SIMATS
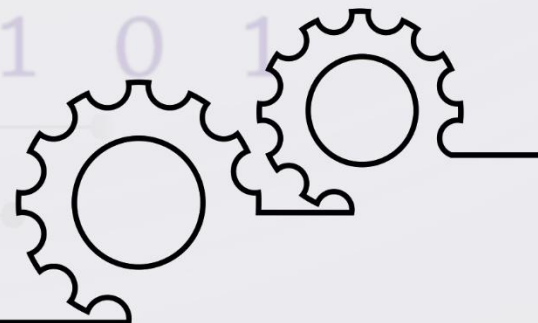# School of Engineering

Fundamentals of Computing

Computer Science and Engineering

Saveetha Institute of Medical And Technical Sciences,Chennai.

OVERVIEW:

* **CENTRAL PROCESSING UNIT (CPU):** Processor of the computer.

* **MONITOR:** Screen, displays information in visual form.

* **KEYBOARD AND MOUSE:** Device used for receiving input

APPLICATIONS:

* **EDUCATION:** Used in schools & colleges.

* **BUSINESS:** To store large amount of information.

* **COMMUNICATION:** Connected with internet to transfer data.

* **SCIENCE:** for research & development.

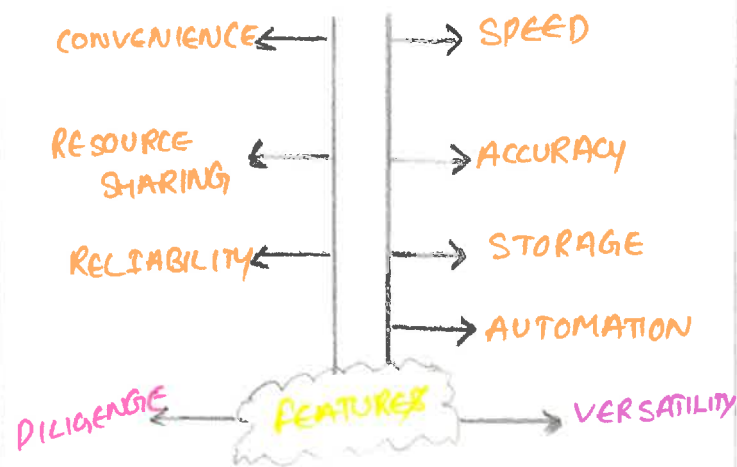* **ENGINEERING:** for creation of complex diagrams.

* **ENTERTAINMENT:** for graphics & animations.

* **BANKING:** Online banking.

* **HEALTH:** To diagnose diseases.

INTRODUCTION TO COMPUTERS

CHARACTERISTICS OF COMPUTERS:

CONVENIENCE ← → SPEED

RESOURCE SHARING ← → ACCURACY

RELIABILITY ← → STORAGE

→ AUTOMATION

DILIGENCE ← **FEATURES** → VERSATILITY

SPEED:
Computers have more speed to perform jobs. Speed is measured in millsec, microsec, nanosec, picosec.

STORAGE CAPACITY:
It can store huge amount of data.

ACCURACY:
High accuracy due to false results.

RELIABILITY:
Results without error.

VERSATILITY:
Diff tasks for different purposes.

DILIGENCE:
Repetitive calculations with same accuracy.

EVOLUTION OF COMPUTERS:

* **ABACUS:** Simple addition & subtraction.

* **NAPIER'S DEVICE:** eleven rods carried numbers marked on them.

* **SLIDE RULE:** To perform arithmetic and trigonometric functions.

* **PASCALINE:** first real desktop calculating device.

* **LEIBNIT'S IMPROVED PASCAL MASHNE:** used for multiplication, division, square root operation.

* **PUNCHED CARD MACHINE:** first punch card machine.

* **CHARLES BABBAGE'S ENGINES:** Algebric expressions.

* **HOLLERITH'S CARD READING MACHINE:** punched cards to tabulated census data.

* **MARK-I DIGITAL COMPUTER:** Sequence of arithmetic operations.

* Atanasoft Berry computer (ABC)

* electronic numerical integrator and calculator (ENIAC)

* electronic Delay storage automatic calculator (EDSAC)

* Manchester Mark I

* microprocessor, personal computer

CLASSIFICATION OF COMPUTERS

1. BASED ON OPERATING PRINCIPLES:

* **ANALOG COMPUTER:** functions on continuously varying quantity.
APPLICATIONS: electronic weighing scale, heartbeat, temperature.

* **DIGITAL COMPUTER:** functions on discrete numbers.
APPLICATIONS: BUSINESS.

* **HYBRID COMPUTER:** combine qualites of both analog and digital computers.

