CLASS NOTES OF "FUNDAMENTAL OF IT SYSTEM"

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J) Theory Session Outcomes (TSOs) and Units: T2418104

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
TSO 1a. Describe the anatomy of the Computer System. *TSO 1b.* List the different Input and Output devices. *TSO 1c.* Identify the different types of memory in computer systems. *TSO 1d.* Describe communication between different components of a computer. *TSO 1e.* Describe the functionalities of a computer system. *TSO 1f.* Use Internet digital Platforms	**Unit-1.0 Basics of Computer System** 1.1 Computer System and its Components. - Generation of Computer - Anatomy of Computer Systems - Input and output device - Motherboard - Peripherals - Backend and Front end of System Unit 1.2. Storage device in Computer System - Primary Storage - Secondary Storage 1.3. CPU Components - Register - Control Unit - ALU 1.4. Types of Bus - Address Bus - Data Bus - Control Bus 1.5 Search Engine - Introduction - Search Query - Applications of Internet Digital Platforms (BHIM, Digi-Locker, m-paravian, NPTEL etc.)	**CO1**
TSO 2a. Convert Binary numbers into different number systems *TSO 2b.* Classify Basic Logic gates and Universal Gates *TSO 2c.* Use basic universal logic gates to design simple digital logic circuit functions	**Unit 2.0 Digital Logic and Number System** 2.1 Introduction to digital computers and number system - Binary number system - Base conversions (Binary, Decimal, Hexadecimal, Octal) - Binary Coded Decimal 2.2 Basic Logic gates - AND, OR, INVERTER, XOR, XNOR - Working of Universal Gates - NAND Gate - NOR Gate	**CO2**
TSO 3a. Explain the functions and services of OS. *TSO 3b.* Explain different types of operating systems. *TSO 3c.* Write steps to Install Windows/Linux Operating System using a hypervisor. *TSO 3d.* Differentiate the licensed and freeware software.	**Unit 3.0 Computer Software and Operating System** 3.1 Different Types of Computer Software - Application Software - System Software - Utility Software 3.2 General features of OS - Introduction - Need, Functions, Services 3.2 Types of OS - Batch Operating System. - Multitasking/Time-Sharing OS. - Multiprocessing OS.	**CO3**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
	- Real-Time OS. - Distributed OS. - Network OS. - Mobile OS 3.3 Windows & Linux Operating Systems (Installation) - Microsoft Windows OS (History Basic Features, Current State of OS) - Linux Operating System (Architecture, Components of Linux System, Kernel Mode vs User Mode, Basic Features) 3.4 Proprietary & Open-source software	
TSO.4a Compare various computer network topologies and types of networks. *TSO.4b* Describe the functions of Networking Devices. *TSO.4c* Classify the concepts of Modulation & Multiplexing for Digital Communication. Describe various wired and wireless media for digital communications. *TSO.4d* Explain the use of IP addressing systems, DNS, and communication devices in the Internet and Intranet.	**Unit.4.0 Computer Network and Internet Tools** 4.1 Basic terminology of Computer Network - Network and its types (LAN, MAN, WAN) 4.2 Network Topology (Bus, Ring, Star, Mesh) 4.3 Networking Devices (Types and use) - Hub, Switch, Router, Bridge, Gateway, Modem, Repeater, Wireless Access Point, NIC 4.4 Transmission modes (Simplex, half-duplex, Full-duplex) 4.5 Modulation (Definition and Need) - Types of Analog Modulation - Types of Digital Modulation 4.6 Wired and Wireless media - Twisted -pair, - Coaxial, - Fiber Optics, - Radio - Infrared - Satellite 4.7 Internet & Intranet - URL - Internet - Intranet - Comparison between Intranet & Internet 4.8 Network Addressing (IPv4) - Internet Protocol (need, types) - Classful addressing scheme, Address space, notations, netid, hostid - Need of IPv6	**CO4 and CO5**
TSO 5a. Explain concepts of Information Security for Data Protection. *TSO 5b.* Classify various cyber-attacks. *TSO 5c.* Describe cyber laws for data protection and IPR	**Unit. 5.0 Information Security** 5.1 Need for Information Security - Definition of various terms of Information Security. - Cryptography - Vulnerability - Threat - Attack - Encryption - Decryption	**CO6**

Major Theory Session Outcomes (TSOs)	Units	Relevant COs Number(s)
	5.2The Principles of Security & Confidentiality, Integrity, Availability (CIA triad) 5.3Security services, Use of Firewall 5.3.1 Cyberattacks - Introduction of common types of attacks (Malware, Man-in-the-middle attack, Denial-of-service attack, SQL injection, Phishing, Password cracking.) 5.3.2 Cyber Law IT Amendment Act 2008 (Section 66 & 67)	

Note: One major TSO may require more than one Theory session/Period.

K) Suggested Laboratory (Practical) Session Outcomes (LSOs) and List of Practical: P2418104

Practical/Lab Session Outcomes (LSOs)	S. No.	Laboratory Experiment/Practical Titles	Relevant COs Number(s)
LSO 1.1. Install device driver. *LSO 1.2.* Install given software on your system. *LSO 1.3.* Perform Registration process on digital India platform.	1.	1.1 Identify specifications of various types of computer systems available in your institute. 1.2 Install Printer, scanner driver. 1.3 Install any two freeware or open-source software/tool by using web browser 1.4 Use Digital India Platforms: BHIM, Dig-Locker, m-parivahan, NPTEL.	CO-1
LSO 2.1. Verify truth table of basic logic gates *LSO 2.2.* Design basic logical gates with NAND and Nor gates	2.	2.1 Using Integrated circuit (IC), verify the truth table of basic logic gates. 2.2 Verify truth table and digital logic circuits of basic logic gates with the help of NAND gate using IC. 2.3 Design digital logic circuit functions of basic logic gates with the help of the universal gate-NOR Gate using IC.	CO-2
LSO 3.1 Identify different software in the PC LSO 3.2 Install different operating systems on PC. LSO 3.3 Use different Linux commands in real life.	3.	3.1 Install windows and Linux operating system 3.2 Practice of Basic UNIX Commands and various UNIX editors such as vi, ed, ex.	CO-3
LSO 4.1. Configure IPV4 addressing in the pc of a network *LSO 4.2.* Implement the cross-wired cable and straight-through cable using a clamping tool. *LSO 4.3.* Interpret Ping and Traceroute Output.	4	4.1 Identify the different networking devices. 4.2 Configure the IPv4 address in every computer in the computer network lab 4.3 Learn different LAN connections in the computer network lab. 4.4 Practically implement the cross-wired cable and straight-through cable using the clamping tool. 4.5 Interpreting Ping and Traceroute Output 4.6 Run Packet tracer tool	CO-4

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[I. T System]

Unit - 1 :-

[Computer] : It is an electronic device which takes Input ① with the help of input device ②, Process it and gives Output ③ as result with the help of Output device. ④

Input :- It is a process in which we give any data, instruction or information from outside to a computer system.

* **Data** :- It is raw fact & figures which have not a meaning

boy | a | is | good | Ram

* **Information** :- When data is Assambled in Meaningful way it is know as information.

eg:- Ram is a good boy.

* **Instructions** :- Thes are group of words with a special meaning to perform a task in Computer.

Recap

Fundamental of I.T

① Computer

② Input Devices :- ① Keyboard :-

* How a keyboard works ?

① ANSI :- American National Standard Institute

② ASCII :- Amercian Standard Code for Information Interchange.

Recap :-

Computer :-

Input :- ① keyboard :- How it works ?

① ANSI :→ American National Standard Institue

अमेरिकी राष्ट्रीय मानक संस्थान

Set of Rules

ii) ASCII : American Standard Code for Information Interchange

अमेरिकी राष्ट्रीय मानक सूचना आदान प्रदान

A → 65

B → 66

C → 67

⋮

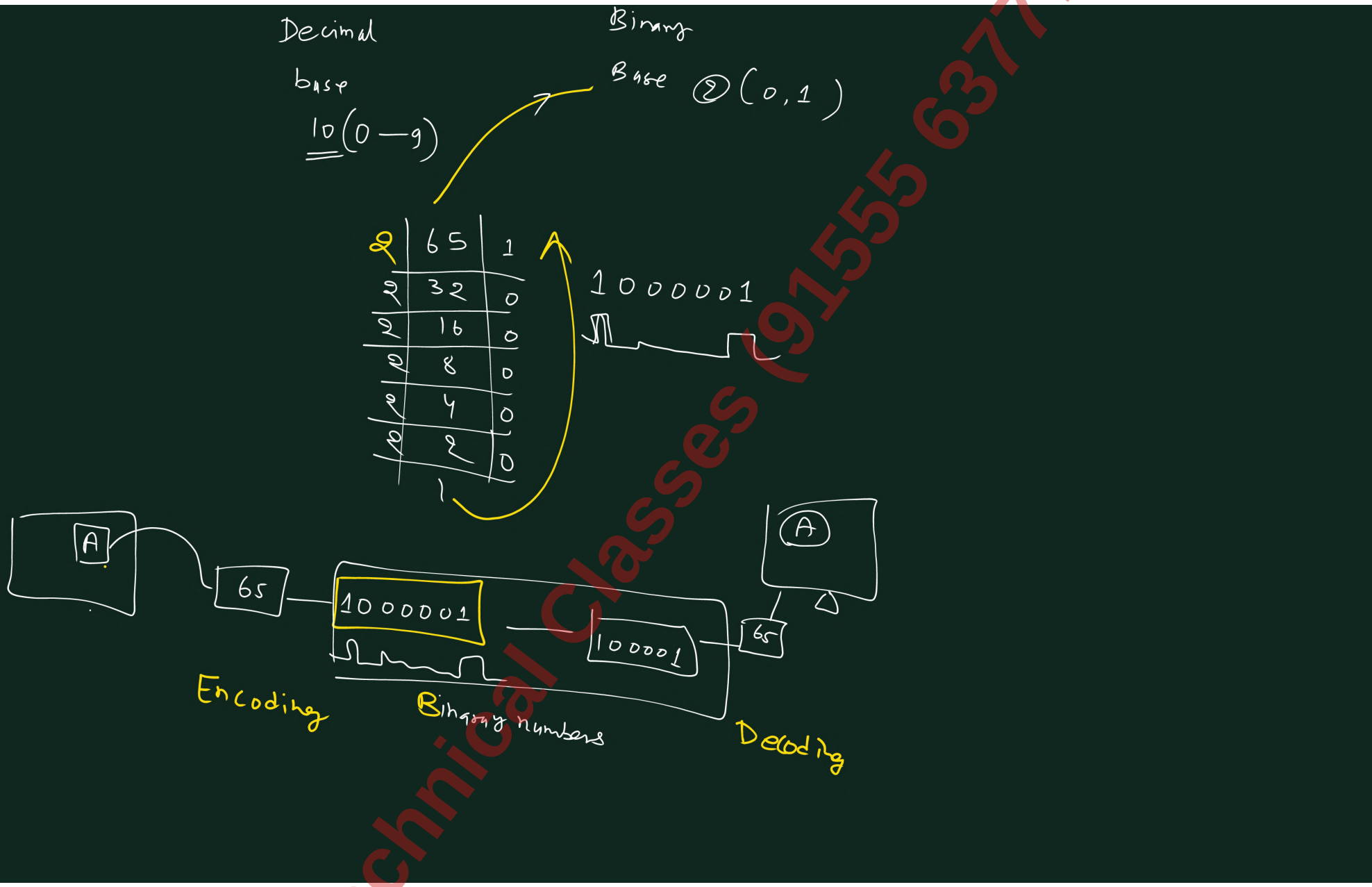
Z .

a → 97

b → 98

⋮

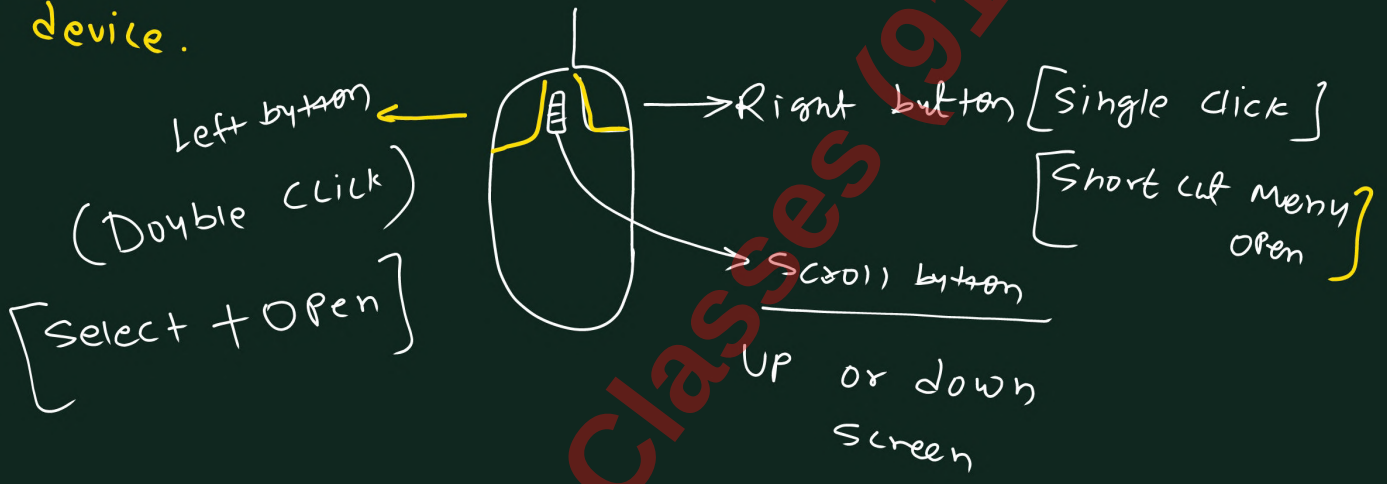
z .



ANSI:- It is Standard Institue of America which definded set of rules and informed all keyboard making Company that they will have to follow the rules otherwise their keyboard will be banned.

ASCII:- It is the rule given by ANSI in which each character on the keyboard have an uniqe decimal number. Eg:- A → 65 | a - 97
B → 66 | b - 98

Mouse :- It is an input device which is use to Point and select any Object on a Computer screen. So that it is also know as Pointing device.



Types of Mouse.

(i) Mechnical Mouse :- Metal ball

(ii) Optical Mouse :- Laser Light

[Good Evening]

Scanner It is an input device which is used to Convert any Physical Objects such as text & image in Digital and Stores in memory for further use.

There are following types of Scanner

(i) OMR :- Optical Mark Reader

(ii) OCR :- Optical Character Reader

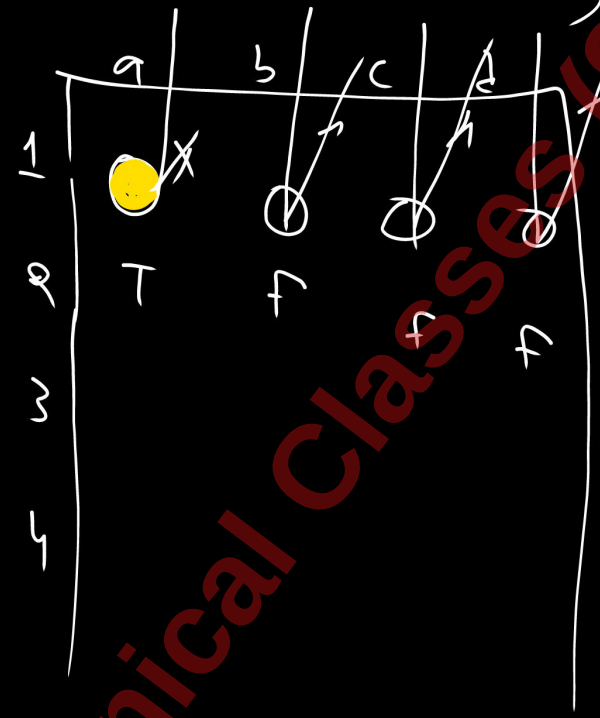
(iii) MICR :- Magnatic Ink Character Reader

(iv) Barcode Reader

① OMR: OPtical Mark Reader :- It is used to evaluate

ओप्टीकल मार्क रीडर

the answer sheets (OMR sheets) used in examation.



OCR :- Optical Character Reader :- These are general Purpose Scanner that converts any Physical Object into Digital. It is also known as Flatbed scanner.

MICR :- Magnatic Ink Character Reader :-

It is a type of scanner which is mainly used in banking sector to stop duplicacy of cheque.

BAR Code Reader :- It is a hand held Scanner which is uses to decode the information given in barcode. It saves our time.

Output Device :-

Such Type of device which is used to take any information or Result from a computer system to out-side of work.

