock pulse)

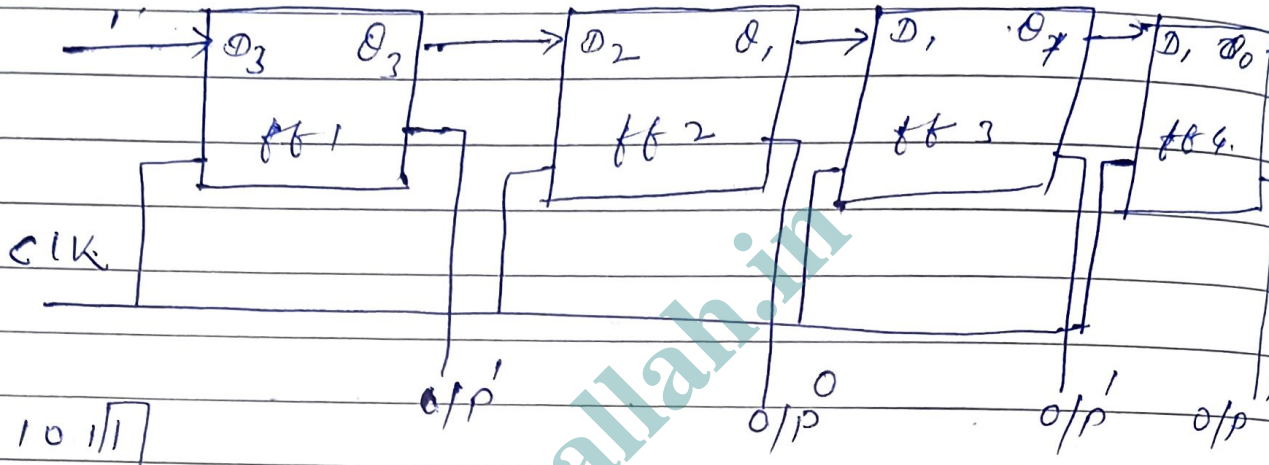
	$Q_3$	$Q_2$	$Q_1$	$Q_0$
Reset	0	0	0	0
$C_1$	1	0	0	0
$C_2$	1	1	0	0
$C_3$	1	1	1	0
$C_4$	1	1	1	1

Reading = 0  
total =  $n + 0 = n$

Reading / o/p =  $4^{th}$  output 1<sup>st</sup> LSB  
 $(n-1)$   $5^{th}$  output 2<sup>nd</sup>  
 $6^{th}$  output 3<sup>rd</sup>  
 $7^{th}$  output 4<sup>th</sup>

Total Loading + Reading  
 $(n + n - 1)$   
 $2n - 1$

SIPO :- (Serial input Parallel output)

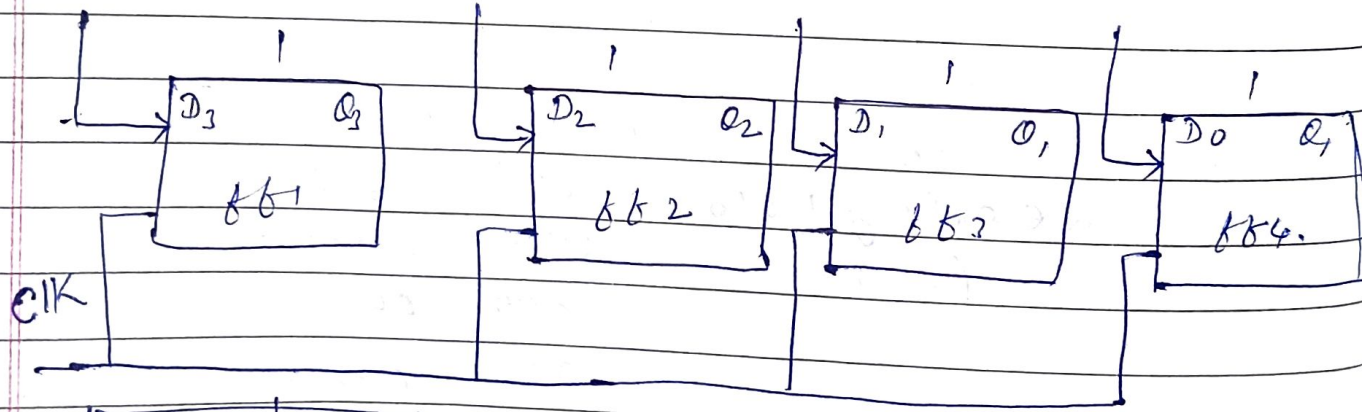


1011  
 LSB

	0	0	0	0
C <sub>1</sub>	1	0	0	0
C <sub>2</sub>	1	1	0	0
C <sub>3</sub>	0	1	1	0
C <sub>4</sub>	1	0	1	1