2. BASED ON APPLICATIONS:

* **GENERAL PURPOSE:** used for variety of tasks.
APPLICATIONS: BUSINESS & scientific problems

* **SPECIAL PURPOSE:** used for particular tasks.
APPLICATIONS: aircraft control system.

3. BASED ON SIZE AND CAPABILITY:

* **MICRO COMPUTER:** microprocessor.
Applications: offices, homes, schools.

* **MINICOMPUTER:** multiprocessor.
APPLICATIONS: for storage applications.

* **MAIN FRAME COMPUTERS:** faster & larger.
APPLICATIONS: large industries, banks.

* **SUPER COMPUTERS:** powerfull.
APPLICATIONS: Atomic Research.

1

THE COMPUTER GENERATIONS

The computer Generations

The COMPUTER GENERATIONS Means step-by-step growth in the technology.

It is often used in relation to the hardware of computer.

It consists of Five generations:

1. First Generation

components Used : vacum tubes or thermonic Valves.

Memory : 10,000 to 20,000 characters

operating speed : Milli seconds

Advantages :

• Performs computations in Milli seconds

• fastest calculating device of their time

• Advent of electronic digital of computer

Disadvantages :

• Very big in Size
• High power consumption
• Vulnerable to frequent hardware failures
• No reliability

2. second Generation

components Used : Transistors

Memory : upto 64,000 characters

Operating speed : Micro seconds

Advantages :

• Small in Size
• Better reliability
• Better portability
• Less prone to Hardware failure

Disadvantages :

• frequent Maintances required
• commercial production was difficult
• Need Air conditioning

3. Third Generation

components Used : Integrated

Memory : upto 4 Million characters

operating speed : Nano seconds (Nano seconds) - 10^9

Advantages :

• Small in size
• General Purpose computers
• commercial production was

easier and cheaper

Disadvantages :

• Need - Air - conditioning
• Manufacture of "IC - CHIPS"

4. fourth Generation

components used : Micro processor

Memory : semi - conductor Memory

operating speed : 1 to 10 Nano seconds

Advantages :

• consumed less power
• cheap as compared to the Previous generation Computers
• More realibility
• object oriented languages are supported
• Less power

Disadvantages :

• Manufacture of LSI chips
• Due to Network connectivity spreads, harmful viruses and Malware are found.

5. Fifth Generation

components used : Artifical Intelligences

Memory : CMOS (COMPLEMENTARY METAL OXIDE SEMICONDUCTOR)
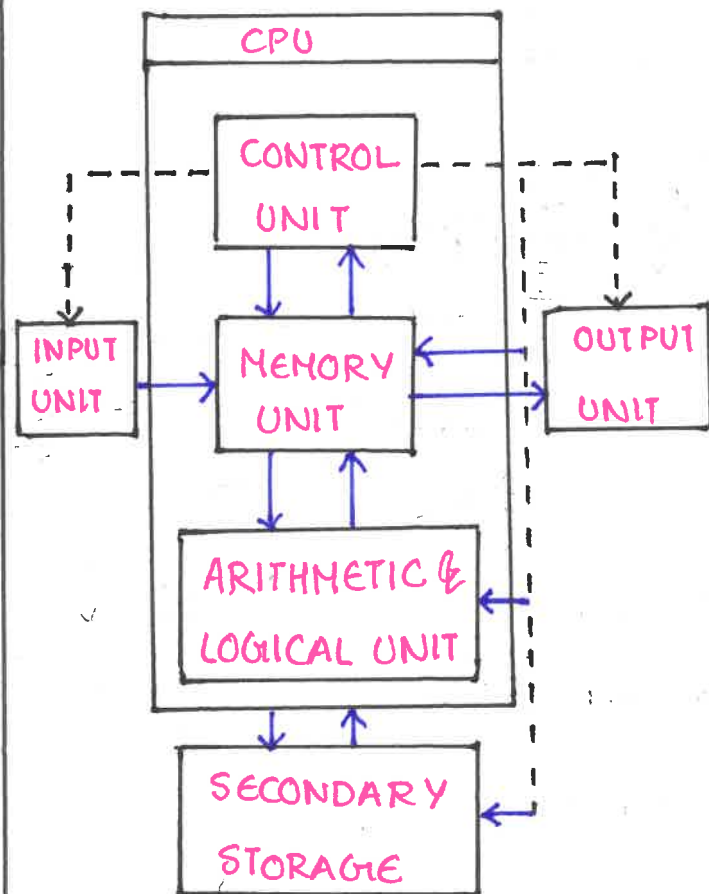
operating speed : 1 to 100 Nano seconds

Advantages :

• Much More smaller in size
• very cheap as compared with the previous generation computer
• Larger and faster primary and secondary storage
• Available in different sixes with unique features