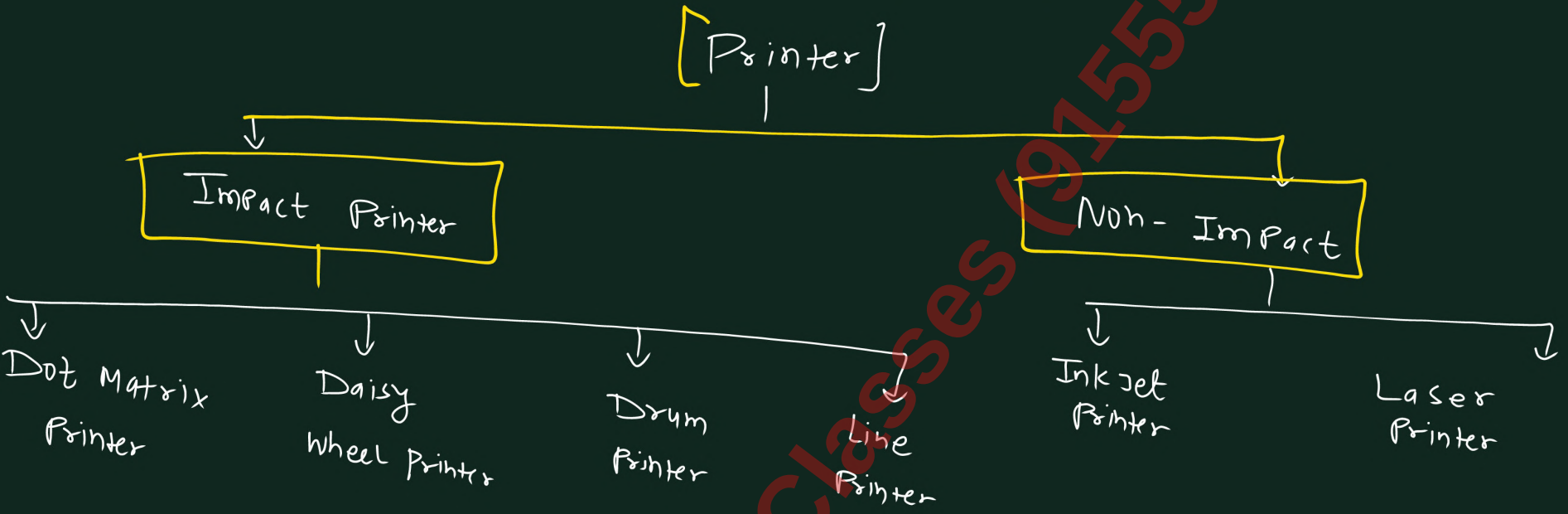
There are following types of Output device.

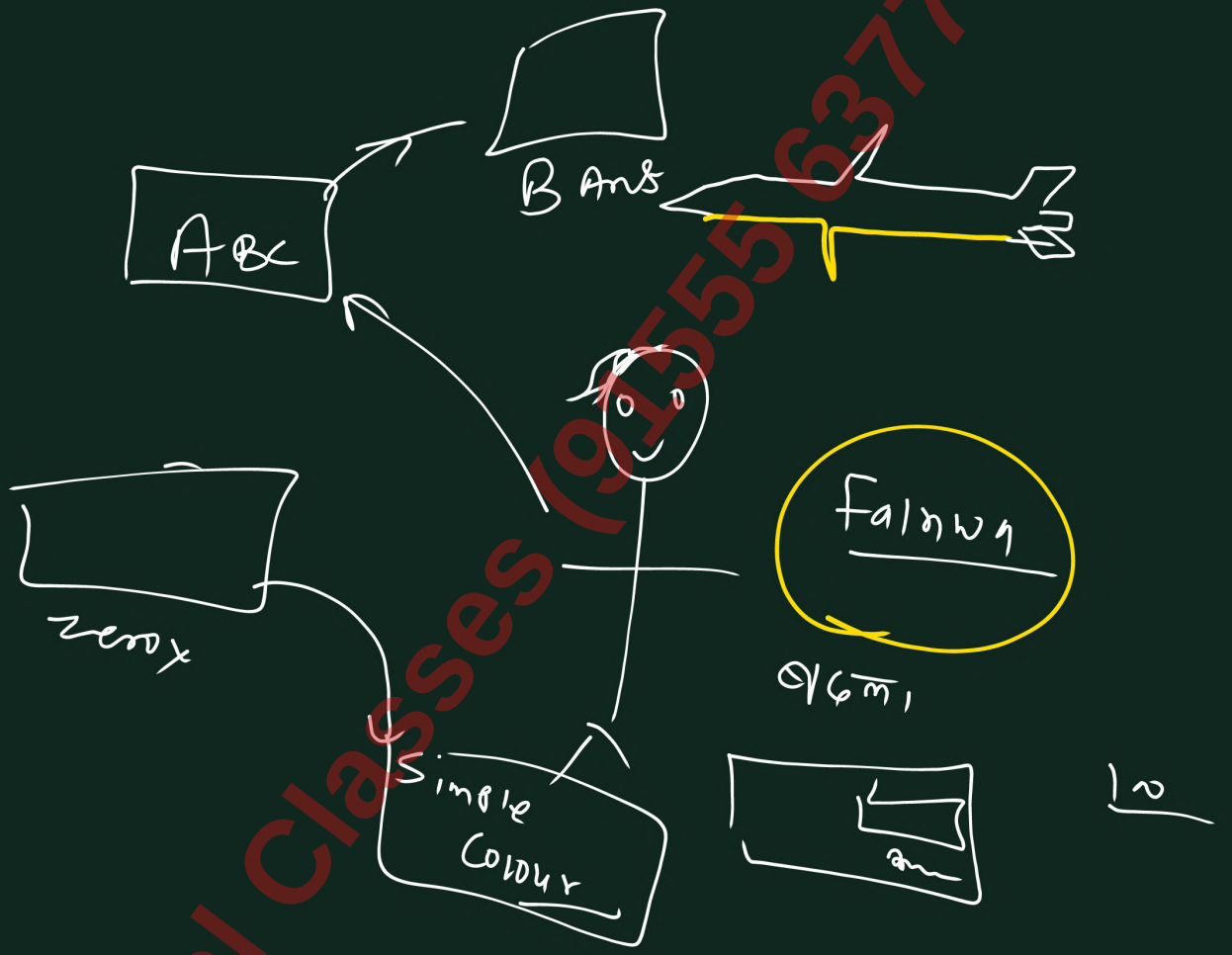
i.> Printer

ii.> Monitor

iii.> Plotter.

Printer :- It is an output device which is used to take result on a Paper [Hard copy].





Monitor :- It is standard output device which is used to take result in soft copy form from a computer system to outside.

There are three types of Monitor.

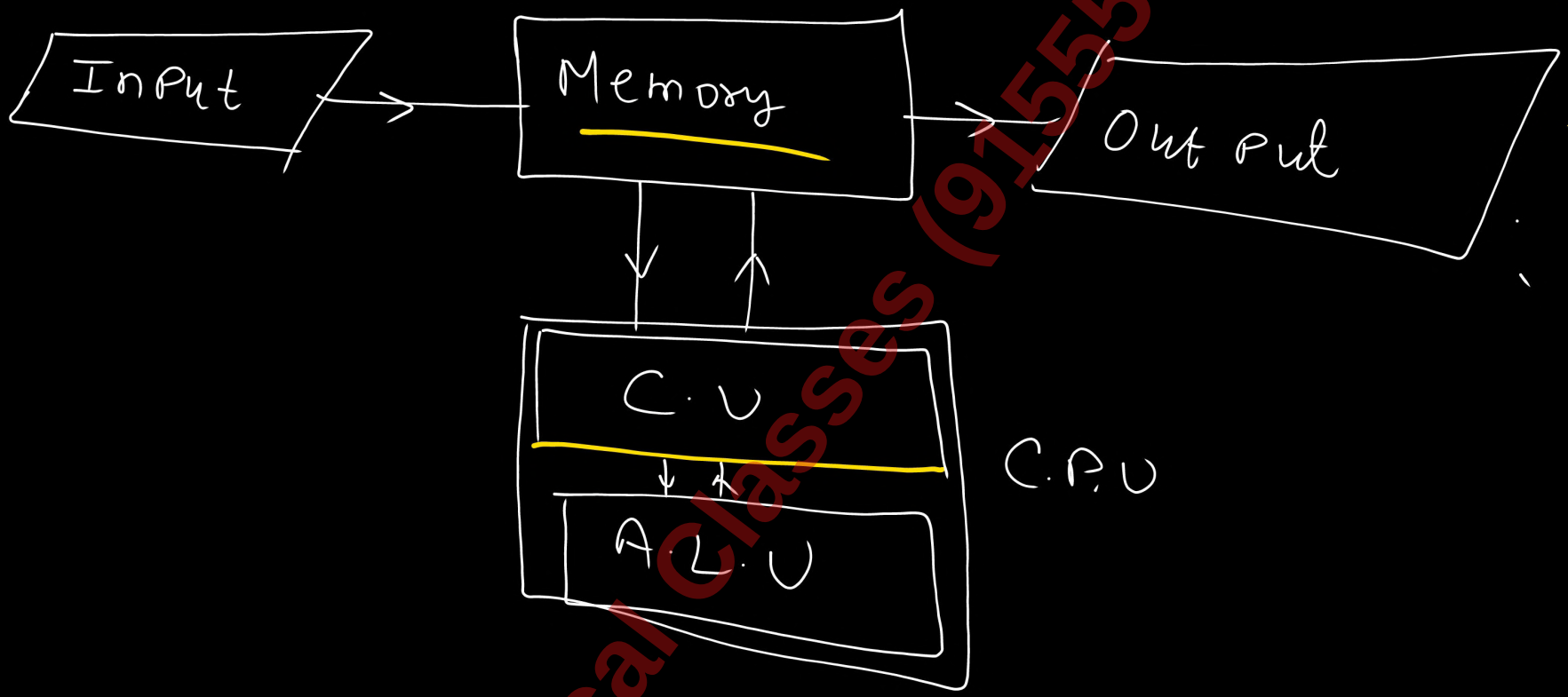
C-R-T (cathod Ray tube)

~~L-C-D (Light Emitting Crystal display)~~

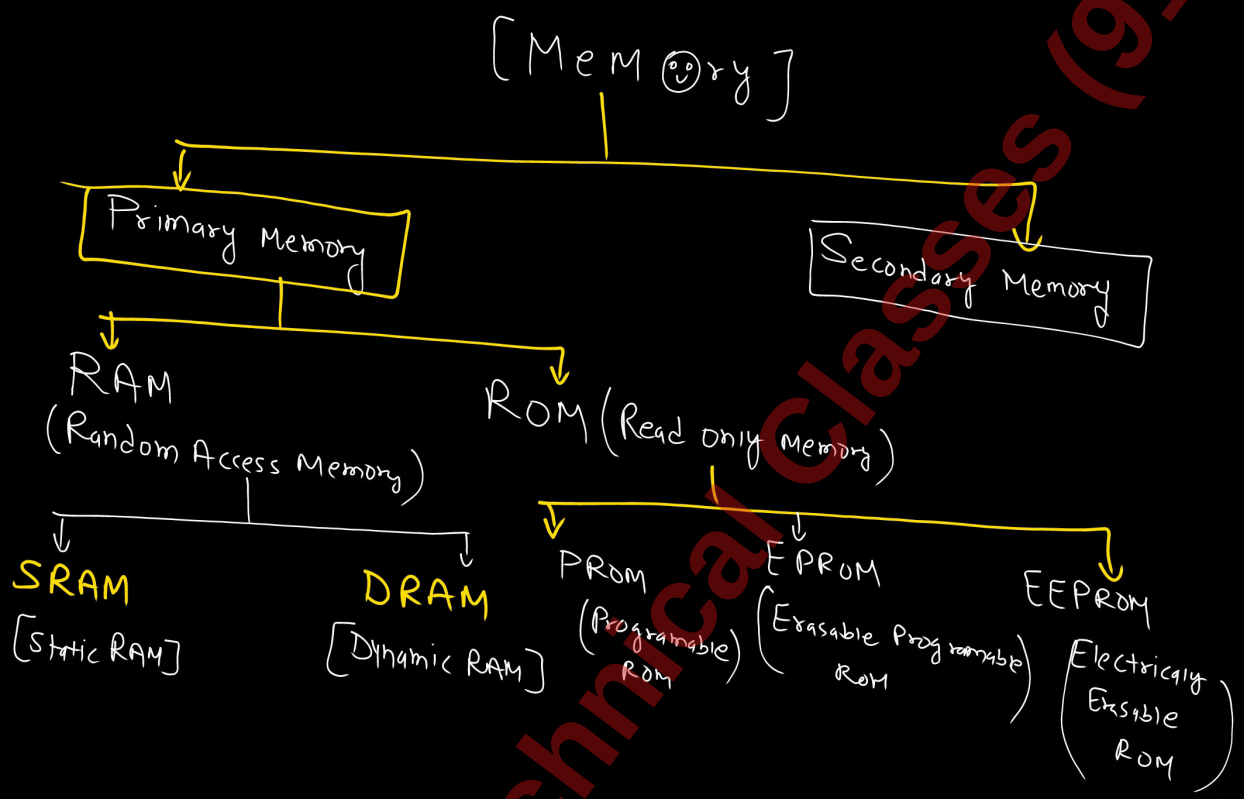
L-E-D (Light Emitting diode.)

L-C-D (Liquid Crystal display)

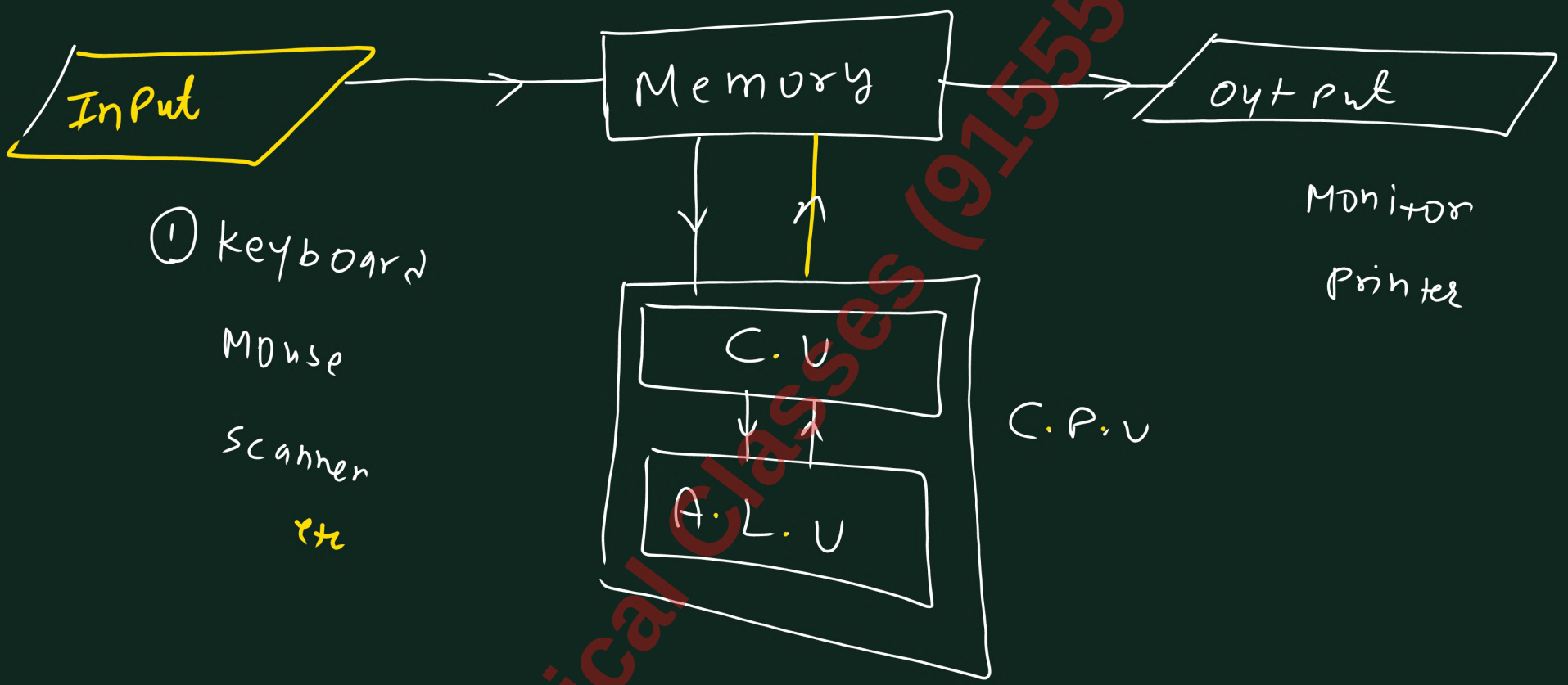
[Block Diagram of a Computer]



Memory :- It is a Place inside or Outside of a Computer which is used to Store any data or information for either Short Period or for Long Period.