Loading = n clock pulse  
 Reading = 0  
 Total = n + 0 = n

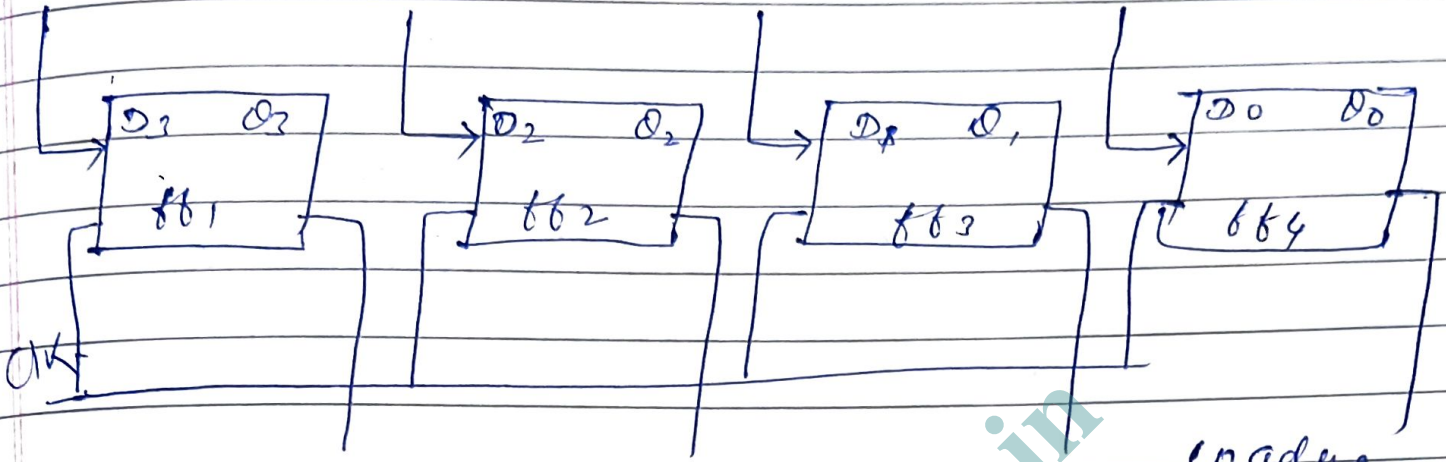
PIPO (Parallel input Serial output)



Reset	Q <sub>3</sub>	Q <sub>2</sub>	Q <sub>1</sub>	Q <sub>0</sub>
	0	0	0	0
CLK	1	1	1	1

Loading = 1  
 Reading = n - 1  
 Total = 1 + (n - 1)

PIPO (parallel input parallel output)



It is very fastest register.

loading = 1  
Reading = 0  
total = 1

Shift Reg.	loading	Reading	total.
SISO	n	n-1	2n-1
SIPO	n	0	n
PISO	1	n-1	n
PIPO	1	0	1

### Counter

↳ set of flip flop. (JK, T)

↳ It is a sequential circuit

↳ 1 bit data stored

i) up count  $\Rightarrow 0, 1, 2, 3, 4 \dots [0, 1, 2, \dots, n-1]$

ii) down count  $\Rightarrow 4, 3, 2, 1, 0 \dots [n-1, \dots, 1, 0]$

iii) up/down count  $\Rightarrow 0, 1, 2, 3, 4 \dots [4, 3, 2, 1, 0]$

$\Rightarrow$  n bit counter

$\Rightarrow$  n flip flop

$\Rightarrow 2^n$  state / mod

$$\begin{bmatrix} 0 & 0 \\ 0 & 1 \\ 1 & 0 \\ 1 & 1 \end{bmatrix} \text{ state/mod.}$$

2 bit counter  $= 2^n = 2^2 = 4$  state / mod.

6244 } 3 bit Counter  
3 bit flip flop

$2^n$  state/mode =  $2^3$  stat = 8 stat/mode

If 9 state/mod  
then no of flip flop and counter

is 4  $\left[ \begin{matrix} 2^4 = 16 \\ 2^3 = 8 \end{matrix} \right]$  middle term

0	0	0
0	0	1
0	1	0
0	1	1
1	0	0
1	0	1
1	1	0
1	1	1

$N \leq 2^n$
$N = \text{no of state}$
$n = \text{no of bit}$

How many flip-flop are required to construct a mod-128 Counter? A mod-32 what is the largest decimal number that can be stored in a mod-64 counter