Disadvantages :

• They tend to be sophisicated and complex tools
• There are a lot of cases required for air conditioning
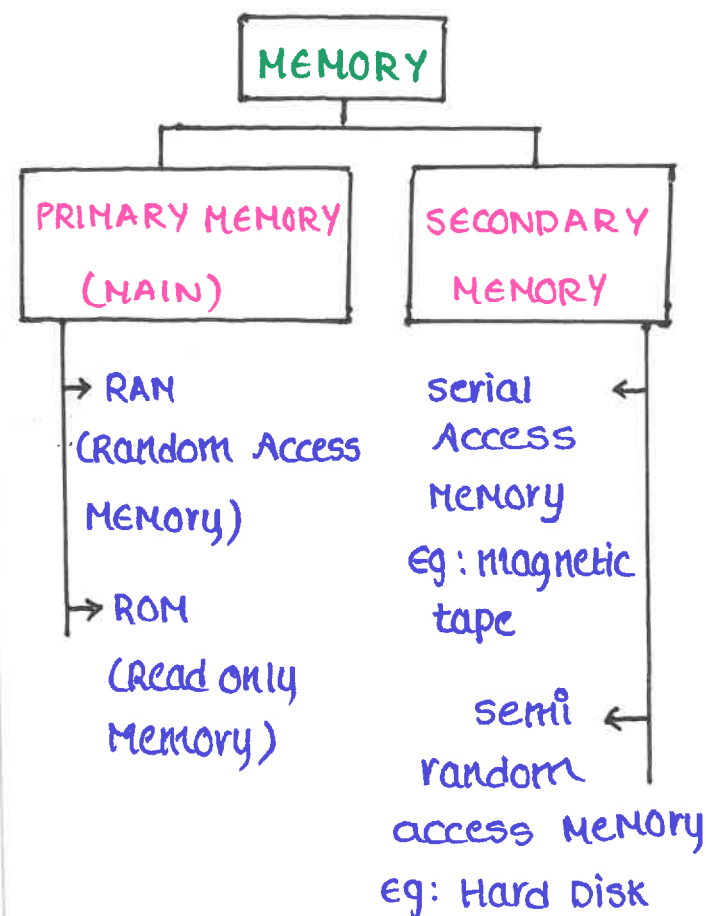• No portable

2

STRUCTURE AND WORKING OF COMPUTER

The basic computer organization remains the same for all the computer system

CPU
- CONTROL UNIT
- INPUT UNIT
- MEMORY UNIT
- OUTPUT UNIT
- ARITHMETIC & LOGICAL UNIT
- SECONDARY STORAGE

- - -> CONTROL FLOW

——> DATA FLOW

The architecture of the computer have not changed since decades, but the technology used to accomplish those operations may vary from one computer to another computer

MEMORY

MEMORY
- PRIMARY MEMORY (MAIN)
  - RAM (Random Access Memory)
  - ROM (Read only Memory)
- SECONDARY MEMORY
  - serial Access Memory
    Eg: magnetic tape
  - semi random access Memory
    Eg: Hard Disk

FUNCTIONAL BLOCKS

1. ALU (Arithematic logic unit)

- Addition
- Subtraction
- Multiplication
- Division
- Logical Unit
- AND
- OR

SELECT FUNCTION
AND
OR
1-BIT FA
MULTIPLEXER
RESULT
CARRY IN
CARRY OUT
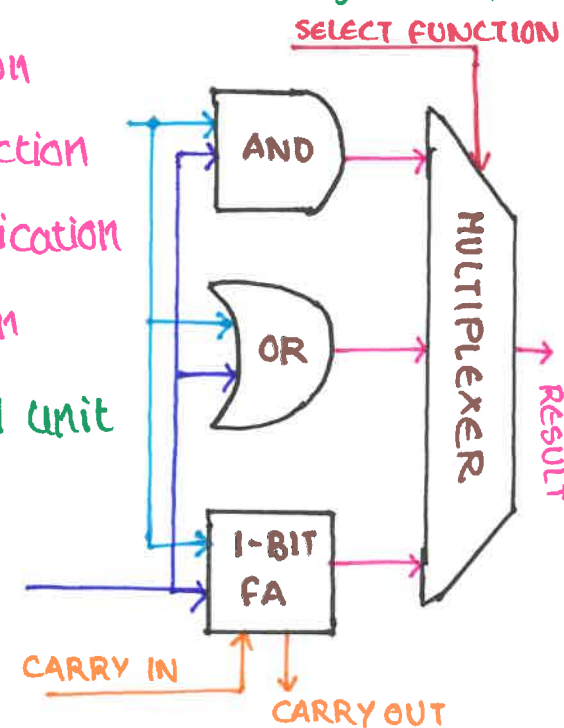
2. CONTROL UNIT

- fetching Get the next program
- Decoding Deciphers what the program
- Executing carries out the action
- Storing saves the result to a Memory

3. Registers

Program counter that manages the Memory address of the instruction to be executed next.