[Block Diagram of a Computer]



① keyboard

Mouse

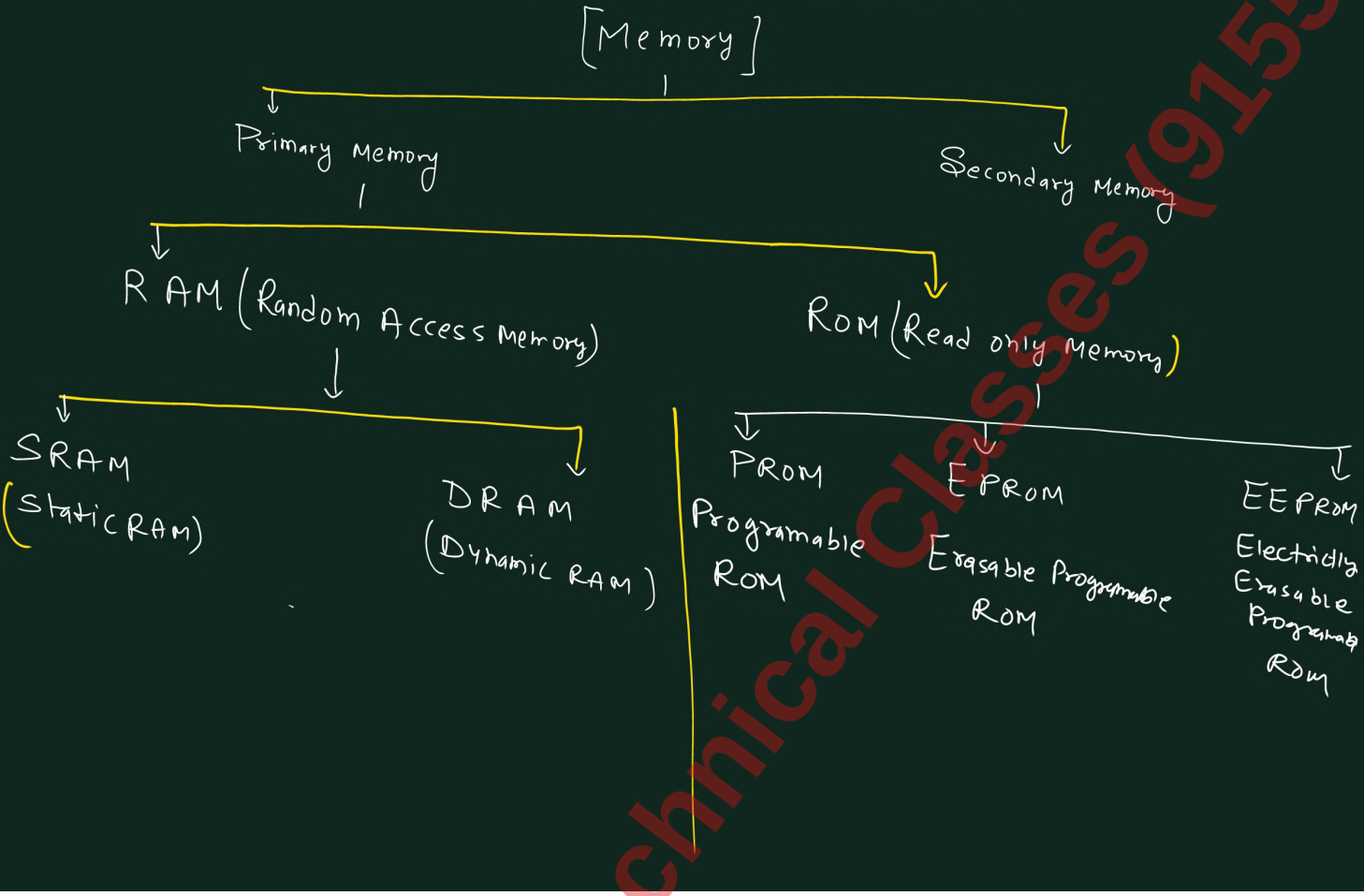
Scanner

etc

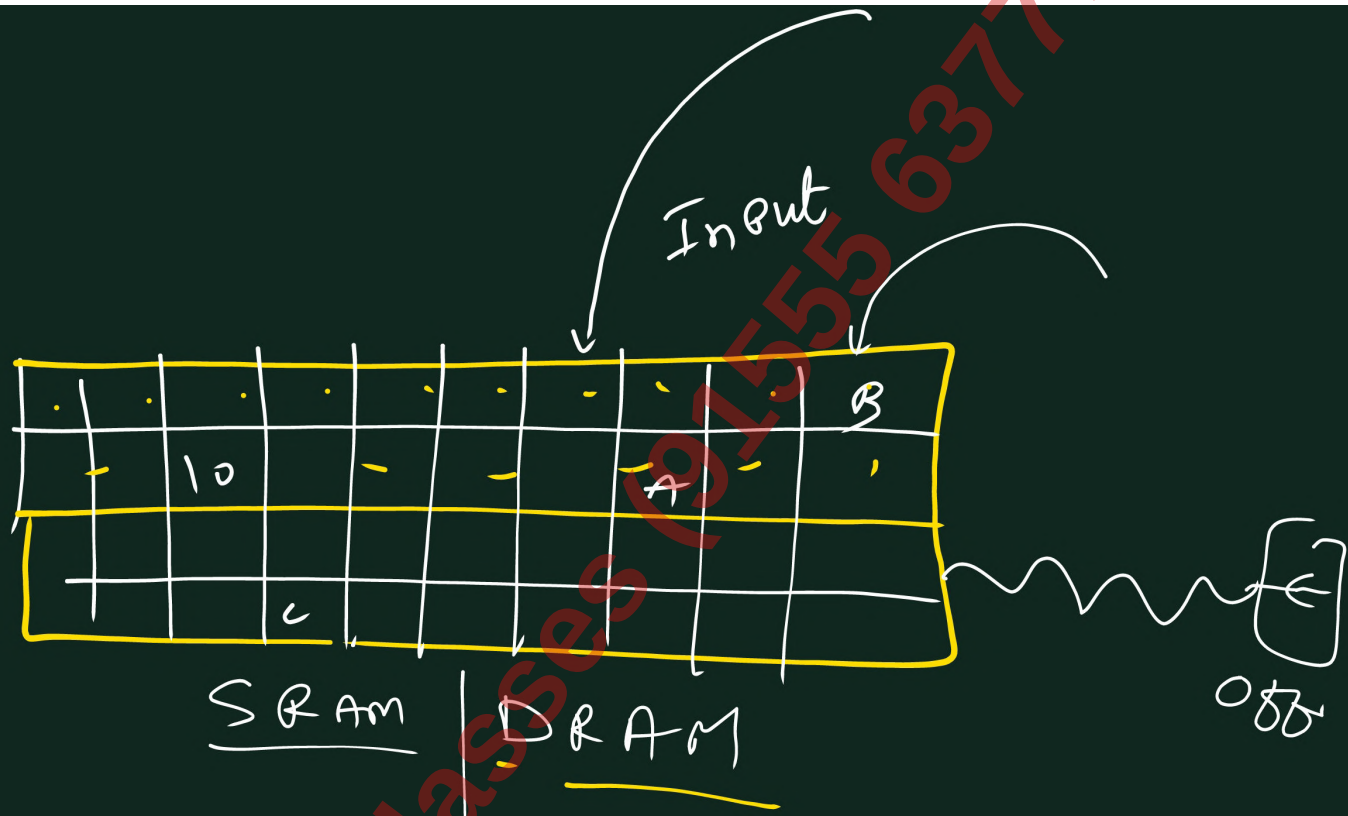
Monitor

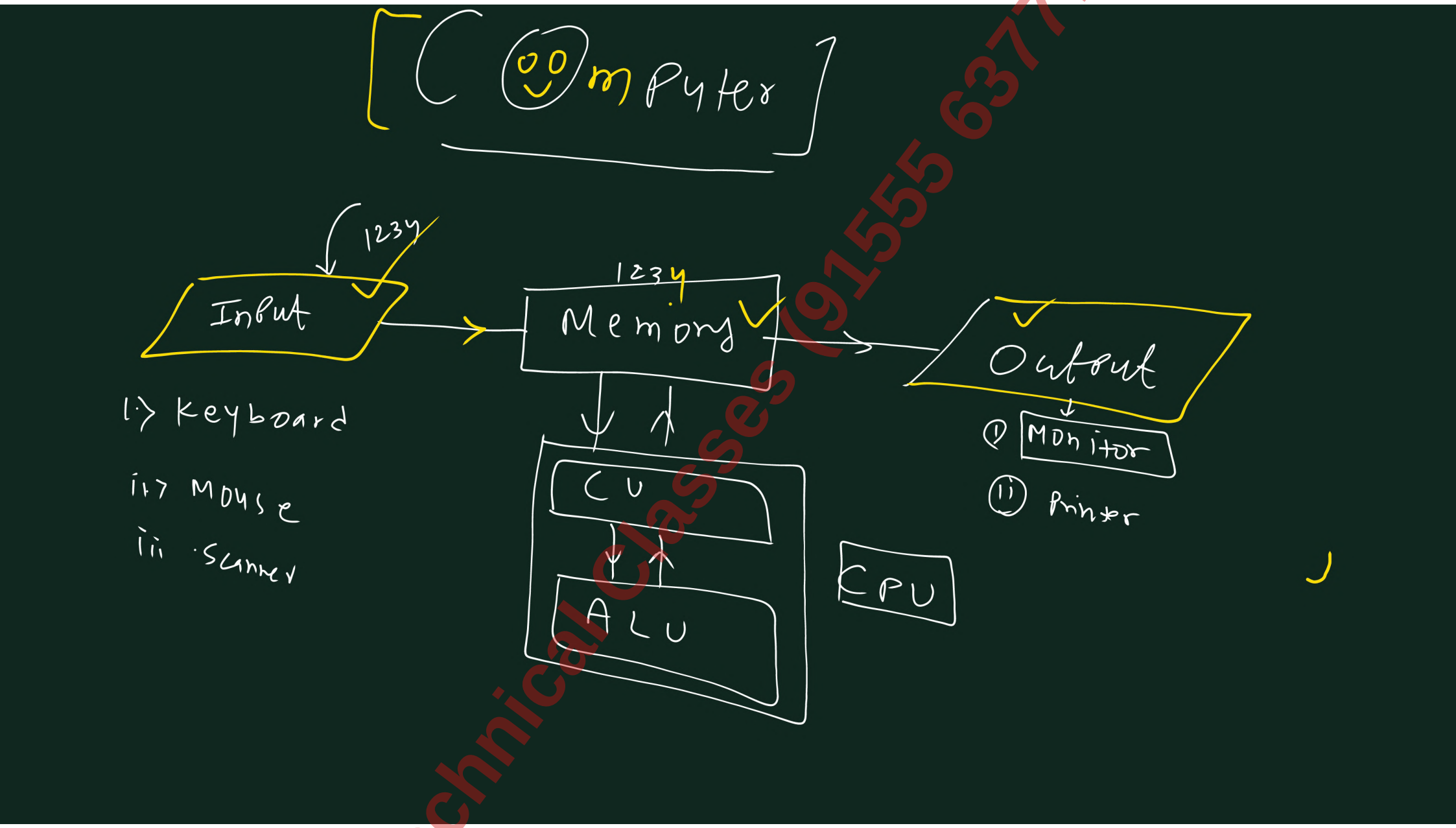
Printer

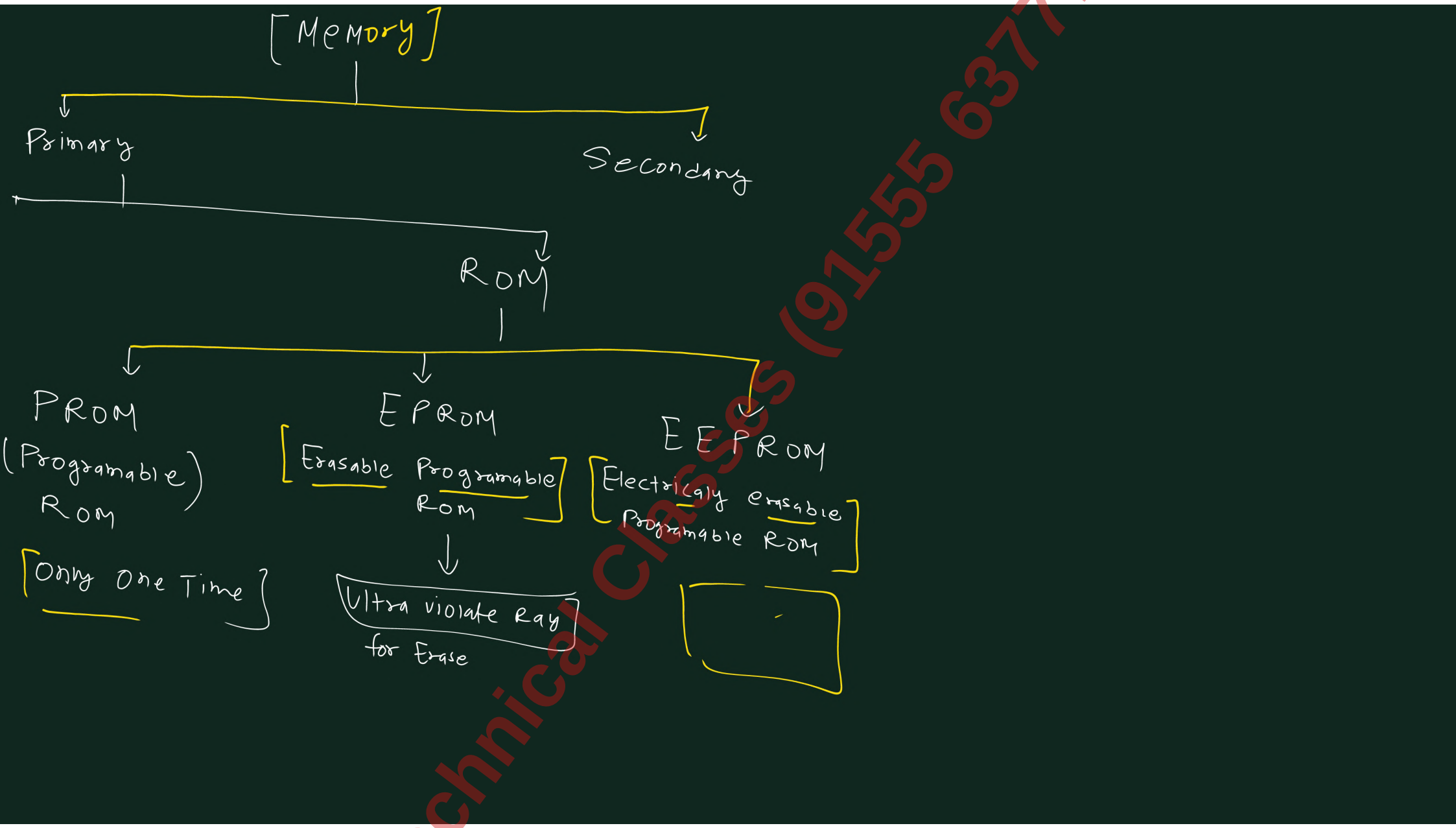
Memory :- Memory is a Place where a Computer system Stores any data or information for either short time or for Long time.



RAM (Random Access Memory) : It is Primary Memory of our Computer System which holds any input for CPU. It is Volatile memory (भूलनकार). It means data stored in RAM deleted aytomatically if Power supply turn Off.







C.P.U [Central Processing Unit] :- It is a

microProcessor also know as BRAIN of the

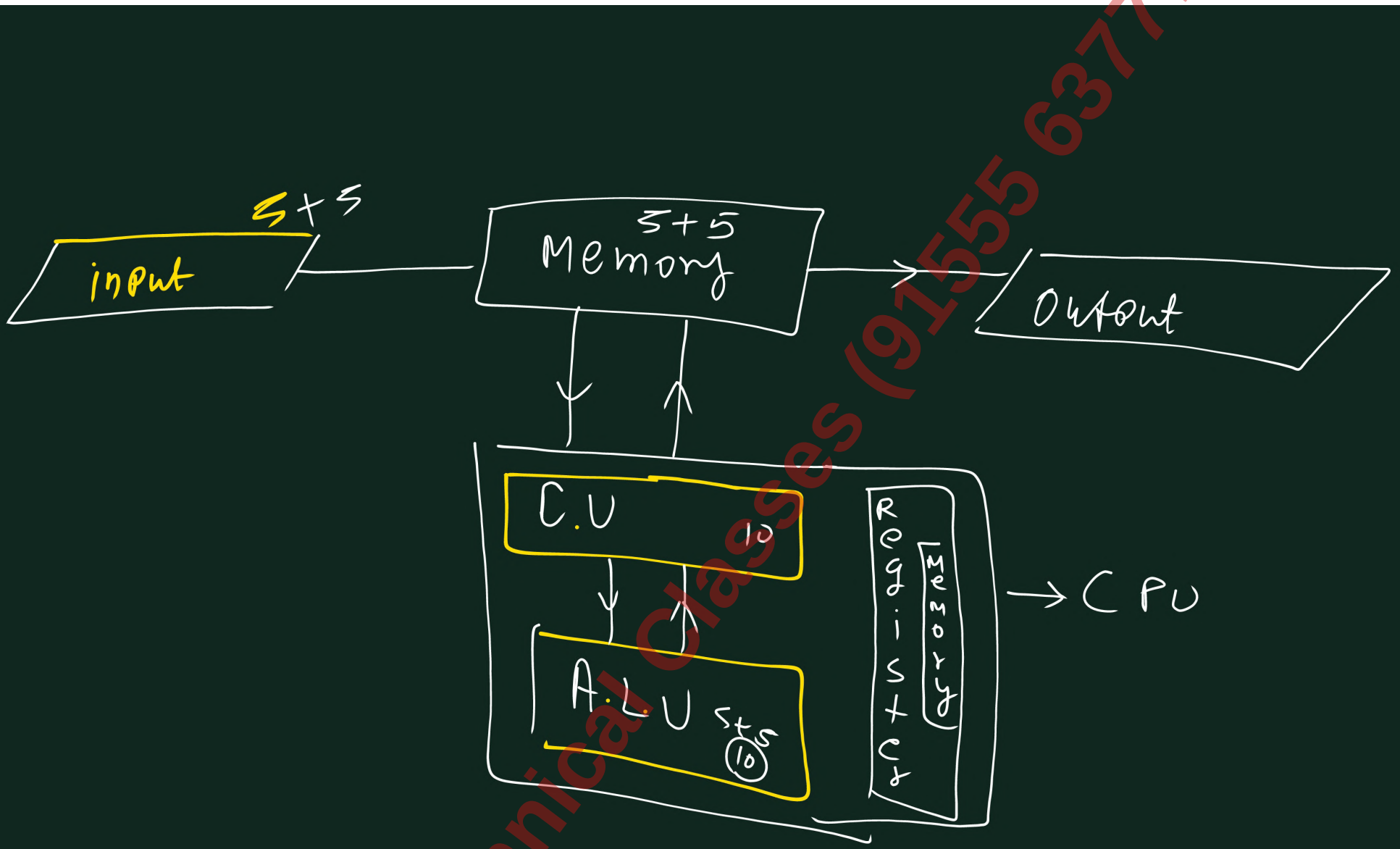
Computer, Consists of three Parts.

i) C.U [Control Unit]

ii) A.L.U [Arithmetical Logical Unit]

iii) Register (Memory)

C.U [Control Unit] :- It is Part of the CPU which is responsible for Controling the Hardwares Component of a Computer. It works Like a manager. so that it is also known as Heart of a Computer.