Soln:-

$N \leq 2^n$   
 $128 \leq 2^7$

no of flip-flop = 7

$32 \leq 2^5$

no of flip flop = 5

$N \leq 2^n$

$64 \leq 2^6$

$(111111)_2 = (371531)_{10}$  (double + add) method  
 $= (63)_{10}$

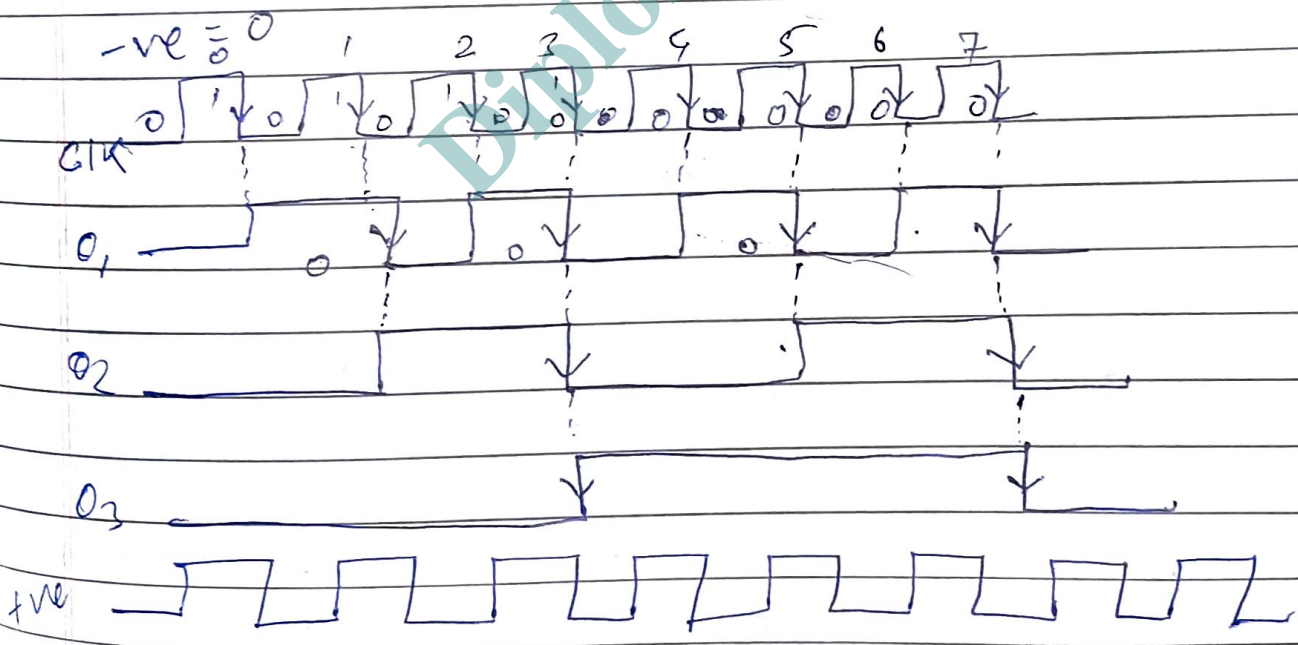
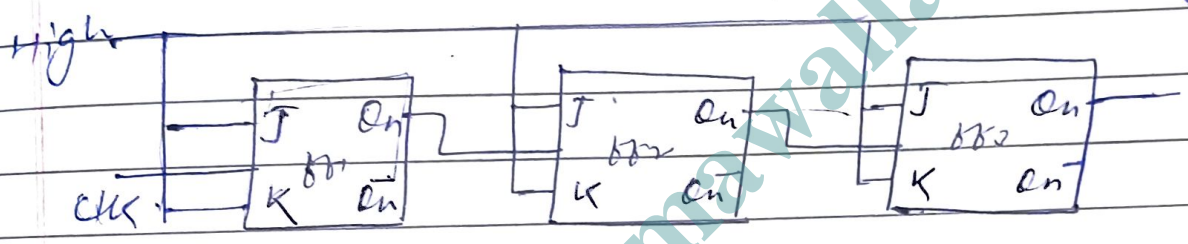
largest decimal is  $(111111)_2 = (63)_{10}$

## Types of Counter.

- (i) Synchronous
- (ii) Asynchronous. Encounter always input will be high.
  - ↳ also known as Serial Counter
  - ↳ also known as Ripple Counter
  - Asynchronous <sup>output</sup> depend on previous outputs
  - In Asynchronous counter clk in first flip.