Instruction register Part of a CPU's control unit that holds the instruction currently being executed or decoded

Memory Address register used to handle the address transferred to the Memory unit

Memory Buffer register Temporary storage area in the main Memory (RAM)

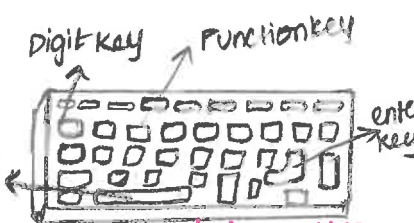Memory Data Register Holds the contents found at the address held in data

Accumulator short-term, intermediate storage of arithmetic and logic data in CPU

INPUT DEVICES

1. Keyboard
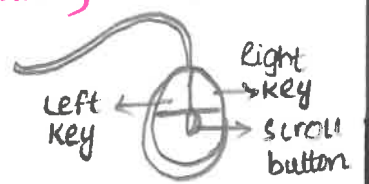
Input device for manual data entry
Also called as Qwerty Keyboard

Digit key   Function key
Space bar   enter key

2. MOUSE

It is hand-held pointing device that allows to control.
It is a locater

Left key   Right key   Scroll button

3. Scanner

Photography Machine and Transfer Image

scanners can transfer typed text, graphics, daigrams and photograph to the computer

4. Joy stick

It is flight stick, is an input device and piroth on base, angle and the direction

OUTPUT DEVICES

1. VDU - visual display unit

consists of Television screen and Keyboard
VDU uses CRT (cathode ray tube)
It creates pictures out of many Mons of lines of tiny dots.

2. Printers

→ Line printer uses fan-fold forms of Papers rather than single sheet.
used for large volume of data to be Printed. Eg: pay roll Marksheet

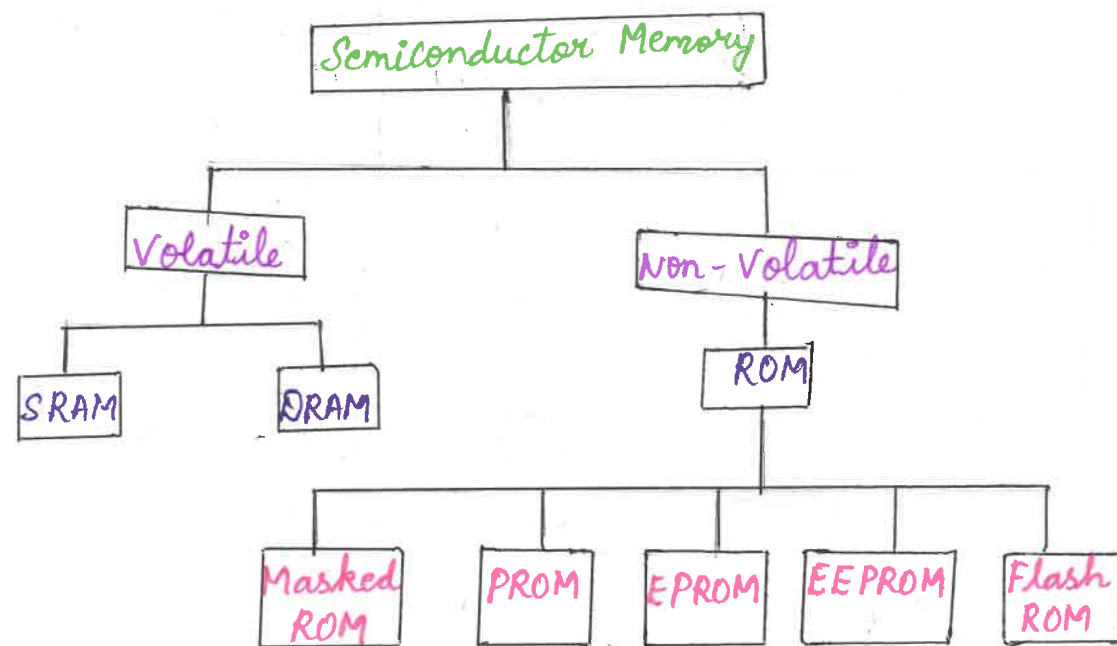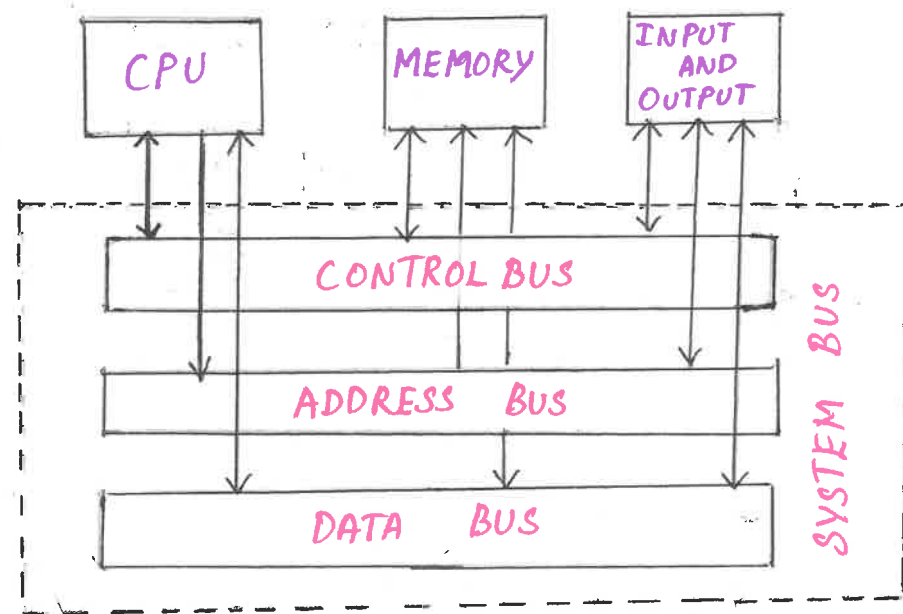→ Dot Matrix It works by Impact 25 to 450 characters Per second