CPU :- [Central Processing Unit] :- It is a microprocessor also know as brain of the computer. It is made up of 3 components

(i) Memory (ii) C U (control unit)

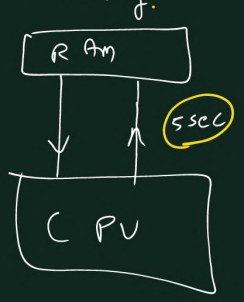
(iii) ALU (Arithmetical Logical Unit)

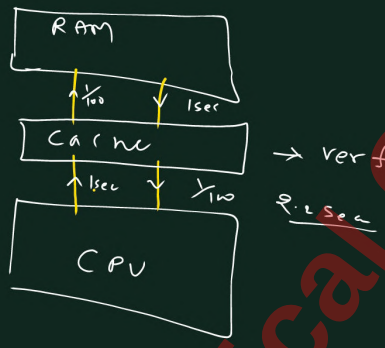
* C U (control unit) :- It is also known as Heart of the computer. It works just like a manager.

* ALU (Arithmetical Logical Unit) : In this unit all type of +, -, ×, / and >, <, >=, <= ≠, = Operations are Performed.

Register :- It is also a type of memory which is used to **hold** data for CPU Processing. It is faster than RAM but can hold very few data in it. It is cheaper than main memory.

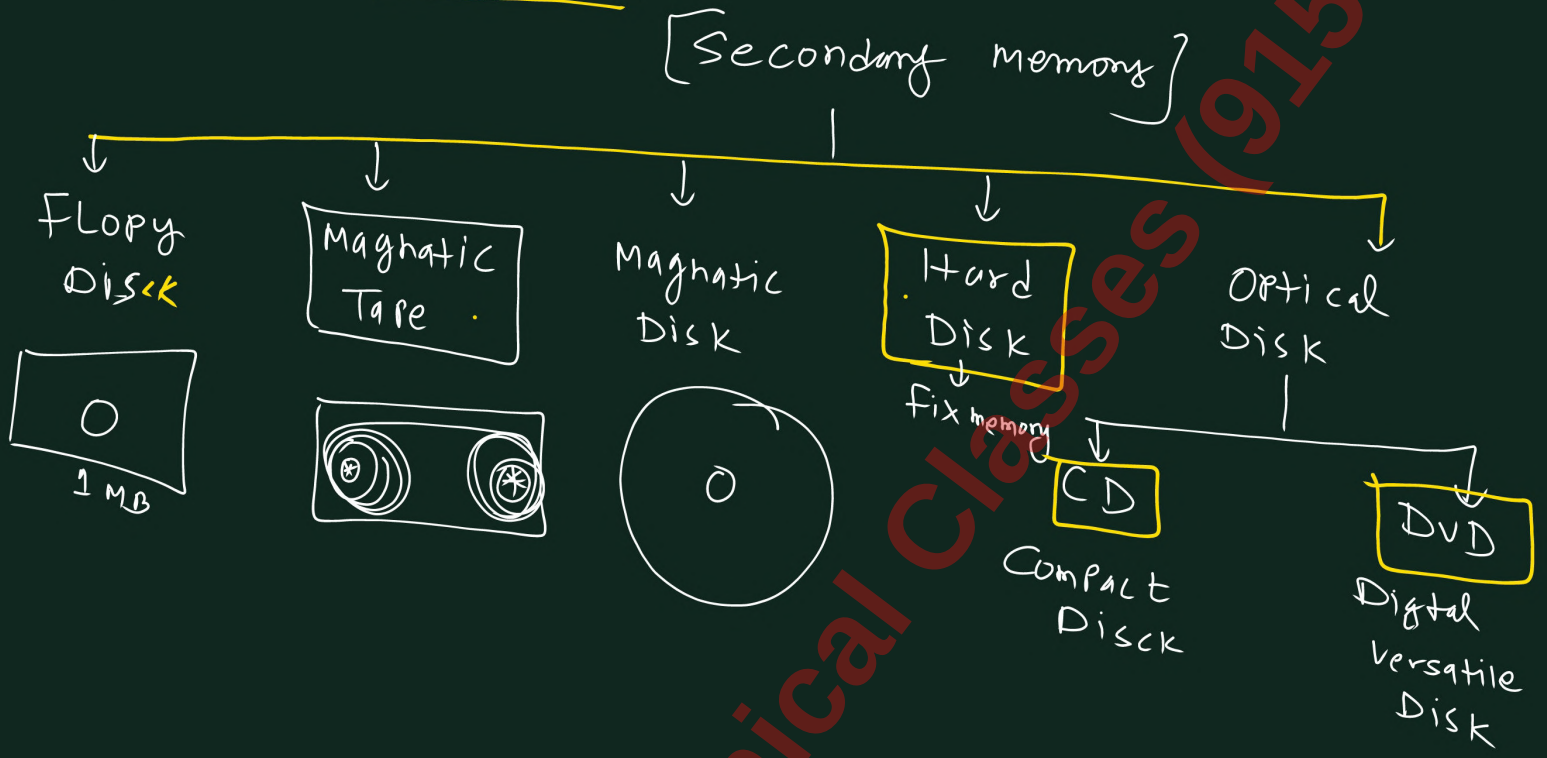
Cache Memory :- It is the **fastest** memory of computer which is placed between main memory and CPU to reduce processing time. It is very costly memory.

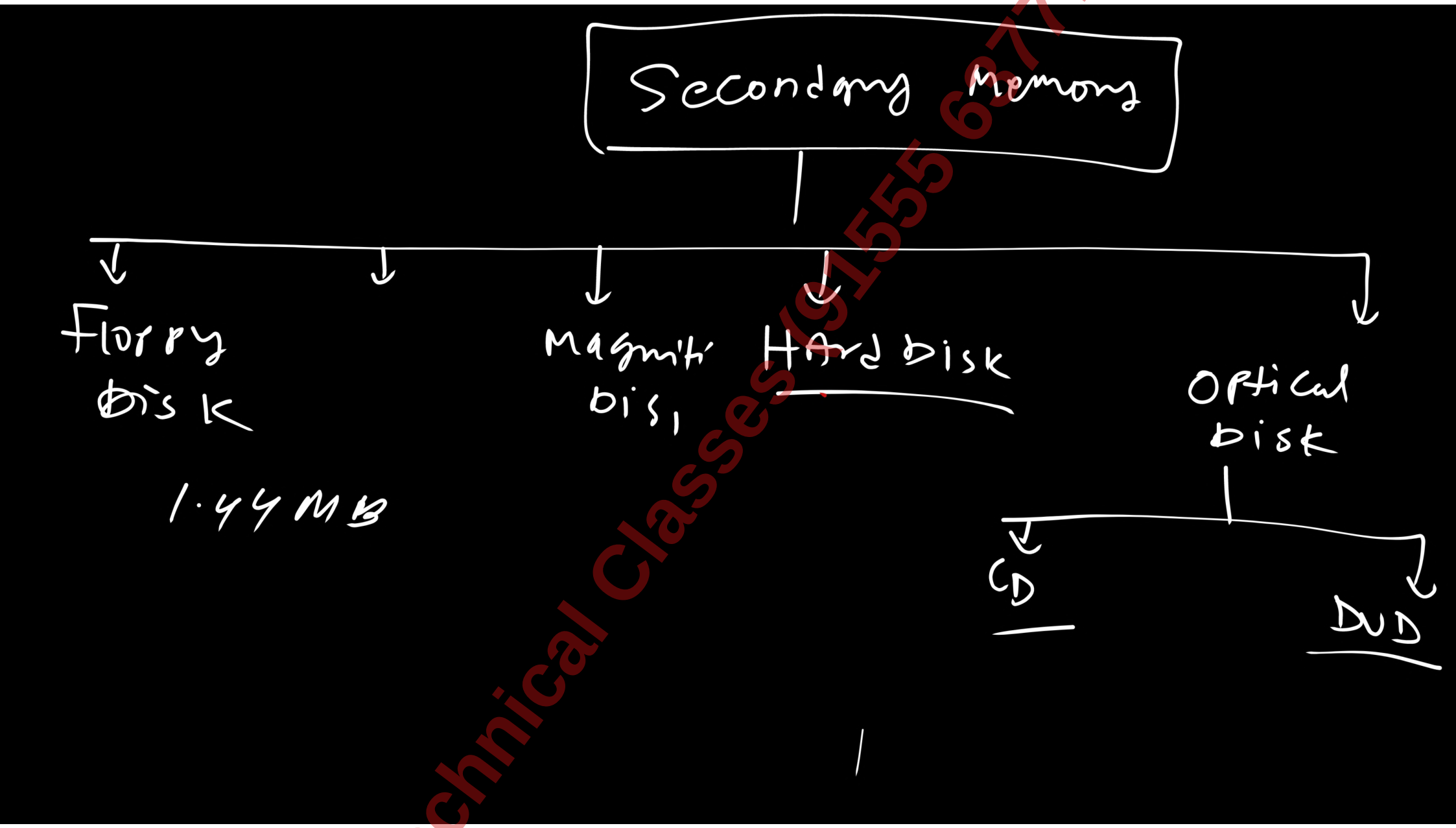


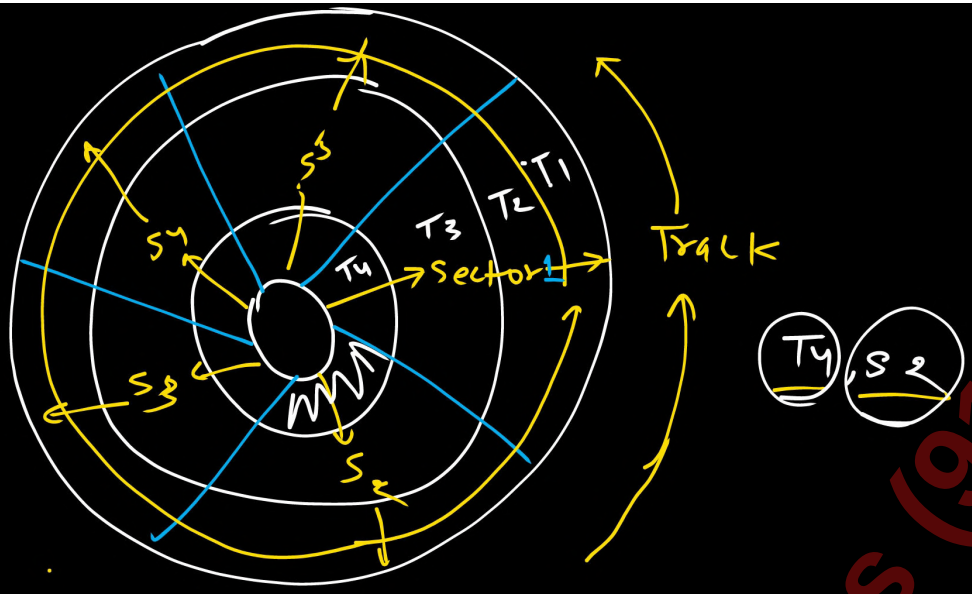


→ very fast
9.1 sec

Secondary Memory :- It is Permanent memory of our Computer system which is used to save data for further use.







A Disk is Logically Divided into two Parts

1.> Track:.

2.> Sector.

Track :- It is Circular Path

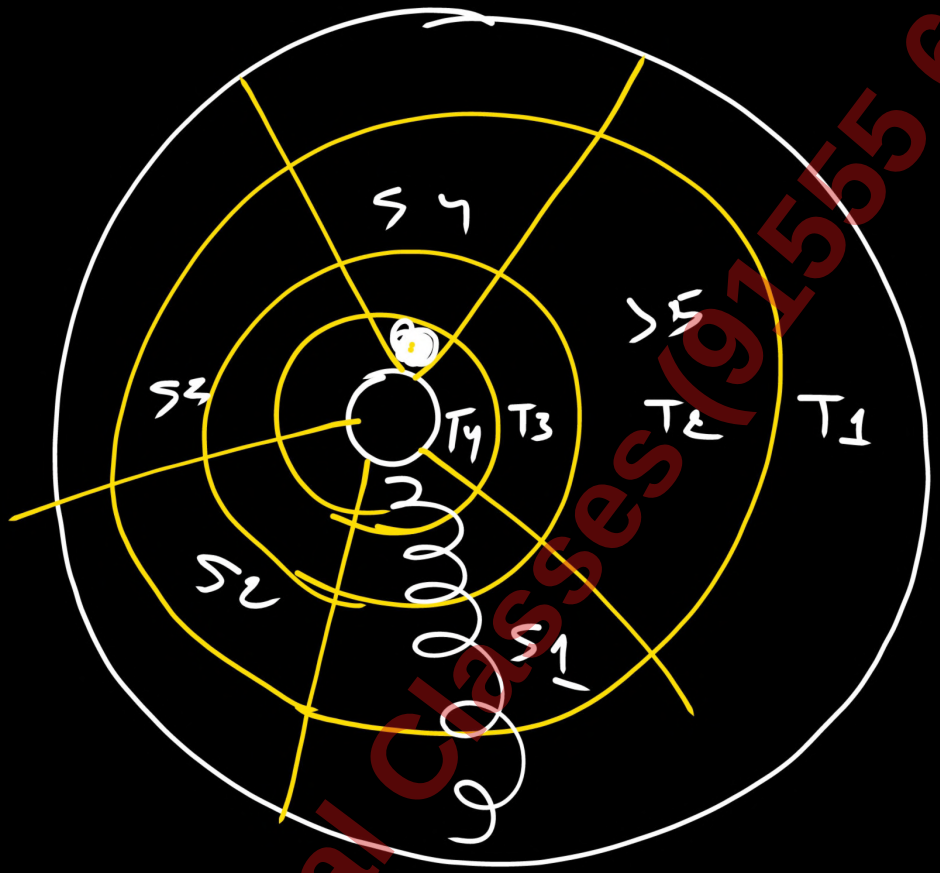
Sector :- It is Sub Part of a Track.

T.T.T.

Generation of Computer

I st Gen	II nd Gen	III Gen	IV Gen	V Gen
* ✓	* * ✓✓	* * *	* * *	* * * *
Vaccum Tube	Technology Change → Transistor	IC Integrated Circuit	LSI Large Scale IC	VLSI Very Large S I

fast
Small
Cheap



S4, T4 (RAM)

The generation of computers can be broadly divided into five phases, known as “generations,” each marked by significant technological advancements.

1st Generation (1940s-1950s)

- **Technology: Vacuum tubes**

Vacuum tubes were key components in early electronic devices, especially in the first generation of computers. They were essential in amplifying and switching electrical signals, and they played a crucial role in the development of early radio, television, and computers.

Key Features of Vacuum Tubes:

1. **Structure:** : A vacuum tube consists of a sealed glass or metal container from which air is evacuated, creating a vacuum. Inside the tube are electrodes (typically cathode, anode, and sometimes a grid).

- **Cathode:** Emits electrons when heated.

- **Anode:** Collects the electrons.

- **Grid:** Controls the flow of electrons between the cathode and anode, allowing amplification or switching.

2. **Functions:**

- **Amplification:** Vacuum tubes could amplify weak electrical signals by controlling the electron flow between the cathode and anode.

- **Switching:** By turning the electron flow on or off, vacuum tubes could act as switches, crucial for binary operations in early computers.

3. **Applications:**

- Early computers like the **ENIAC** used vacuum tubes for processing information.

- Vacuum tubes were also widely used in radios, televisions, and other early electronic communication systems.

Advantages:

- Allowed the first computers and electronic devices to process signals and perform calculations.

- Provided high-speed amplification in radio and audio systems.

Disadvantages:

- **Size:** They were bulky and took up a lot of space.

- **Heat:** They generated a significant amount of heat, leading to energy inefficiency.

- **Power Consumption:** Vacuum tubes consumed large amounts of power.

- **Reliability:** They were prone to burnout and frequent failure, requiring constant maintenance.

- **Notable Computers:** ENIAC, UNIVAC

- **Characteristics:**

- Huge in size and consumed a lot of power.

- Programming was done using machine language.

- Used punch cards for input.

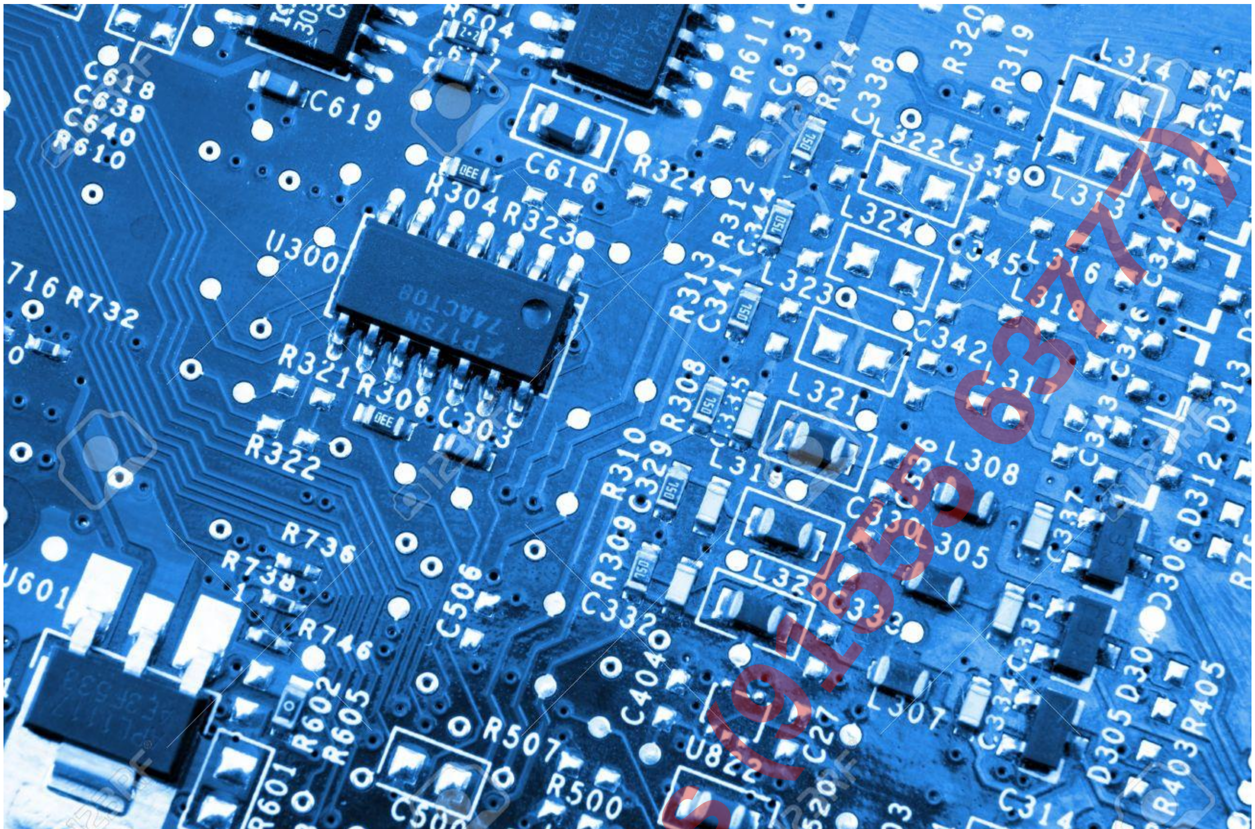
- **Advances:** Introduction of basic computation, first programmable machines.