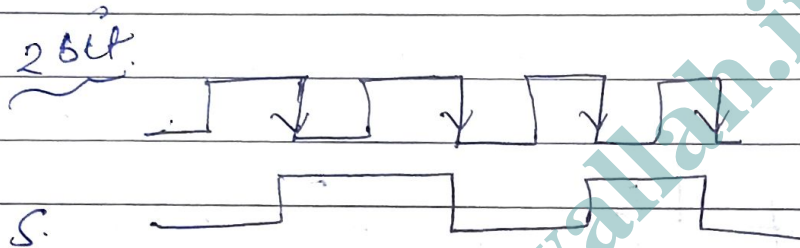
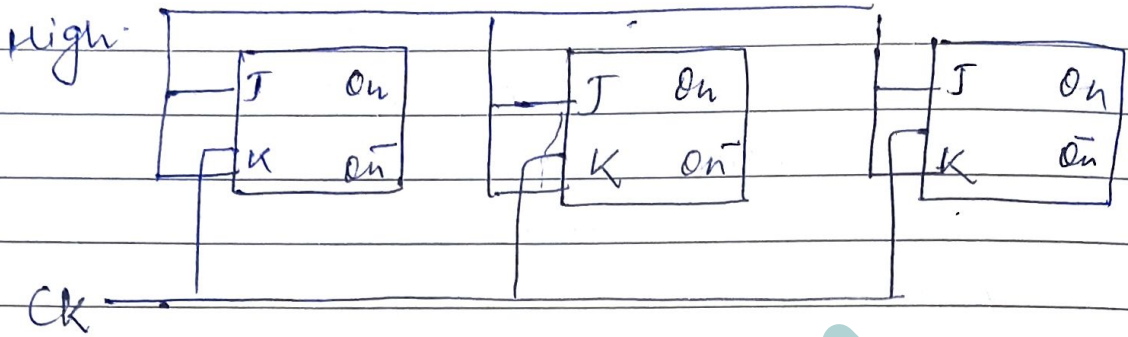
### Three bit ripple counter

8 mod



## Synchronous Counter :- (parallel)

In synchronous counter CLK is different in each block.



### Software

↳ set of program

↳ set of instructions

Application software

System software

Software

markup lang  
programm

SOL (very lang)

It is a type of software that is directly interact with the web.

Exms word  
ms office

System software ← is directly connected to h/w.

Ex - OS, Interpreter, Compiler

OS is a system sw which is directly <sup>interact</sup> connected to the hardware

function of OS

- (i) security
- (ii) memory management
- (iii) Resource management
- (iv) storage "
- (v) process "

Types of operating software:-

- (i) Batch OS
- (ii) multiprogramming OS
- (iii) multiprocessing OS
- (iv) multi tasking OS / time sharing
- (v) Real time OS
- (vi) distributed OS
- (vii) network OS
- (viii) mobile OS

mobile OS  $\rightarrow$  multitasking.  
 $\rightarrow$  It is light weighted.

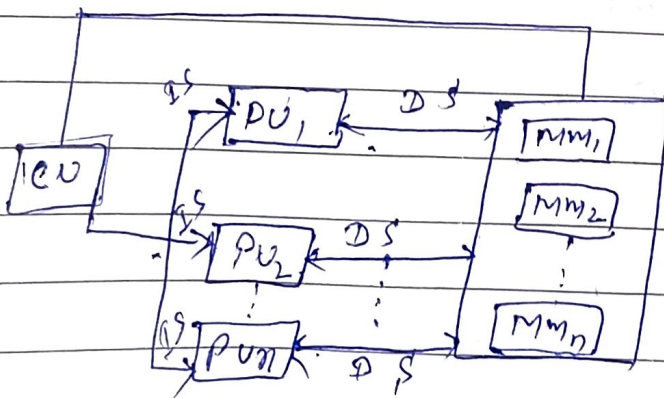
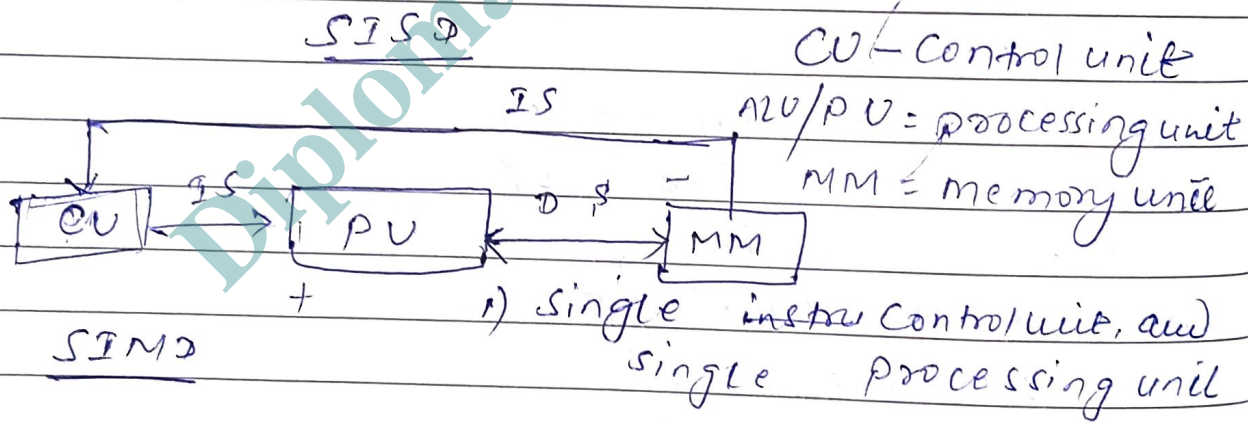
M.M.D

Flynn's classification (Michael J Flynn 1966)