→ Ink Jet printer It sprays ink through holes 0.5 to 4 pages

→ Laser fire Powder ink 4 to 20 pages Per minute

→ Plotter Produces good quality drawing

3

BUS STRUCTURE

PROM	EPROM.
* Not reusable	* Reusable.
* Inexpensive	* Expensive
* Irreversible	* Reversible
* Write only	* Read and write.
* Bipolar transistors used.	* MOS transistors used.
* Older version of EPROM	* Modern version of PROM.

Hard Disk.
* Permanent storage can store lot of information
* Capacity of hard disk is measured in Megabytes (MB) or Gigabytes (GB).

CD - COMPACT DISK.
* Stores large volume of data i.e) 700MB - 1.4GB.
* Cheaper & easy to handle.

Advantages.
* High storage capacity
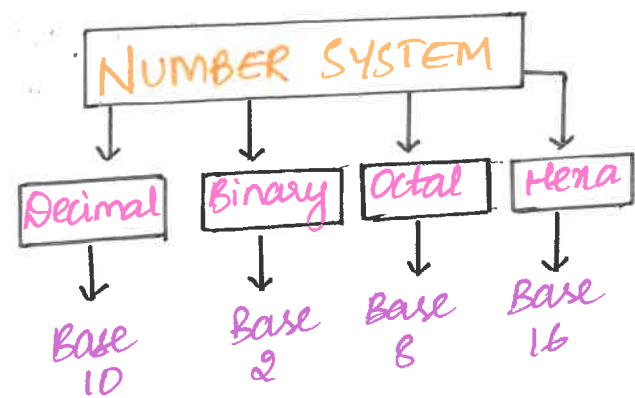* Can Read/Rewrite using CD-RW's.

SSD - Solid State Drive.
* Uses IC assemblies to store data
* It is also called as semiconductor storage device, solid state device/disk
* Capacity of SSD started with 20 MB (Sandisk) and developed to 100 TB.

USB - Universal Serial Bus.
Acts as Interface that allows a computer to communicate with peripheral and other devices.
Example for USB devices to connect computer.
⇒ Digital Camera
⇒ External drive
⇒ Gamepad
⇒ Printer, Joystick etc.

PROM
* Programmable Read Only Memory
* User must write desired program into it once, by a special process.
* Contents can't be changed.

EPROM
* Erasable Programmable Read Only Memory
* Content can be erased in EPROM using ultraviolet light.
* If there is an error while writing on EPROM can be still used again.

EEPROM.
* Many devices incorporate EEPROM
Electrically Erasable PROM.

SECONDARY MEMORY
* Secondary memory is a storage device that is not accessible directly by the CPU.
* Magnetic disk are used to store data permanently also known as backup memory.