Vacuum tubes were gradually replaced by transistors in the 1950s and 1960s, which were smaller, more energy-efficient, and reliable. This transition marked the shift from the first to the second generation of computers.

2nd Generation (1950s-1960s)

- **Technology: Transistors**

Transistors are semiconductor devices that revolutionized the field of electronics and computing by serving as switches or amplifiers of electrical signals. They replaced bulky vacuum tubes and became the key component in the second generation of computers, leading to smaller, faster, and more reliable machines.



Structure: Transistors are made of semiconductor materials, typically silicon or germanium. They have three terminals: emitter, base, and collector (in bipolar junction transistors), or source, gate, and drain (in field-effect transistors).

<u>Functionality:</u>

Switching: Transistors can turn current on or off, making them ideal for binary logic operations in computers.

Amplification: They can amplify weak electrical signals, which is useful in communication devices like radios and televisions.

- **Notable Computers:** IBM 7094, UNIVAC 1108

<u>- **Characteristics:**</u>

- Smaller, more reliable, and energy-efficient compared to vacuum tube computers.

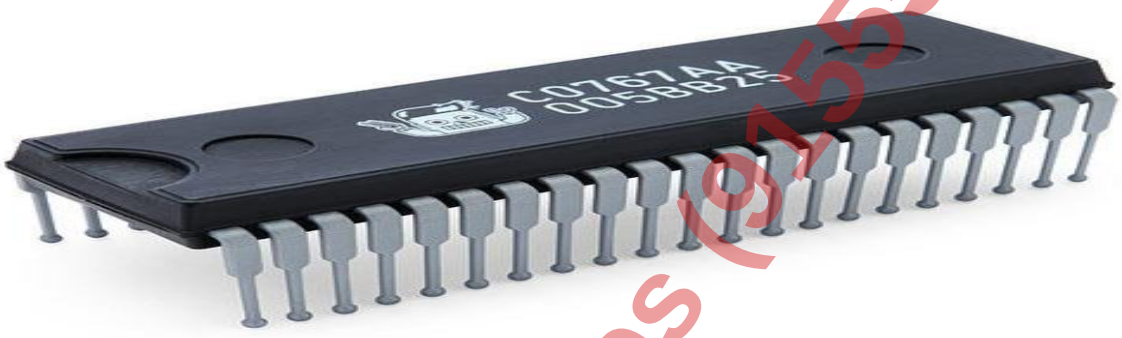
- Programming was done using assembly language and early high-level languages like COBOL and FORTRAN.

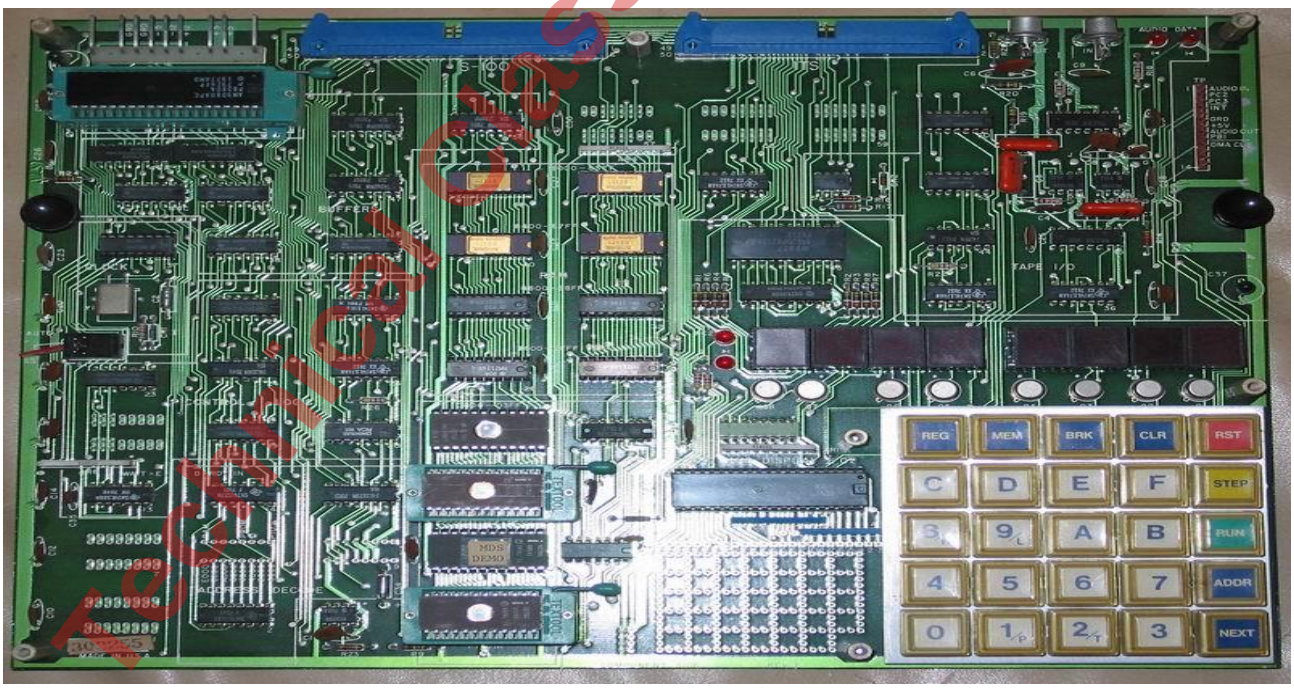
- **Advances:** Faster processing, higher reliability.

3rd Generation (1960s-1970s)

- **Technology:** Integrated Circuits (ICs)

Integrated Circuits (ICs) are a revolutionary technology in electronics that allowed multiple transistors, resistors, capacitors, and other electronic components to be fabricated onto a single piece of semiconductor material, usually silicon. This breakthrough enabled the miniaturization of electronic devices and the mass production of more powerful, reliable, and affordable technology.





- **Notable Computers:** IBM System/360, PDP-8

- **Characteristics:**

  - Further reduction in size, cost, and power consumption.

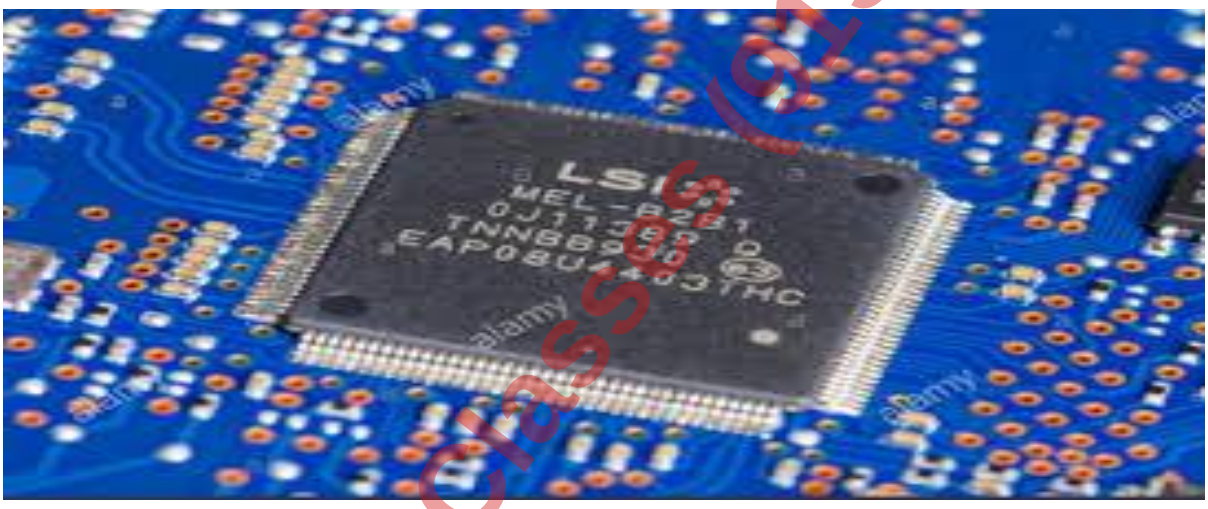
  - Multitasking and time-sharing were introduced.

  - Operating systems began to be widely used.

- **Advances:** Miniaturization, greater processing power, more widespread use in business and government.

4th Generation (1970s-Present)

- **Technology: Microprocessors (LSI, VLSI)**



- **Notable Computers:** IBM PC, Apple II

- **Characteristics:**

  - Use of microprocessors allowed the development of personal computers (PCs).

  - Graphical user interfaces (GUIs) became standard.

  - Introduction of portable and home computing.

- **Advances:** Dramatic increase in speed, availability to the general public, start of the internet era.

5th Generation (Present and Future)

- **Technology:** Artificial Intelligence (AI) and Quantum Computing

- **Characteristics:**

  - Development of computers that can learn and adapt (AI-based systems).

  - Parallel processing, high-speed networking, and cloud computing.

  - Research in quantum computers, which may lead to exponentially faster processing.

- **Advances:** Ongoing developments in AI, natural language processing, and quantum computing.

These generations reflect the rapid evolution of computer technology, from bulky machines for government and business use to personal computers and the current frontier of AI and quantum advancements.

[Anatomy of Computer System]

It refers to the core components of a computer system i.e Hardware & Software. There are following breakdown of theses key components.

1> Hardware :- These are physical components that can be touched. It is the working part of a computer system. Such as

* CPU [Centeral Processing Unit] → Brain of Computer
* Memory : Primary , secondary
* Input device : Keyboard, Mouse, Scanner
* Output device :- Printer , Monitor
* Motheboard :
* Peripheral Devices. :

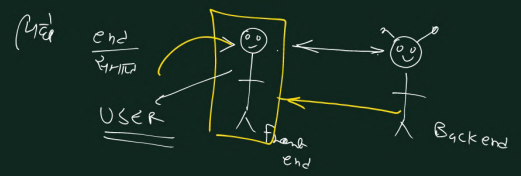
Motherboard :- It is the main circuit board in a Computer, on which various electronic components are Placed. so that it Acts Like a hub where all hardware Communicate with each other. It also Connects CPU, Memory, storage and Peripherials.

* Peripheral devices :- Any device which can be attached or connecte with our Computer system is known as Peripheral devices.

Such as Printer, Pendrive, keyboard, mouse etc

[Computer Fundamental]

Backend and Front end of a Computer system



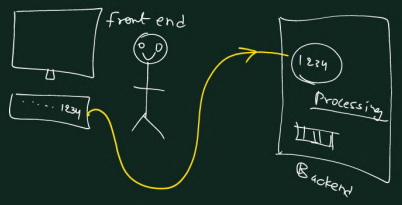
Backend :- The Backend of a Computer system refers to the Parts of the computer system which actually perform the Processing and are not directly in contact with user. Such as

* CPU
* Memory
* Motherboard
* Other Hardware.

Front End :- It Refers to the hardware or Software to whom a user directly Intracts.

Eg :- Keyboard, Mouse, touchscreen, etc

∴ Operating System, Application SW



Bus :- A Bus refers to a communication system that transfers data between components inside a computer or between two computers.

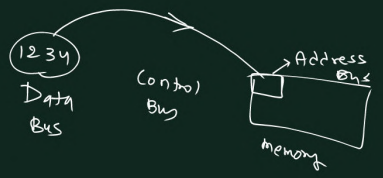
It is mainly a pathway through which data flows in a computer system.

There are following types of Bus in Computer system

1.> Data Bus :

2.> Address Bus :-

3.> Control Bus :-



① **Data Bus** :- It Carries the actual data to be processed.

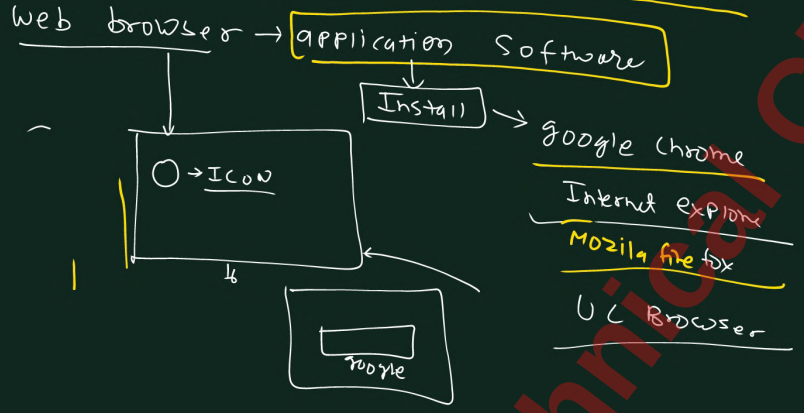
② **Address Bus** :- It Carries address of the Place where data is stored so that it can be retrived.

③ **Control Bus** :- It Carries Control signals to manage Operation between different Parts of the Computer.

UNIT-1 1.5

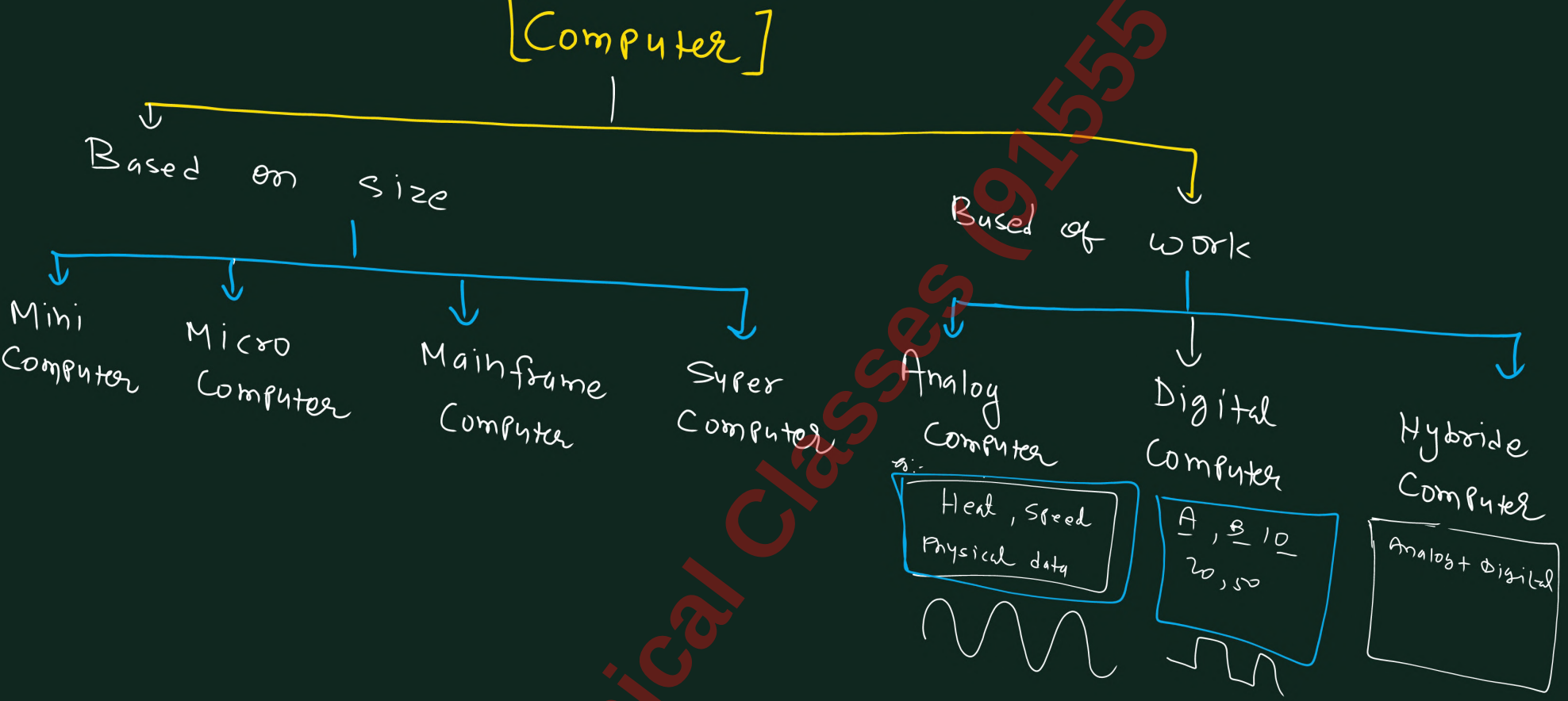
Search Engine :- It is a faclity avaliable on Internet which help us to find any information or any website on internet if we have only few knowledge about that. We can searc any image, data, information, Map etc with the help of search engine.

eg:- google, Yahoo, Bing, MSN etc



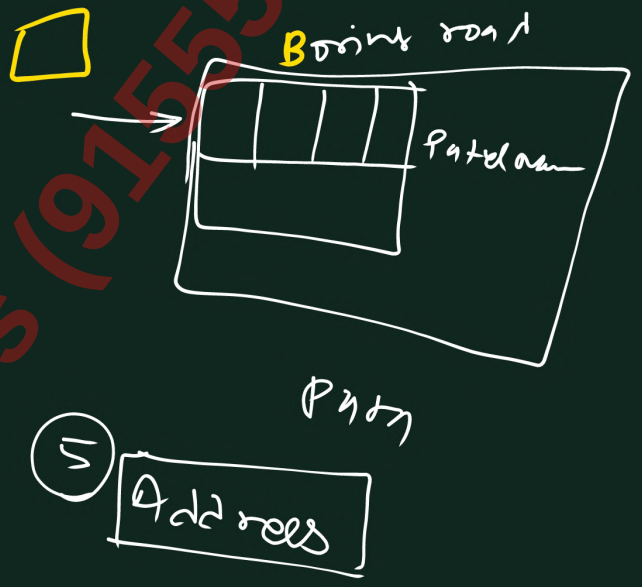
UNIT - 02 :- Digital Logic and Number system.