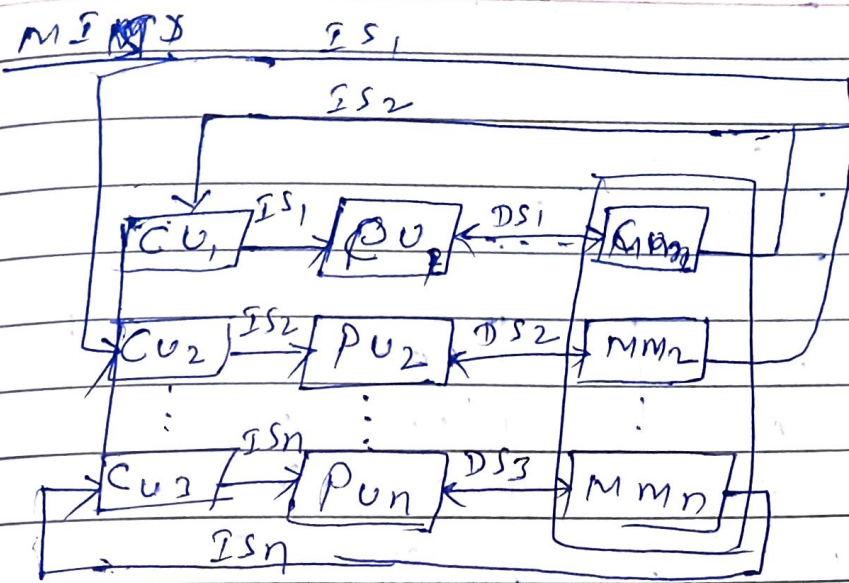
Bus

- $\rightarrow$  data bus  $\leftrightarrow$  bidirectional SISP
- $\rightarrow$  address bus - uni " SIMP
- $\rightarrow$  control bus - uni " MISP

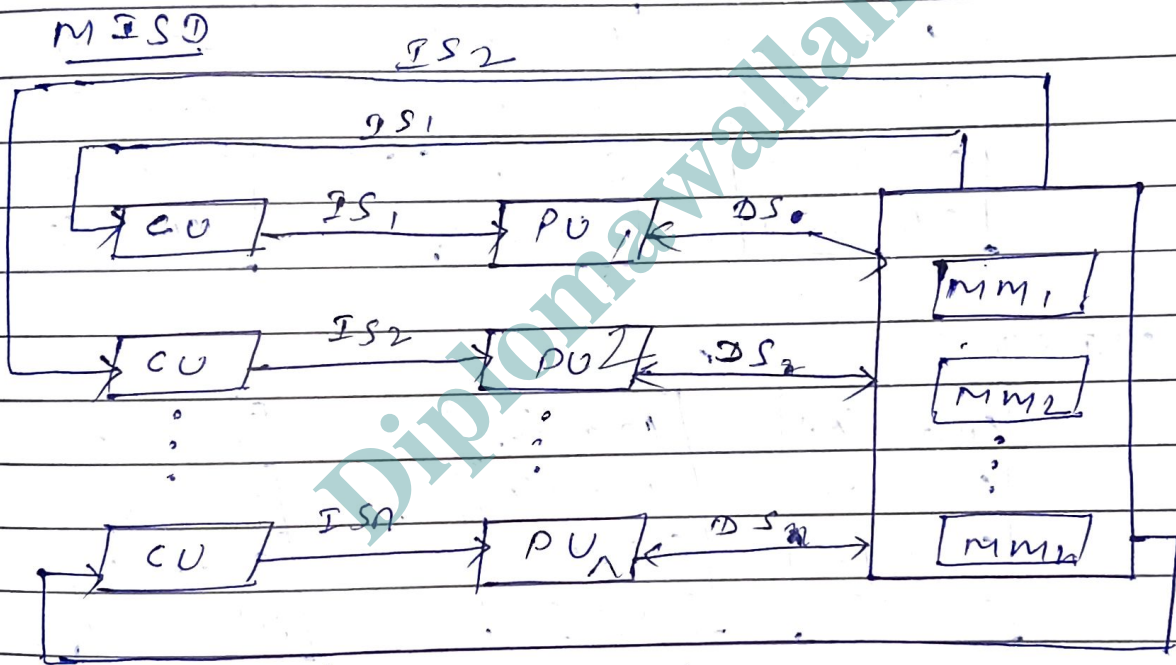
- 1) Single instruction stream single data stream MIMD.
- 2) <sup>single</sup> multiple instruction stream multiple data stream.
- 3) multiple instruction stream single data stream.
- 4) multiple instruction stream multiple data stream.