ROM	RAM
* Non-Volatile memory	* Volatile memory
* Permanent	* Temporary
* cost effective	* cost is very high
* High storage capacity	* Low storage capacity
* Low speed	* High speed.
* OS supporting programs can be stored	* User defined programs can be stored

4

NUMBER SYSTEMS

NUMBER SYSTEM
- Decimal → Base 10
- Binary → Base 2
- Octal → Base 8
- Hexa → Base 16

Decimal to Binary Conversion

$(243)_{10} \rightarrow (?)_2$

```
2 | 243
2 | 121  — 1
2 | 60   — 0
2 | 30   — 0
2 | 15   — 0
2 | 7    — 1
2 | 3    — 1
    1    — 1
```

$(1 1 1 1 0 0 1 1)_2$

Decimal to Octal

$(243)_{10} \rightarrow (?)_8$

```
8 | 243
8 | 30 — 3
    3  — 6
```

$(363)_8$

Decimal to Hexadecimal

$(243)_{10} \rightarrow (?)_{16}$

```
16 | 243
    15 — 3
```

15	3
↓	↓	⇒ $(F3)_{16}$
F	3

Binary to Decimal conversion

$(11101011)_2 \rightarrow (?)_{10}$

1 1 1 0 1 0 1 1

$1 \times 2^0 = 1$
$1 \times 2^1 = 2$
$0 \times 2^2 = 0$
$1 \times 2^3 = 8$
$0 \times 2^4 = 0$
$1 \times 2^5 = 32$
$1 \times 2^6 = 64$
$1 \times 2^7 = 128$
 _____
 235

$(235)_{10}$

Binary to Octal conversion

$(11101011)_2 \rightarrow (?)_8$

```
011   101   011
 ↓     ↓     ↓
 3     5     3
```

$(353)_8$

Binary to Hexadecimal conversion

1 1 1 0 1 0 1 1 0 1

```
0001   1101   0110   1101
  ↓      ↓      ↓      ↓
  1     13      6     13
```

$(1 D 6 D)_{16}$

Octal to Decimal conversion

$(247)_8 \rightarrow (?)_{10}$

247

$7 \times 8^0 = 7$
$4 \times 8^1 = 32$
$2 \times 8^2 = 128$
 _____
 167

$(167)_{10}$

Octal to Binary conversion

$(247)_8 \rightarrow (?)_2$

010 100 111

$(010100111)_2$

Octal to Hexadecimal conversion

$(5456)_8 \rightarrow (?)_{16}$

(i) Convert Octal to Binary
(ii) Convert Binary to Hexa

(i) → Octal to binary
$(5456)_8 \rightarrow (?)_2$

101 100 101 110

(ii) Binary to Hexa

```
1011   0010   1110
  ↓      ↓      ↓
 11      2     14
  B      2      E
```

$(B2E)_{16}$

Hexadecimal to Decimal Conversion

$(8EB4)_{16} \rightarrow (?)_{10}$

8 E B 4

$4 \times 16^0 = 4$
$11 \times 16^1 = 176$
$14 \times 16^2 = 3584$
$8 \times 16^3 = 32768$
 _____
 36532

$(36532)_{10}$

Hexadecimal to Binary conversion

$(B2E)_{16} \rightarrow (?)_2$

```
 B    2    E
 ↓    ↓    ↓
11    2   14
```

1011 0010 1110 ⇒ $(011000101110)_2$

Hexadecimal to octal conversion:

(i) converted to binary
(ii) convert Binary to octal

$(B2E)_{16} \rightarrow (?)_8$

(i) B2E → 11 2 4
    = 1011 0010 1110

(ii) 1011 0010 1110
     (5   4   5 6)_2

Two's complement

$4 = 0100$ $-4 = 1100$
1's comp = 0011   1's com = 1011
2's comp = 0100   2's comp = 1100 (-4)
sign bit (+4)   -ve sign bit

Signed number System

2's complement number system

Example :- -003 } complement digits
              ↓ ↓ ↓
              9 9 6 } add 1.
              + 1
             _____
              9 9 7

Binary addition

Example :-   1 0 0 1 0
           +   1 0 0 1
           _____
             1 1 0 1 1

Binary subtraction

Example :-   1 1 1 1
           -   1 0 0
           _____
             1 0 1 1

Binary multiplication

Example :-   1 0 1 0
             × 1 0 1 1
           _____
               1 0 1 0
             1 0 1 0
           1 0 1 0
         1 0 1 0
        _____
        1 1 0 1 1 1 0

5

COMPUTER LANGUAGE

Algorithm :-
- Set of Finite rules or Instructions.
- Sequence of Finite steps to solve Problems.
- Characteristics :-
→ Well defined Inputs
→ Clear & unambigious
→ Language independent

Types of Algorithm
→ Brute force Algorithm
→ Recursive Algorithm
→ Backtracking Algorithm
→ Searching Algorithm
→ Sorting Algorithm.
→ Hashing Algorithm.
→ Divide & Conquer Algorithm
→ Greedy Algorithm.