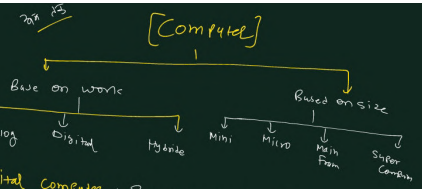
Introduction to Digital Computer



Analog Computer :- Such types of computer which take physical data as input (Heat, Speed, Temp) etc is known as Analog computer

Search engine





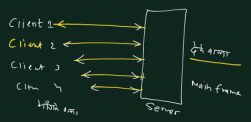
Digital Computer :- Such type of Computers which Takes digital data for input such as, digits characters etc are know as Digital Computer.

Hybrid Computer :- This type of Computers are combination of both digital as well as Analog Computer.

Micro Computer [PC] :- This is genral Purpose Computer used to perform general tasks such as for education, Entertainment, Business etc eg:- Laptop, PalmTOP, Desktop

Mini Computer :- It is more powerful Computer than micro computer. These are Mid Size Computer mainly used in any organization to perform tasks eg Bank, Railways etc

Main Frame :- These are Larger and more powerful than Mini Computer and mainly used by Large size organization for bulk data Processing such as Server Computer



Super Computer :- It is the most Powerful Computer mainly used by scientist for research Purpose. It Can Perform any Complex task in fraction of seconds. India's First Super Comp was PARAM

Number System : Why ?

Alphabets

Digits

[0 1 2 3 4 5 6 7 8 9]

Decimal Number

[Computer]

It is an electronic Device

ON, Off

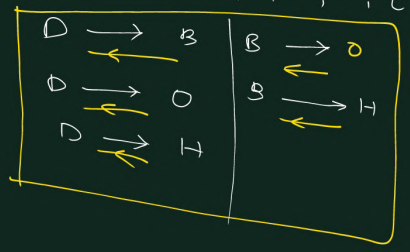
1 , 0

Binary Number

Number System :- A number system is a way of representing numbers using set of symbols. There are following types of Number systems is in use.

	Base, Redix	Digits
(i) Decimal	10	0, 1, 2, 3, 4, 5, 6, 7, 8, 9
(ii) Binary	2	0, 1
(iii) Octal	8	0, 1, 2, 3, 4, 5, 6, 7
(iv) Hexadecimal	16	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F

T.T.I



[Good Evening]

Recap:- [F I T S]

Number System

i> Decimal	0 – 9	Base 10
ii> Binary	0 1	Base 2
iii> Octal	0 – 7	8
iv> Hexadecimal	0 – 9 A B C D E F	16

Conversion

Decimal to Binary number system

2	65	1
2	32	0
2	16	0
2	8	0
2	4	0
2	2	0
	1	

$(65)_{10} = (1000001)_2$

1 0 0 0 0 0 1

Decimal to Octal $(65)_{10} = (\quad)_8$

(0 – 7)

1)

8	52	4
	6	

$(52)_{10} \rightarrow (64)_8$

2)

8	65	1
8	8	0
	1	

$(65)_{10} = (101)_8$

Decimal to Hexadecimal Conversion

16	960	0
16	60	12 → C
	3	

$(960)_{10} = (3C0)_{16}$

Q)

$(18.625)_{10} = (10010.101)_2$

2	18	0
2	9	1
2	4	0
2	2	0
	1	

Ans is 10010

$0.625 \times 2 = 1.25$ → 1

$0.25 \times 2 = 0.50$ → 0

$0.50 \times 2 = 1.00$ → 1

Ans is .101

$(18.625)_{10}$

$0.625 \times 2 = 0.250$ → 1

$0.250 \times 2 = 0.50$ → 0

$0.50 \times 2 = 0.00$ → 1

H.W:-

$(5062)_{10} = (\quad)_2$

$(50.62)_{10} = (\quad)_2$

$(656)_{10} = (\quad)_8$

$(12825)_{10} = (\quad)_{16}$

$(4267)_{10} = (\quad)_8$

$(156.78)_{10} = (\quad)_{16}$

[Good Evening]

Number System

Recap :

Decimal	10
Binary	2
Octal	8
Hexadecimal	16

D → B

D → O $(65)_{10} \rightarrow (1000001)_2$

D → H

2	65	1
2	32	0
2	16	0
2	8	0
2	4	0
2	2	0
	1	

LSB, MSB, 1000001, MSB, LSB

Q:> $(65.62)_{10} = (1000001.1001)_2$

.62 × 2 = 1.24	1
.24 × 2 = 0.48	0
.48 × 2 = 0.96	0
.96 × 2 = 1.92	1

$(65)_{10} \rightarrow (101)_8$

8	65	1
8	8	0
	1	

$(65.62)_{10} \rightarrow (101.47)_8$

.62 × 8 = 4.96	4
.96 × 8 = 7.68	7
.68 × 8	

$(65)_{10} \rightarrow (41)_{16}$

16	65	1
	4	

$(65.62)_{10} \rightarrow (41.9E)_{16}$

.62 × 16 = 9.92	9
.92 × 16 = 14.72	14

Binary to Decimal Conversion.

$(1000001)_2 = (65)_{10}$

$1\times2^6 + 0\times2^5 + 0\times2^4 + 0\times2^3 + 0\times2^2 + 0\times2^1 + 1\times2^0$

$64 + 0 + 0 + 0 + 0 + 0 + 1$

$= 65$

1010

$8\ 4\ 2\ 1 \quad = 10$

Binary to Octal :-

$(1000001)_2 = (\quad)_8$

$(101)_2 = (5)_8$

$1\times8^2 + 0\times8^1 + 1\times8^0$

$64 + 0 + 1$

[3 group]

Q.) $(011\ 011)_2 = (33)_8$

You may add extra zero

Q.) $(011\ 011.110)_2 = (33.6)_8$

Binary to Hexadecimal :-

group of (4)

$(0001\ 1011)_2 = (1B)_{16}$

[Octal to Hexadecimal]

$(237)_8 = (19F)_{16}$

110 011 111

000 | 100 | 111

1 9 15

F

[Good Evening]

Number System Conversion :-

1.> D(10) to B(2)

⇒ Divide the number by 2.

2.> D(10) to O(8)

⇒ Divide the number by 8

3.> D(10) to H(16)

⇒ Divide the number by 16

4.> B(2) to D(10)

⇒ Multiply each digit by 2.

$(110)_2$ to $(\ )_{10}$

$1\times2^2+1\times2^1+0\times2^0$

$=6$

5.> O(8) to D(10)

⇒ Multiply each digit by 8

$(126)_8$ to $(\ )_{10}$

$1\times8^2+2\times8^1+6\times8^0$

$=$

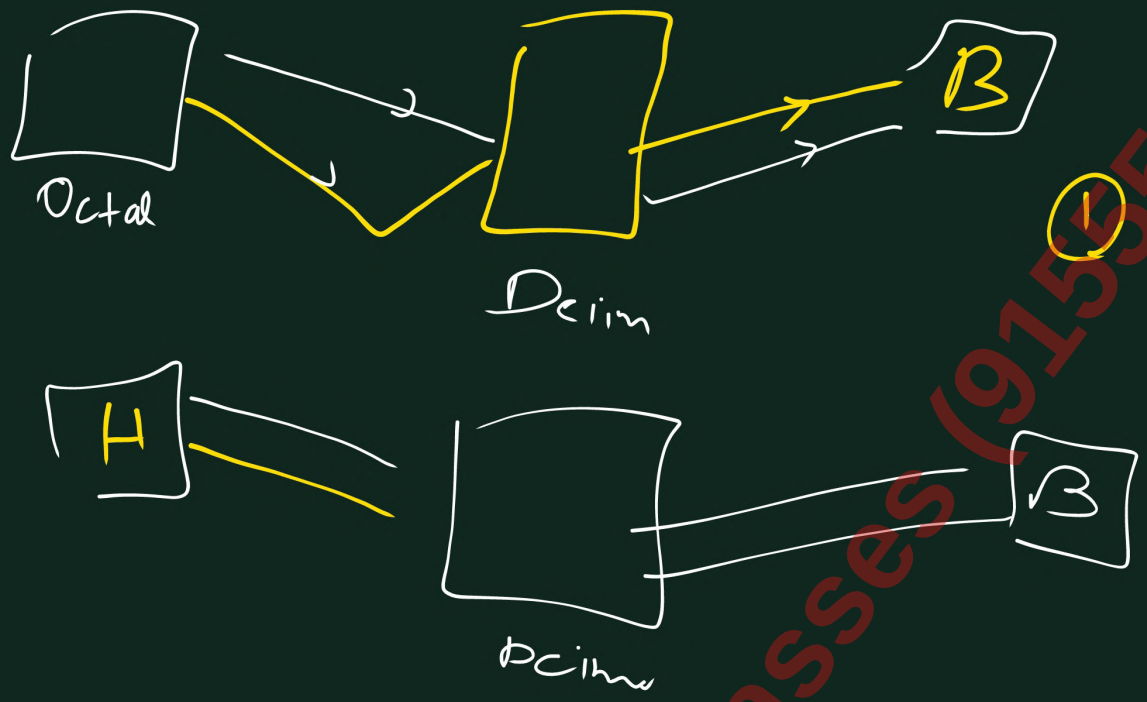
6.> H(16) to D(10)

⇒ Multiply each digit by 16

$(B3)_{16} = (\ )_2$

$12\times16^1+3\times16^0$

$=$



BCD

Binary | Coded | Decimal

It is a method of encoding decimal numbers in binary form where each digit of decimal number is represented by it's own binary equivalent.

eg:- $(65)_{10}$ → BCD →

Bina → 0110

Binary → 0101

BCD → 01100101

Decimal	BCD
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
10	0001 0000
11	0001 0001
12	

Decimal to BCD

$(567)_{10}$ → BCD

7 → 0111
6 → 0110
5 → 0101

0101 0110 0111

5 → 0101

BCD Code Type → 8 4 2 1

Binary to BCD

Step 1 → Binary to Decimal

Step 2 → Decimal to BCD

Q> $(11001010)_2$ ⇒ BCD

$= 1\times2^7 + 1\times2^6 + 0\times2^5 + 0\times2^4 + 1\times2^3 + 0\times2^2 + 1\times2^1 + 0\times2^0$

$= 128 + 64 + 0 + 0 + 8 + 0 + 2 + 0$

$= 202$

0010 0000 0010 BCD

Octal to BCD

Step 1 → Octal to Decimal

Step 2 → Decimal to BCD

eg :- $(621)_8$ to BCD

Step 1 → Convert to Decimal = $6 \times 8^2 + 2 \times 8^1 + 1 \times 8^0$

$= (401)$

Step 2 →

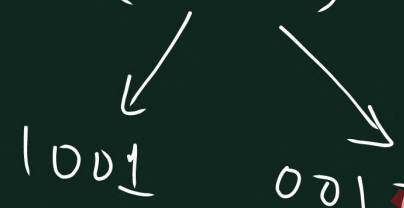
Ans

Hexadecimal to BCD

Hexa ⟶ Decimal ⟶ BCD

$(5C)_{16} = 5 \times 16^1 + 12 \times 6^0$

$= (92)$



Ans 10010010

Binary Number Arithmetic

Add :- A 6 → 0110
B + 3 + 0011
9 1001

A	B	carry	Add
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	0

```
  1 0 1 0
+ 1 1 0 0
---------
1 0 1 1 0
```

```
  1 1 0 1
+ 0 0 0 1
---------
  1 1 1 0
```

Sub :- A → 6 → 0110
B → 3 − 0011
3 0011 → 3

Borrow → 0 1

```
  0 1 0 0
- 0 0 0 1
---------
  0 1 0 1
```

[Logical gate] V.v.I

Logical gates are fundamental building blocks of digital circuits. These are used to perform Logical operations on one or more binary input.

There are following types of Logical gates.

1.> AND Gate

2.> OR Gate

3.> Not Gate

4.> NAND Gate

5.> NOR Gate

6.> XOR Gate

7.> XNOR Gate

① AND gate :

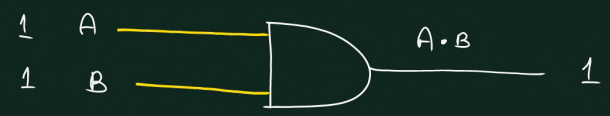
Truth Table

A	B	Output
0	0	0
0	1	0
1	0	0
1	1	1

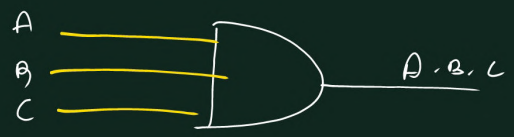
Ex. Rahul

Mr.

graphical Representation



AND gate is a Fundamental digital Logical gate that gives Output 1 (True) only if all of it's input is 1 other wise it gives 0 (False).



2.> OR Gate :- It is also a basic gate which returns False (0) only if all given inputs are False (0) other wise it Returns True (1)

Expression :- A + B

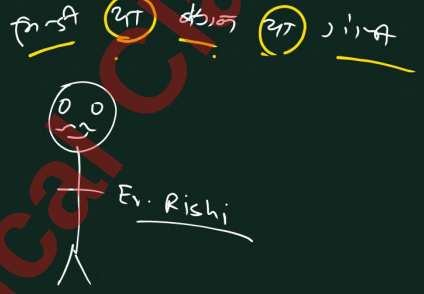
We use Curved shape with an Arrow to Represent OR Gate

Circuit Diagram

Truth table

OR गेट

A	B	A + B
0	0	0
0	1	1
1	0	1
1	1	1



③ Not Gate [Inverter] :- It is also a Baisc gate which works by taking only one input and it also gives one output. It simply change the input signal into opposite value. It means zero to one and one to zero.

Expression ⇒ $\overline{A}$ or A'

Symbol :- We use Triangle with Circle symbol

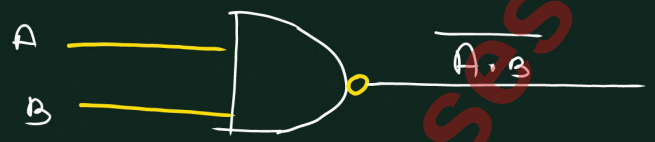
Truth Table

a	ā
0	1
1	0

NAND :- Not + AND = NAND : It is an Universal gate which gives just opposite result of AND Gate.

Expression :- $A \cdot B = \overline{A \cdot B}$

Circuit diagram :-



Truth table

A	B	$\overline{A \cdot B}$
0	0	1
0	1	1
1	0	1
1	1	0

NOR Gate (Not + OR) = NOR

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

Circuit Diagram :-

Truth table

A	B	$\overline{A+B}$
0	0	1
0	1	0
1	0	0
1	1	0

XOR [Exclusive OR gate] :- These are Arithmetical gates which gives false (0) only in condition when both input are same otherwise it gives True (1).

Expression $A \oplus B$

Circuite Diagram

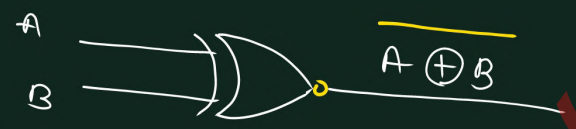
Truth Table

A	B	A ⊕ B
0	0	0
0	1	1
1	0	1
1	1	0

XNOR [Exclusive NOR gate] = NOT + OR

Expression :- $\overline{A \oplus B}$

Circuit Diagram :-



Truth Table

A	B	$\overline{A \oplus B}$
0	0	1
0	1	0
1	0	0
1	1	1

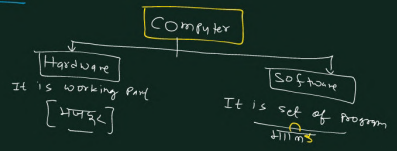
[Good Evening]

Recap :- [Local Gates]

- AND
- OR
- NOT
- NOR
- NAND
- XOR
- XNOR

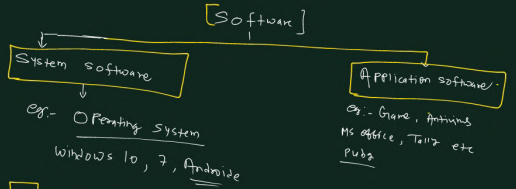
UNIT-3 : Computer Software and Operating System

Software :-

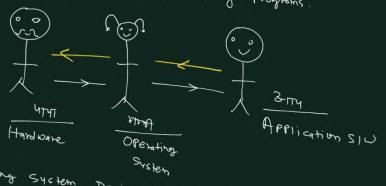


Software :- Set of Program
↓
Set of Instructions

It is set of Program which is also set of instructions written in Computer Language that instructs our Computer Hardware to Perform any task.



i) System Software :- It is such types of software that manages and controls the hardware components of a computer system and also provides a Platform for running Application S/W. It includes Operating System (OS) and Utility Programs.

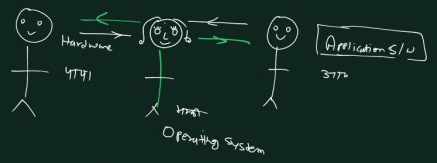


eg:- Operating System, Device Drivers, Utility S/W firmwares etc.