Single control unit and multiple processing unit



multiple control unit and multiple processing unit



multiple control unit and

Instruction stream:- multiple processing unit  
 sequence of instruction- but Datastream is  
 datastream:- different.  
 sequence of data (input/output/partial data)

SEQ

load(A)
load(B)
$C = A + B$
store(C)

SIMD

load(A <sub>1</sub> )	load(A <sub>2</sub> )
load(B <sub>1</sub> )	load(B <sub>2</sub> )
$(C_1) = (A_1) + (B_1)$	$(C_2) = (A_2) + (B_2)$
store(C <sub>1</sub> )	store(C <sub>2</sub> )

MIMD

load(A <sub>1</sub> )	load(A <sub>2</sub> )	load(A <sub>n</sub> )
load(B <sub>1</sub> )	load(B <sub>2</sub> )	load(B <sub>n</sub> )
$(C_1) = (A_1) + (B_1)$	$(C_2) = (A_2) + (B_2)$	$(C_n) = (A_n) + (B_n)$
store(C <sub>1</sub> )	store(C <sub>2</sub> )	store(C <sub>n</sub> )

MESD

load(A <sub>1</sub> )	load(A <sub>2</sub> )	load(A <sub>n</sub> )
load(B <sub>1</sub> )	load(B <sub>2</sub> )	load(B <sub>n</sub> )
$(C_1) = A + B$	$(C_2) = A_2 + B_2$	$C_n = A_n + B_n$
store(C <sub>1</sub> )	store(C <sub>2</sub> )	store(C <sub>n</sub> )

Computer threats

[Malware is malicious software]

File corrupt

- virus → virus is a malicious software.
- worm → it self replicate.
- spyware → sniffing
- adware → data share <sup>ex</sup> amazon to flipkart
- Trojan horse → data gather to share data.
- ransomware

# Demorgan's theorem simplification

$$\textcircled{1} \quad \overline{A + BC}$$

$$\overline{A} + \overline{BC}$$

$$\overline{A} + \overline{B} \cdot \overline{C}$$

$$\textcircled{2} \quad \overline{AB + CD}$$

$$\overline{AB} \cdot \overline{CD} \quad (\text{Demorgan's 1st law})$$

$$(\overline{A} + \overline{B}) \cdot (\overline{C} + \overline{D})$$

$$\textcircled{3} \quad D + \overline{CD}$$

$$D + (\overline{C} + \overline{D})$$

$$D + \overline{D} + \overline{C}$$

$$1 + \overline{C}$$

$$= 1$$

$$\textcircled{4} \quad \overline{A + BC} + \overline{AB}$$

$$\Rightarrow \overline{A} \cdot \overline{BC} + \overline{A} + \overline{B}$$

$$= \overline{A} \cdot \overline{BC} + \overline{A} + \overline{B}$$

$$= \overline{A + BC} + \overline{A} + \overline{B}$$

$$= (A + BC) + (A \cdot B)$$

$$= A(1 + BC) + (A \cdot B)$$

$$= A + 1 \cdot B$$

$$= A + B$$

$$\textcircled{3} \quad \overline{AB + \overline{C}D}$$

$$\Rightarrow \overline{AB} \cdot \overline{\overline{C}D}$$

$$\Rightarrow \overline{A} + \overline{B} \cdot C + \overline{D}$$

$$\textcircled{Q} \quad \overline{C} \cdot (\overline{A} + B)$$

$$= \overline{C} + (\overline{A} + B) \quad (\text{demorgan's})$$

$$= C + (\overline{A} + B)$$

$$= C + (A \cdot \overline{B})$$

Solve simplification; -

$$\textcircled{Q} \quad DE + \overline{D} + \overline{E}$$

$$DE + \overline{DE} \quad ((A + \overline{A}) = 1)$$

$$= DE(1 + \overline{DE}) = 1$$

$$= DE \times 1$$

$$= DE$$

$$\overline{A+B} = \overline{A} \cdot \overline{B}$$

Q)  $\overline{A+B} + (\overline{A+B})$       Q)  $A + \overline{A}B = A+B$

=  $\overline{A+B} + \overline{A+B}$  (by demorgan's theorem) =  $A+AB + \overline{A}B + 0$  ( $A+\overline{A}B = A+B$ )

=  $\overline{A+B} + \overline{A} \cdot \overline{B}$        $\Rightarrow A(1+B) + \overline{A}B + A\overline{A}$

=  $\overline{A+B} (1+\overline{A})$        $\Rightarrow A+B (A+\overline{A})$

=  $\overline{A+B} (1)$        $\Rightarrow (A+B)(1)$

=  $\overline{A+B}$       =  $A+B$  proved.