Example : Add 3 numbers

Step 1 :- START
Step 2 :- Declare 3 int Variable
Step 3 :- Read 3 numbers
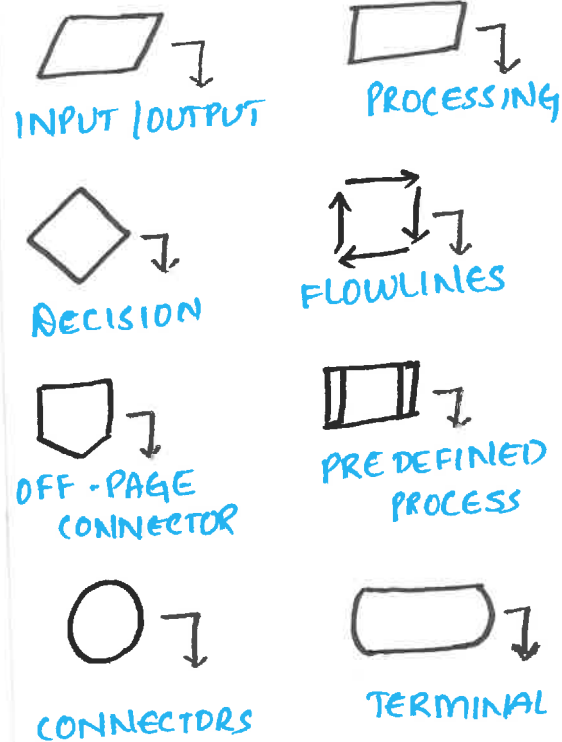Step 4 :- Add 3 numbers & Assign
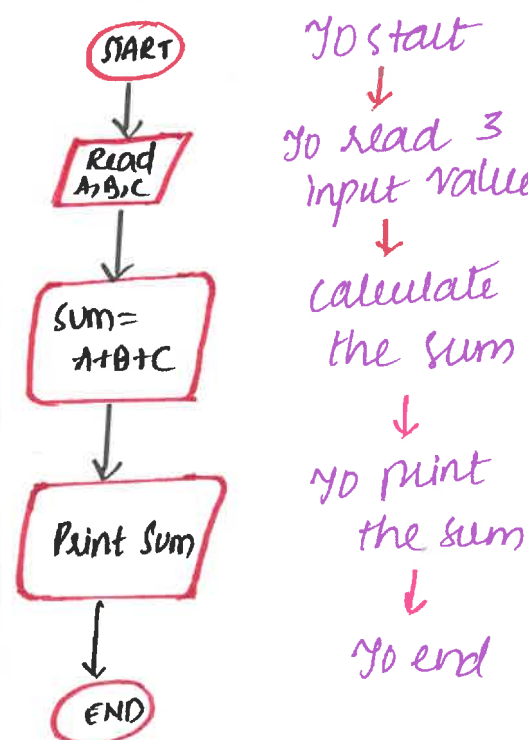Step 5 :- Print the Value
Step 6 :- END

Flow Chart
→ Diagramatic representation of an algorithm.
→ A step by step approach to solve a task.

Symbols :

INPUT / OUTPUT

PROCESSING

DECISION

FLOWLINES

OFF-PAGE CONNECTOR

PREDEFINED PROCESS

CONNECTORS

TERMINAL

Example :-

START
↓
Read A,B,C
↓
Sum = A+B+C
↓
Print Sum
↓
END

To start
↓
To read 3 input values
↓
Calculate the Sum
↓
To print the sum
↓
To end

Machine Level Language
→ Low Level Programming
→ Binary digits (0's & 1's)
→ Can independently learn, grow, develop & adapt.

C = A+B	C	C++	JAVA
	High Level Language		

ADD A,B	Assembly level language

10101101	Machine Language

Assembly Language
→ Low level programming language
→ communicate with computer hardware.

Assembly Code

Operation	Operand address
READ	K
ADD	L
CLA	K

Advantages :-
→ Less memory
→ Less execution time
→ Suitable for time critical Jobs.
→ Suitable for writing interupt service routines.

Disadvantages :-
→ It is machine dependent.
→ Difficult & time consuming.

High level language.
→ Closer to human language
→ easy to read write & maintain
→ It executes faster
→ Requires compiler to convert to machine level language.

Example :-
```
I = 0;
repeat
    I = I+1;
    SUM := SUM+N;
    N = N+5;
until (I=10);
```

Languages Example :-
→ C   → C++
→ PASCAL   → JAVA
→ PYTHON   → ADA
→ LOBOL

Assembler :

Assembly language Program → Assembler → Machine language Program
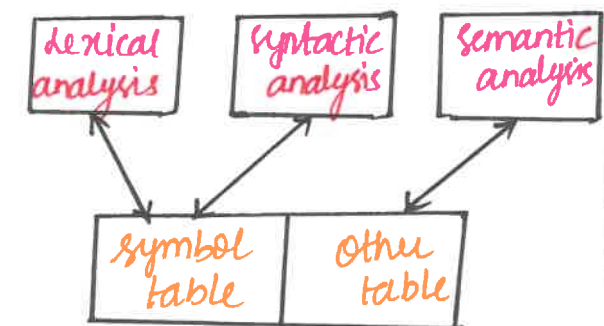
Types :
→ single pass   → multiple pass.