Application software :- These types of software are developed for any special Purpose. It means if a user have to Perform any specific type of Job He will install or devlope it. It is Not essential for our computer system. eg :- gaming s/w Ms office, Tally, Antivirus, etc.

[Good Evening]

Operating System :- An Operating System is a system software that Manages Computer Hardware, Software resources and Provides Services for Computer Programs. It acts as an intermediary (Platform) for Hardware & Application Software.



Function of Operating System :-

* Process Managment :- It controls the execution of programs and Multitasking.

* Memory Managment :- It handels Allocation & deallocation of Memory.

* File Managment :- It Manages data storage & file retrieval.

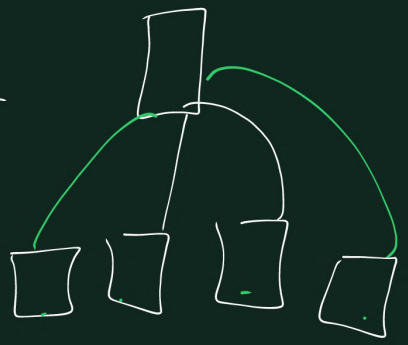
* Devile Managment :- It controls Peripherals such as keyboard, Monitor, Printer, SD, USB etc.

* User Managment :- It Manages who can use the Computer

* Security Mangeal :- By Securing Managment OS ensures the Misusing of data & information by asking Password to Login.

Types of O.S

* Single Tasking O.S
* Multi tasking O.S
* Single User O.S
* Multi " "
* Real ime O.S
* Batch Processing O.S
* Network O.S
* Distributed O.S
* Mobile O.S :



Types of O.S :-

(1) Batch Processing O.S :- In this type of O.S the tasks of batches or Jobs are Processes without user interaction during execution. It means this type of O.S are used where same type of Job is to be done in Bulk.
eg:- IBM's OS/36 and DOS.

(ii) Multitasking / Time sharing O.S :- This O.S can handle the execution of multiple task or Process at same time. In this type of O.S a CPU has to perform multiple task in this manner that each Program will run without delay.
eg:- Windows, MacOS, LINUX

(iii) Multiprocessing O.S :- This type of O.S is used to instruct our computer Hardware and Application s/w to perfor Multiple Process at a time. It means in this type of OS CPU can support multiple Process (users) at a time in a singne computer.
eg:- LInux, UNIx

(iv) Real time O.S

(v) Distributed O.S

(vi) Network O.S

(vii) Mobile O S

① Single tasking single Processing

O.S

DOS :- Disk Operating System

[Good evening]

[OS]

CUI
Character User Interface
eg:- DOS :- Disk Operating system

GUI
Graphical user Interface
eg:- Windows xp, 2007, 8, 16, 20 etc
Linux
UUIx
etc

Desktop :- It is the first screen comes after turning on a comptuer. It is mainly used to Hold regularly used files or Programs.

Task bar :- It is by default situated at the bottom of windows screen. There is a start button on it's Left side and it shows date & time on it's right side. It holds all the opened program so that we can easily switch between them.

Icons :- These are small graphical objects which represent any file, folder or Program.
↳ data ↳ Container (Box)
There are following types of Icons.
i) System ICON
ii) User ICON
iii) Shortcut ICON

1> System Icon :- These Icon are Created by Operating System at the time of it's installation. These icons helps the O.S to Perform it's basic task. These are :-

i> My Computer (This Pc)

ii> My Network Place

iii> My Document

iv> Recycle Bin

v> Internet Explorer (Web browser)

1> This Pc (My Computer) :- In this Place we can find our Computer's Internal (Harddisk) or external memory (USB). It means we can manage Storage Space at this Place.

2> My NetworPlace :- It is used to manage the Network connection to which our Pc is Connected.

3> Recycle Bin :- When we delete any file or folder it takes Place in Recycle Bin. we Can Restore the deleted files from Here. But if any one delete files from Recycle bin it is Permanent deleted.

* for Permanent deletion Shurt cut is

Shift + Del

[Good Evening]

4.) My Document :- It is the Place where by default any file is stored. It means if at the time of saving a document we don't Choose the Place the document will be saved here.

5) Internent Explorer [Edge] :- It is a web browser an application software which is used to Launch an internent on our Computer. There are various types of web browser available in Market and we can Select them according to our need & choice. eg. google Chrome, Internet explorer, Mozila firefox etc (Edge)

② User Icon :- It is created by a user which is used to represent any folder or file.

Right Click → New → folder

③ Shortcut Icons :- We can create a shortcut of any program using shortcut Icon option so that accessing time becomes less. There is an arrow symbol on this Icon.

Eg:

Linux Operating System :- It is an Open Source O.S which is known for it's Security, flexibility and robustness. It was created in 1991 by Linus Torvalds. The Linux O.S is used on a wide range of devices such as PC, phones etc.

features :-

1> Open Source :- It is free for every person.

2> Multitasking and Multiuser :-

3> Stability and Security :-

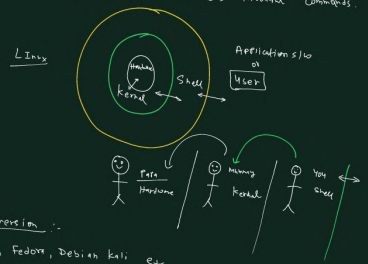
4> File System Support :-

5> Customization and flexibility

Component of Linux O.S

1> kernal :- It is Core of Linux O.S that manages hardware resources, memory, Process and System Calls.

2> Shell :- It is a Command Line Interface that allows user to interact with O.S through Commands.



Linux version :-

Ubuntu, Fedora, Debian kali etc

Application of Linux

① Servers

② Embeded Systems :- Like TV, mobile etc

③ Super Computer

④ P.C

etc

Basic Linux Commands :-

* ls :- It list directory Content Cd Path

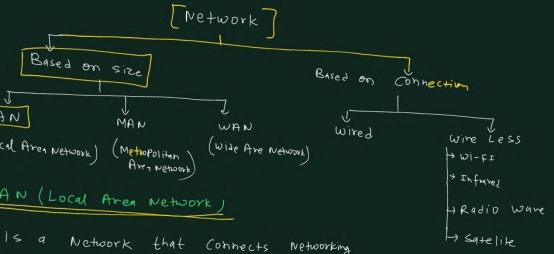
* cd :- Change directory

* cp, mv, rm :- Copy, move and delete files

etc

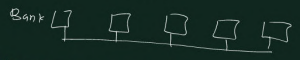
Computer Network & Internet tools

Computer Network : It is an interconnection of one or more networking devices (computer, Printers etc) to share their resources (files, information, data). It is known as Network.



1> LAN (Local Area Network)

⇒ It is a Network that connects Networking devices within a small geographical area (1 km) such as Home, office or School.



2> MAN (Metropolitan Area Network)

It is a network that covers a city or a large geographical Area. It is larger than LAN but smaller than WAN.

3> WAN (Wide Area Network)

It is a network that covers a very large geographical Area such as Countries or Continents.

Eg:- Internet

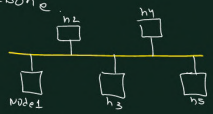
Network Topology

It is an arrangment of networking devices (nodes) with in a network. It means it defines how devices will communicate & interact with each other on a network. There are following types of Network Topology

1) Bus
2) Ring
3) Star
4) Tree
5) Mesh
6) Hybride

1.) Bus Topology

In this type of Network Topology all Nodes are connected to a single cable known as the bus or backbone.

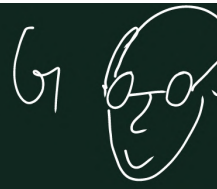


Advantage

- Easy to setup
- cost effective for small network
- Requires less cable than other topology

DisAdvantage

- A failure in the central cable will distrurt all network
- Performance decreases as more divices are added.



Good Evening

[Network]

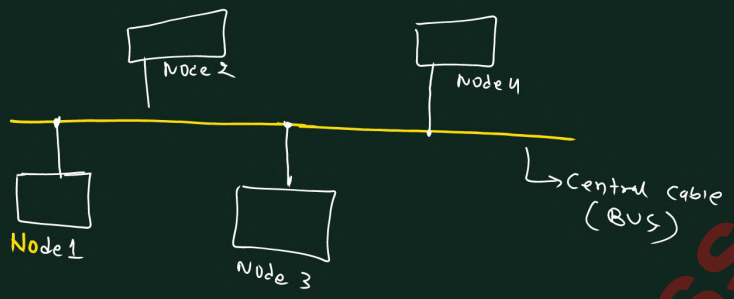
Base on Size

1. LAN
2. MAN
3. WAN

[Topology]

1. Bus
2. Ring
3. Star
4. Mesh
5. Tree
6. Hybrid

(1) **Bus Topology** :- In Bus Topology all Networking devices (Nodes) are Connected to a single central Cable (know as Bus). It means data sent from a device travel along the bus and can be recived by any other device.



Advantages :-

⇒ It is easy to install

⇒ It requires Less Cable, One single Cable.

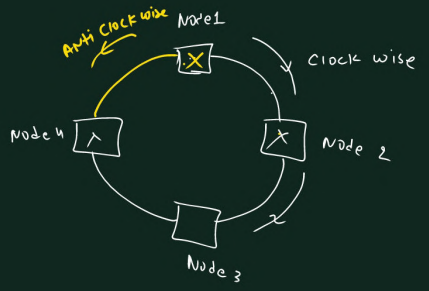
⇒ So that it is cost effective

DisAdvantages :-

⇒ If main cable fails the entire network will fail.

⇒ When we add more nodes it becomes slow.

2.> **Ring Topology** :- In this topology nodes are connected in circular faishon and each device is connected with two other devices. In the ring topology data travels in only one direction either clock wise or Anti clock wise and reaches to the destination.



Advances :-

⇒ Data flow in an ordly direction either clock wise or Anticlockwise

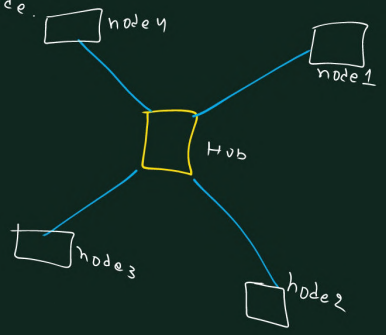
⇒ Easy to error finding & troubleshoot

Disadvantages:

⇒ If a single Connection breaks, entire network will be affected.

⇒ It is slower because data passes through multiple devices.

(iii) **Star topology** :- In A star topology all nodes are connected to a Centeral Devices known as Hub or switch. Data from any device firstly reaches to hub then it is further forwarded to it's destination node.



Advantages :-

⇒ If one device fails, the other device will still work.

⇒ It is very easy to add or remove device in this topology

Disadvantages :-

⇒ If centeral Hub fails all network will fails.

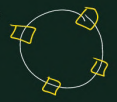
⇒ It required more wires so that it is costly

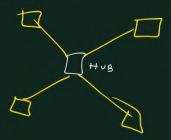
[Good Evening]

Recap :- Network -

[Topology]

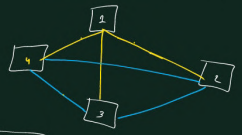
i>  Bus

ii>  Ring

iii) 

Star

iv> Mesh Topology :- In this topology each & every networking devices (node) n are connected with each other with a Sperate Networking Cable.



Formula

$\frac{n \times (n-1)}{2}$

$\frac{4 \times (3)}{2}$

$= 12/2 = 6$

Q> There are 3 nodes in a mesh Topology. The no of wirle will be -

① 6
② 2
③ 3
④ None

Advantage :- Faster than all other Networking

→ Error finding and Correcting is ealser

Disadvantage :- Costly due to no. of wires

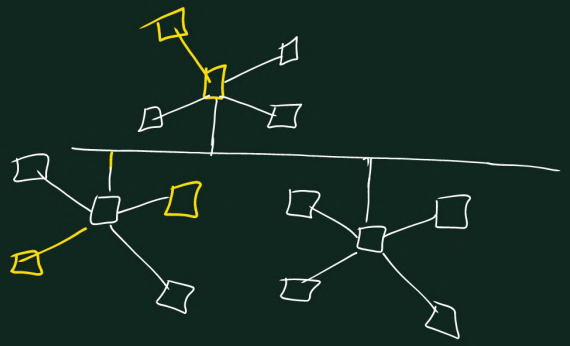
→ Hard to Maintained

Tree Topology : It is Combination of Bus and Star topology. In this topology group of Star topology is connected with a single backbone (Bus).

Advantage:- It is easily managed

fault finding is easier task

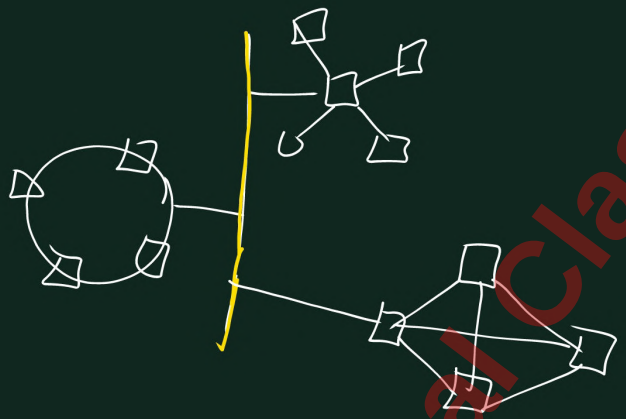
DisAdvantage :- If the backbone breaks the whole Network will be breakdown.

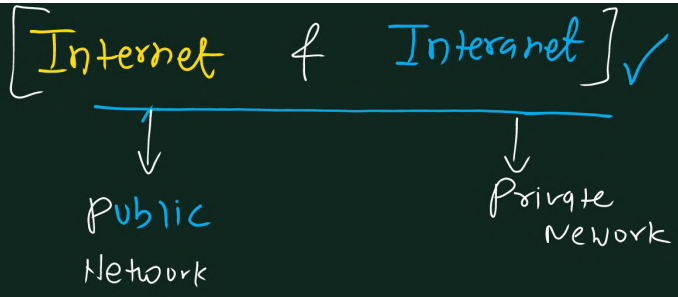


Hybride Topology :- It is Combination of two or more than two topology.

Advantage :- It Allows flexblity.

Dis Advantage :- Complex design





Internet and Intranet both are types of network but they have different purpose.

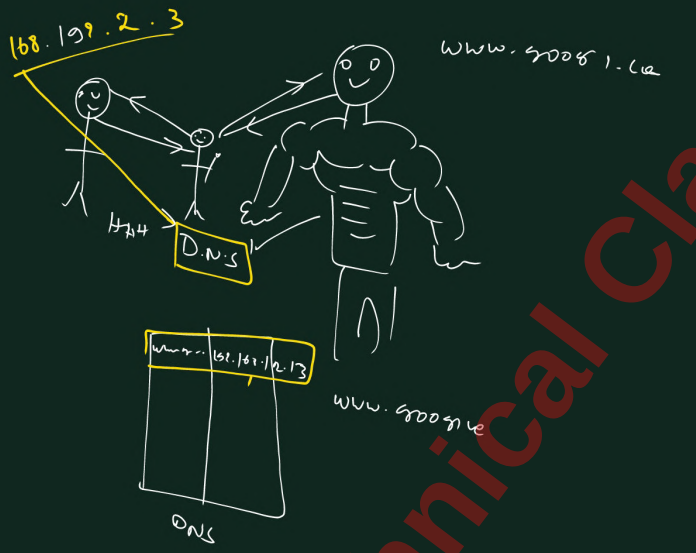
1) Internet :- It is Network of Networks It means it connects millions of Computers to each other for Sharing of resources. It is a Publicly accessible Network. It means any person with a Mobile or computer with internet connection can use it.

[Good Evening]

Recap

[D.N.S]

Domain Name System Server ?



[Networking Device]

A Networking Device is a Hardware that connects Computer, Printers, and other Communication Devices on a Network. So that we can say these devices are very important to manage the flow & traffic in a Network. There are following types of Networking devices.

i) Switch
ii) Router
iii) Gateway
iv) Modem
v) Repeater
vi) Wireless Access Point
vii) NIC

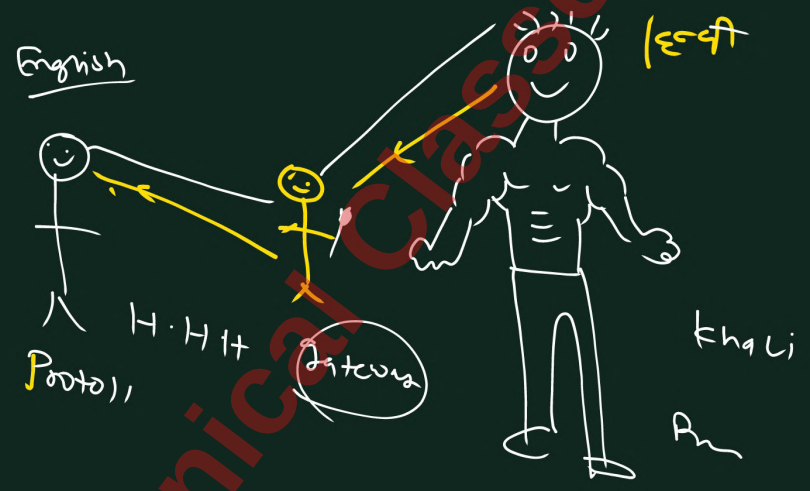
i> Switch :- It is a very Important Networking device used to connect multiple device with in the same LAN (Local Area network) such as Computer, Printer, Server to allow them Communicate efficently. It Intelligently forwards data to the Specific device for which data is sent.

[Good Evenging]

Recap → [Networking Devices]

Router :- A router is a critical Network device that is used to connect two or more than two different Networks and forwards data between them. A Router is responsible for forwarding data packets between networks based on IP address.

Gateway :- It is a networking device or software that acts as a bridge between two different Networks, espcially when both uses different Protocols. It Performs Convesion of Protocols (Rules).