Q)  $AB + (A(B+C) + B(B+C)) = B+AC$

Soln

=  $AB + AB + AC + BB + BC$

=  $AB + AC + B + BC$  (let  $AB + AB = AB$ )

=  $AB + AC + B(1+C)$  (and  $BB = B$ )

=  $AB + AC + B$

=  $AB + B + AC$

=  $B(A+1) + AC$

=  $B + AC$  proved

Q)  $F(A+B+C) = (A+B)(A+C)$

Soln

R.H.S =  $AA + AC + AB + BC$

$A + AC + AB + BC$




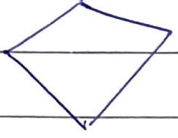


$A(1+C) + AB + BC$

$A + AB + BC$  [ $\because A \cdot 1 = A$ ]

$A(1+B) + BC$

$A + BC$

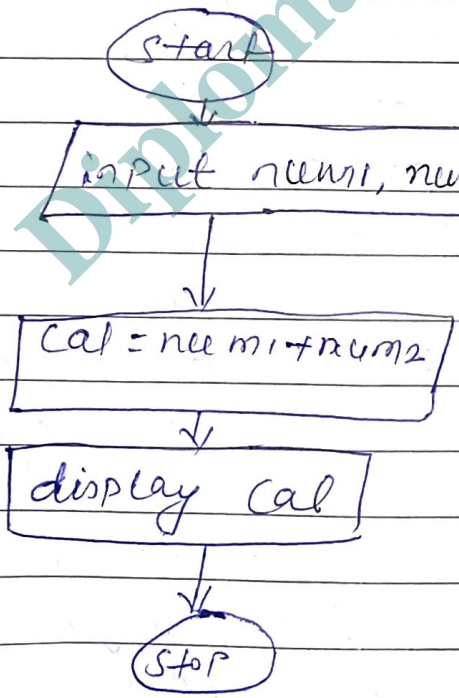


- 1) Terminal  oval.
- 2) displaying input/output  Parallelogram.
- 3) Processing  Rectangle
- 4) making Decision  Rhombus / diamond shape
- 5) Flow line  Arrow
- 6) Connector  circle

BIOS → software / firmware

POST error:  
Power on self test

Add two no



Algorithms

- Step 1) start
- Step 2:- Take two numbers num1, num2
- Step 3: Add two numbers num1 and num2
- Step 4:- display the output
- Step 5: stop.

Decision making if statement

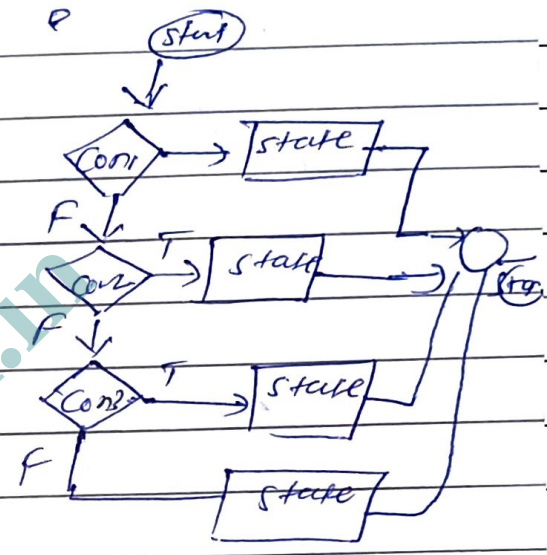
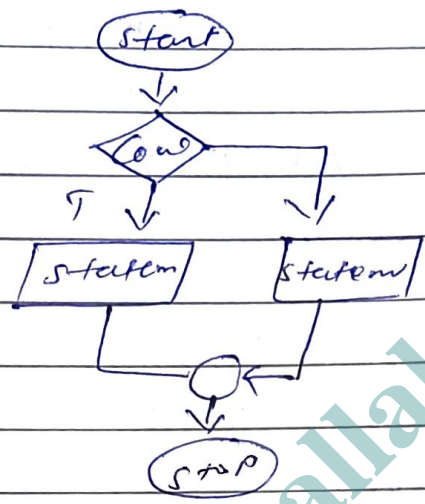
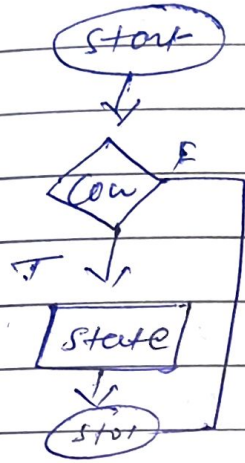
- 1) simple if
- 2) if else
- 3) else if ladder
- 4) nested if

If the condition is false then another condition professional  
non professional

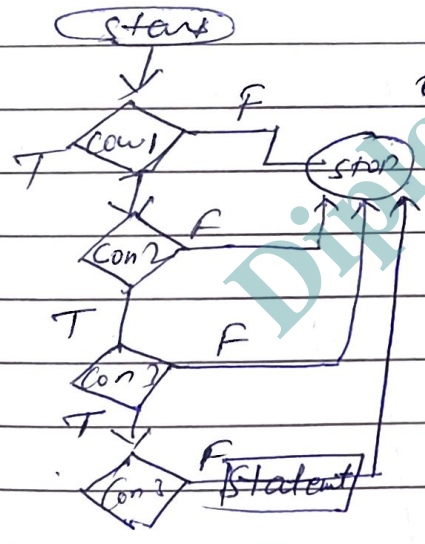
Q. Draw a flowchart to take two input and display maximum no.