MODEM :- (Modulator - Demodulator) :- It is a Networking device that enables digital data to be tarnsmitted over analog communication Lines. Such as Phone Line, Cable Lines. It is used to Modulate (Convert) Digital signals into Amlog signals and transmit it and at the other end another Modem (DeModulates) the Signal from Analog to Digital.

Or:- We use Modem to Connect our Comphter with Isp (Internet service Provider)

Repeater :- It is a networking device which is used to extend the Range of a network by amplifying or regenerating the signal. So that data can be travel to a Long distance.

Wireless Access Point (WAP) :- It is a networking device that allows wireless devices such as mobile phone, Laptop, Tab etc to Connect with a wired network using WI-FI. It acts as a bridge between wirless network and the wired LAN.

NIC [Network Interface Card] :- It is a hardware component that enables a computer to connect with a network. It Provides Physical Interface for both wired & wireless network.

[Good Evening]

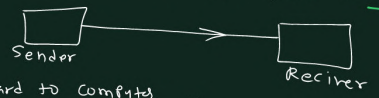
Recap :- Network, Tyres, Topology, Networking Devices.

Transmission Mode :

It is the Path on which data is Sent or Recived.

There are following tyres of transmission Modes.

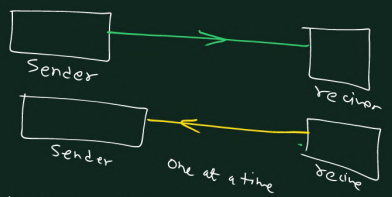
1.> Simplex Mode :- In this Mode data flows in a single direction.



eg :- Television, keyboard to computer etc

2.> Half Duplex :- In this Mode data flows in both direction but only one direction at a time.

eg :- Walki-talkies



3.> FULL-Duplex Mode :- In this Mode data flows in both direction.

eg :- Mobile

Modulation

It refers to the process of modifing a carrier signal to encode information for transmission. So that data can be sent to various communication medium.

Types :-

1> Analog Modulation

It is used for Analog signals, such as audio, video over analog medium.

* Amplitude Modulation (AM) :-> eg :- Am Radio
* Frequency Modulation (FM) :-> eg :- Fm Radio
* Phase Modulation (PM) :- eg :- early analog Tv.

2.> Digital Modulation

It is used for transmitting digital data (bits) over analog or digital medium.

* Amplitude Shift Keying (Ask)
* Frequency " " (Fsk)
* Phase " " (Psk)

Wired and	Wireless Media
Twisted Pair Cable	Radio wave
Coaxial Cable	Infrared
fiber optic cable	Satellite

1> Twisted – Pair Cable :

It is one of the most common type of cable used in Networking. It Consist of pairs of insulated Copper wires twiested together to reduce electromagnatic interferance.

* Coaxial Cable

It is a type of electrical cable used for tarnsmitting data (video, Audio). Ther are many Layer for excellent shielding against electromagnatic interferance (EMI).

* Fiber optic cable *

It is a type of networking cable that transmits data as light pulses through plastic or glass. It is widely used for high speed internet, telecommunication etc.

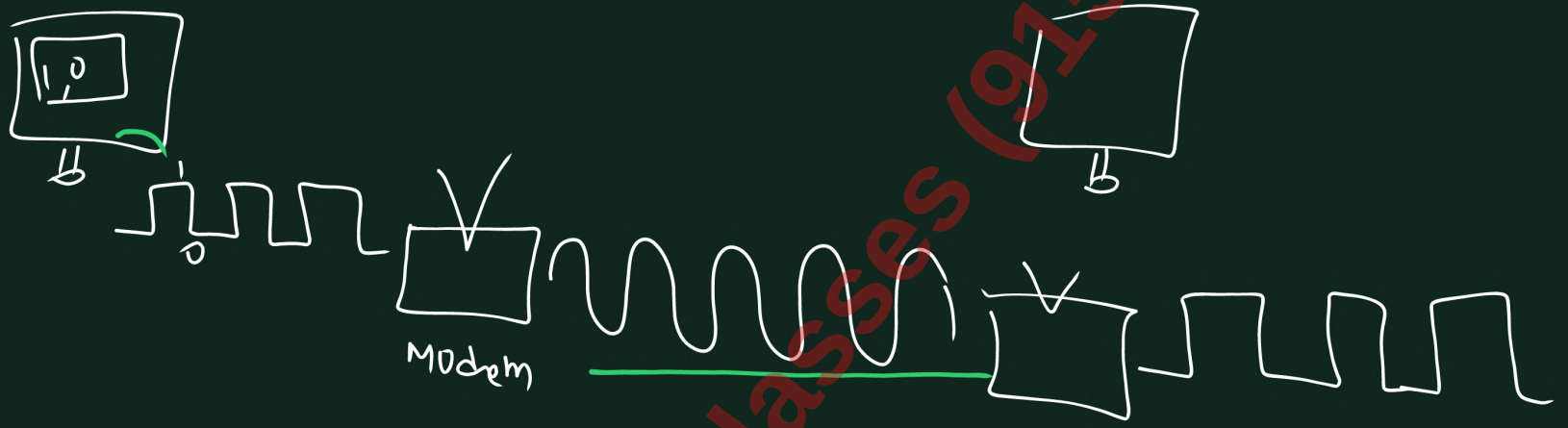
* Radio wave *

It is a Communication System commonly used in broadcasting, and wireless networking because they Can travel Long distance and Penetrate various materials.

* Infrared *

It is an Electromagnatic waves with wave lenght longer than visible light but shorter than microwaves. It is mainly used in imaging system.

*



address (number)

IP address

IPV4

- It's Length is 32 bits
- It is divided is 4 Octet Seperated by decimal point
- Rang is fram 0 to 255
- Only 4 billions address can be generated (2^{32})

Eg:-

192	. 168	. 2	. 6

IPV6

- It's Length is of 128 bits
- 8 octet of Hexadecimal numbers
- 0 to FFFF (65536)
- 340 trillion (2^{128}) unique address
- 3fB8 : 1806 : 4545 : 2 : 100 : L8ff : 21 : 44ff
  - colon

[Classes of IP address]

Class A :- 0 to 126 (126 . 255 . 3 . 63)

→ 127 . 255 . 255 . 255 → Reserved for private expriment (Server)

Class B → 128 to 191 (132 . 255 . 192 . 63)

Class C → 191 to 223 (192 . 168 . 3 . 2)

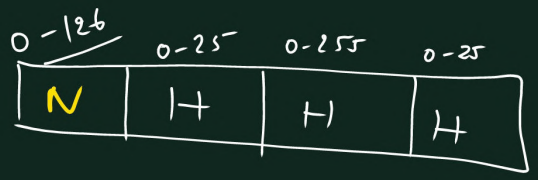
Class D → 224 to 239 → Used for multicasting

Class E → 240 to 255 → Used for Research Purpose

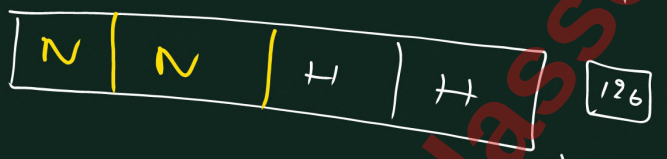
IP address

- Network ID
- Host ID ?

Class A



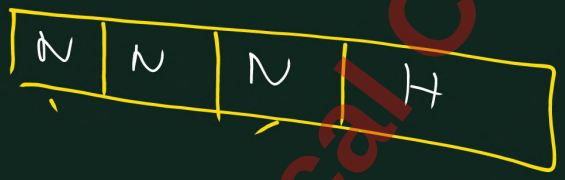
Class B



126

→ 65000

Class C



Conversion

Number system	Base	Numbers
Decimal	10	0 – 9
Binary	2	0 – 1
Octal	8	0 – 7
Hexadecimal	16	0 – 9, A B C D E F (A=10, B=11, C=12, D=13, E=14, F=15)

Conversion :-

Decimal to Binary (2) → Division

Decimal to Octal (8) → Division

Decimal to Hexadecimal (16) → Division

Eg.- $(65)_{10} \rightarrow (1000001)_2$

2	65	1
2	32	0
2	16	0
2	8	0
2	4	0
2	2	0
	1	

Read from bottom to top

$(65)_{10} \rightarrow (101)_8$

8	65	1
8	8	0
	1	

$(65)_{10} \rightarrow (41)_{16}$

16	65	1
	4	

Binary to Decimal

Octal to Decimal

Hexa to Decimal → Multiplication

Eg.- $(1000001)_2$ to $(65)_{10}$

$1\times2^6 + 0\times2^5 + 0\times2^4 + 0\times2^3 + 0\times2^2 + 0\times2^1 + 1\times2^0$

$= 64 + 0 + 0 + 0 + 0 + 0 + 1 = \boxed{65}$

HW $(10101)_2$ to $(\quad)_{10}$

$(101)_8$ to $(65)_{10}$

$1\times8^2 + 0\times8^1 + 1\times8^0$

$= 64 + 0 + 1 = 65$

[Good Evening]

Unit - 5 : Information Security

5.1 → Need of Information security.

- ⇒ Cyptrography
- ⇒ Vulnerability
- ⇒ Threat
- ⇒ Attack
- ⇒ Encryption
- ⇒ Decryption

Information Security

जानकारी की सुरक्षा

In today's digital age information Secuity is a very critical task due to dependency on technology. All Person saves their data & Personal Information in the form of digital data in Comptuer. So that Protection of these data is very essential.

✳ Cryptography

:. It is the science of securing Communication and information by converting it into a format that is unreadable to Unauthorized user.

Eg :. Hi How Are you ? → Original

+1 ij ipx Bsf zpv → Cryptography (Encription)

-1

* **Vulnerability** :- It is a weakness or flaw in a system, network, application, or process that can be exploited by a hacker to compromise the integrity, confidentiality or availability of information or system.

* **Threat** : It means any danger or malicious activity that could exploit a Vulnerability to compromise the security of data.

* **Attack** :- It is an attamp to disrupt, Compormise, or gain unauthorize access to system network or data. Such as

- Network attack
- Application ,,
- Social Enginering ,,
- Malware (Virus) Attack

etc

* Encryption :- It is the process of converting Plain text data into unreadable form using Cryptography algorithms. So that only authorize user with the correct Decryption algorithm can read it.

* **Decryption** :- It is the process of converting encrypted data back into it's original readable form.

[Good Morning]

The Principles of Security & Confidentiality

It refers to the guidelines and Practices used to ensure that sensitive informations are Protected from Unauthorized access.

Integrity :- It ensurces the accuracy and reliablity of infromation throughout it's Life cycle.

To achive this we may follow following steps

⇒ Regular audit and checks.

⇒ Implementing Controls to Prevent data Leake.

Availablity :- It esurses that only authorized User have access to information and system When heeded. for this we may follow

⇒ Regular system update and maintenance.

⇒ Protacting against Denial of service Attack.

Firewall :- It is a Security device or Software designed for monitor and control incoming and outgoing network tarffic based on Predetermined Security rules.

Function of Firewall

⇒ Traffic Monitoring and Filtering

⇒ Access Control

⇒ Threat Prevension

etc

Cyberattacks : It is an attempt by individuals or groups (Hackers) to break the Security of Computer system, network, or devices to steal or destory our important data.

Types of Cyberattack

Malware : It is an application software which is designed to damage or disrupt our Computer system. There are following types of Malware.

1.) Viruses :

2.) Worms

3.) Trojan Horse

4.) Ransomware

5.) Spyware

6.) Adware

Man in the Middle Attack

It is a type of cyber attack in which a malicious actor intrupts the communication between to parities without their knowledge.

Denial of Service Attack :-

It is a type of cyber attack that aims to disrupt the normal functioning of a Server Service or network by creating flood of traffic.

V.V.V.V.V.I

SQL Injection

It is a web security attack in which attackers effects queries of a data base By injecting malicious SQL Codes into input field and attackers may get Unauthorized access to a database

Phishing :- It is a type of cyber attack in which a person attamps to a device and steals sensitive information such as password, ATM card number or personal data. There are following types of Phishing.

(i) Email Phishing
(ii) Vishing
(iii) Smishing
(iv) Pharming

etc

Cyber Law :-

IT Amendment Act 2008 (sec 66 & 67)

This act is replacement of IT Act 2002 which aims to improve electronic governace and to stop cybercrime.

Sec 66 :- It deals with offences involving unauthorized access to or damage to a computer system or data.

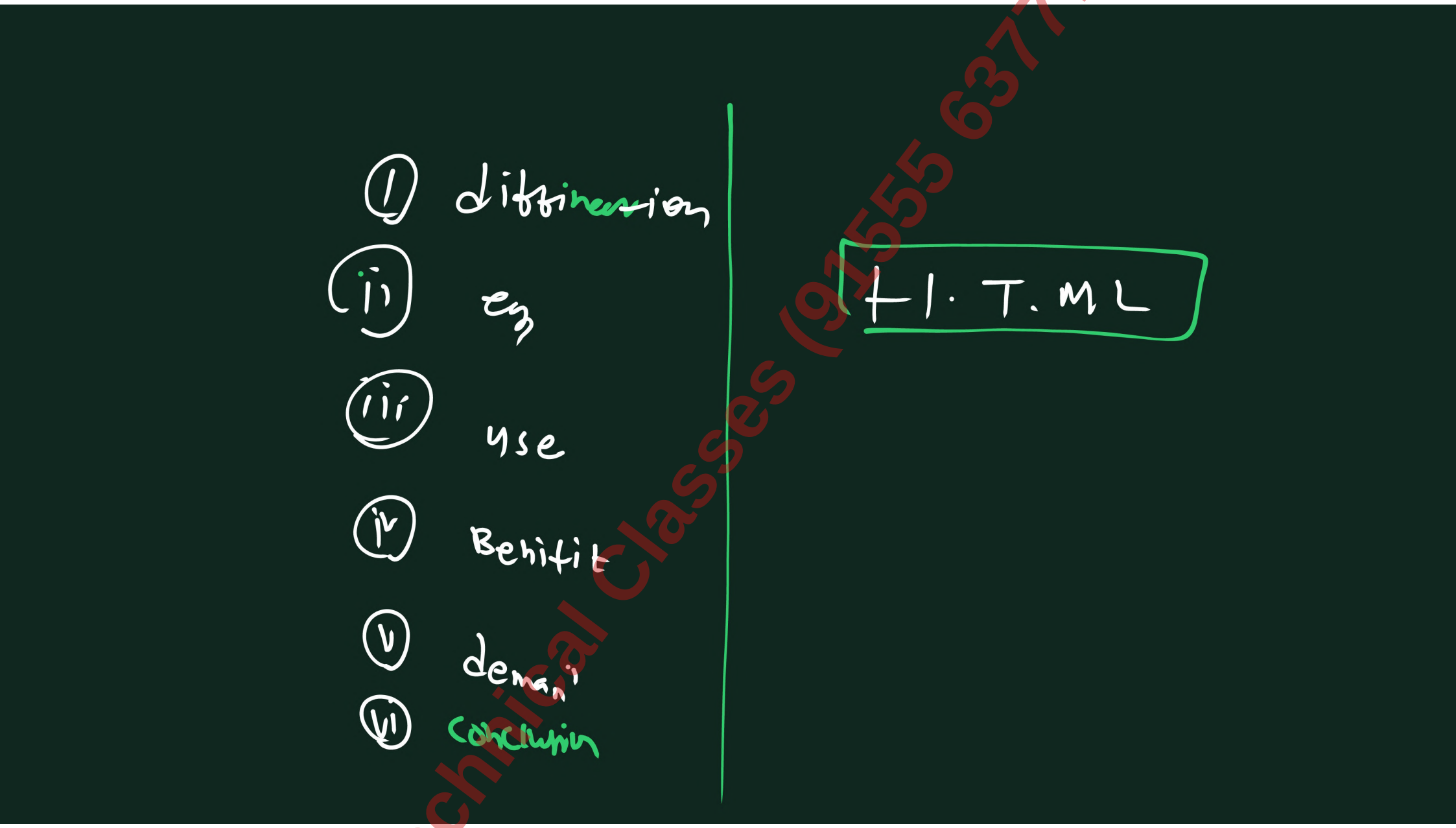
⇒ **Punishment** :- Jail upto 3 years

Fine upto 5 Lakh

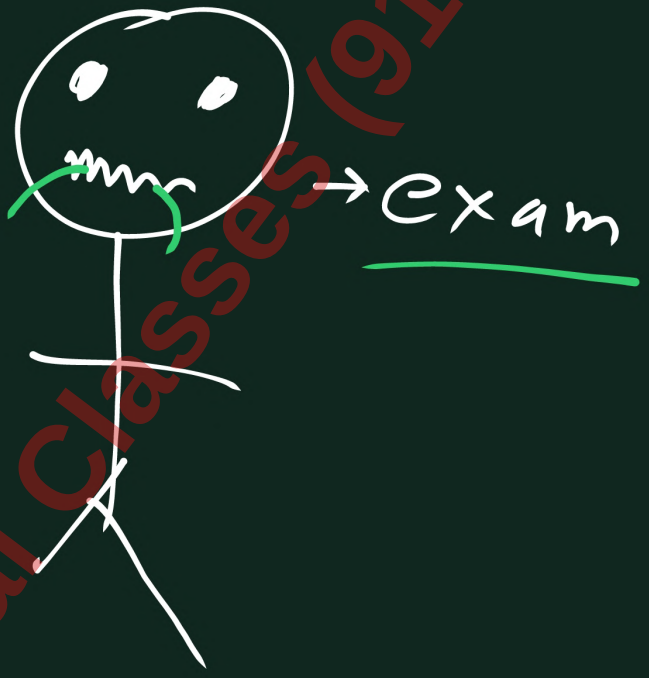
Sec 67 :- This section deals with Creation Publication, and Sharing of Obscene or sexually explicit material electronically.

Punishment :- first time → 3 Years Jail
5 Lakh Fine

:- again :- Jail for 5 Years
fine upto 10 Lakh



Exam



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