1) simple if      2) if else

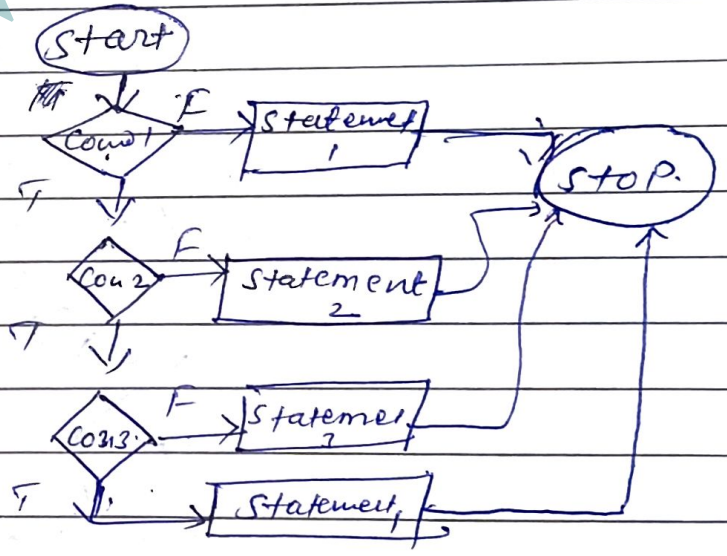
else if ladder



nested if



or



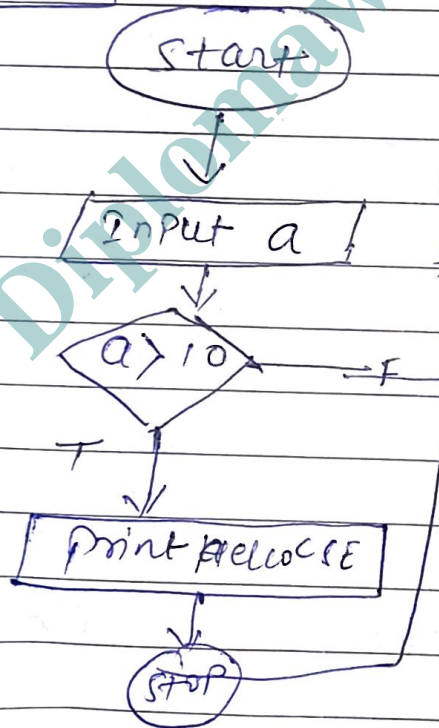
one true how go next step

Q. Draw a flowchart for simple if statement.

Q. Antivirus :- Antivirus is a type of software that is designed to detect, prevent and remove malicious software (malware) from soft computer systems. malware includes virus, worms, trojans, spyware, adware, ransomware and other types of harmful programs.

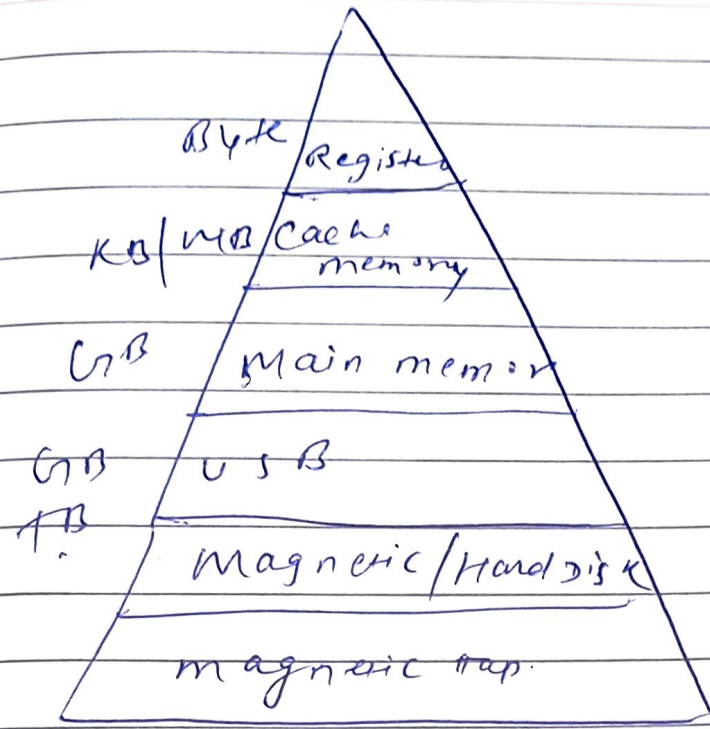
Q. Firewall :- Firewall is a network security device. All the data pass through the firewall. After examining the data firewall either pass the data or block the data.

Flowchart



Algorithms

- 1) start
- 2) Take the input number
- 3) If  $a > 10$ , then print Hello cse
- 4) display the output Hello cse
- 5) stop



Diplomawallah.in