Features :-
→ Mnemonics
→ symbolic addres.
→ symbolic constants
→ storage allocations
→ expressions.

Compiler :

Lexical analysis	Syntactic analysis	Semantic analysis

symbol table	other table

Converts highlevel Language to Machine level language.

Lexical :- (also called Scanner)
→ Reach the successive line
→ Breaks into terms-like - Identifier, operator, De-limiter
→ constructs symbol table.
→ symbol table allocates memory.

Syntactic :- (also called Parsing)
→ Expression, statement, declaration are identified.
→ Aided by formal grammer of programming language

Semantic : (also called Phase bridge)
→ Analysis Phase of syntax.
→ Last phase of translation is code generation.

Tools :-
LEX - Lexical Analyser
YACC - Yet Another compiler compiler.

Interpreter :
→ Used to convert to machine level language.
→ To translate a code.
Examples :- PHP, PYTHON, RUBY, MATLAB, PERL.

PROGRAM PARADIGM

Characteristics of Good Language

1. Portability
Ability of an Application to run on Different platforms

2. Readability
Makes other users to follow the logic

3. Efficiency
Time and Memory of computer, Utilized to process Instru and the Data

4. Structural
Task Must be broken down to Many subs tasks.

5. Flexibility
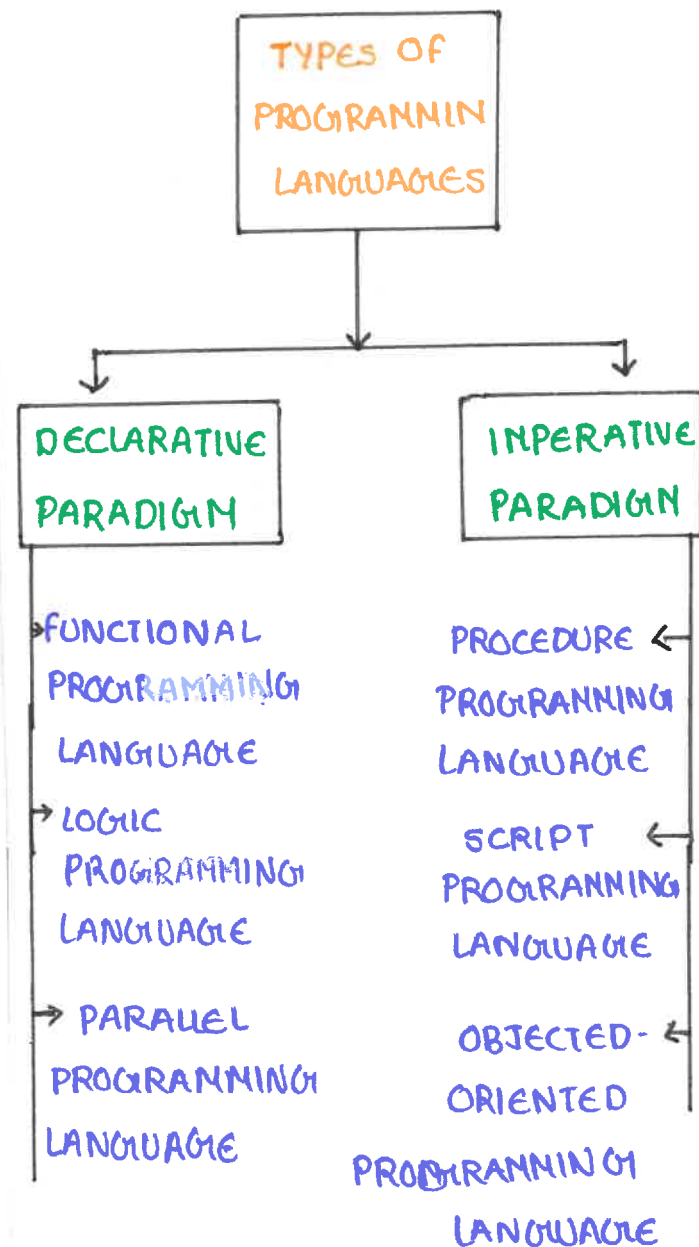this can made any changes Without rewriting the programs

6. Generality
Program should be general

7. Documentation
A Well documented application is More useful for the others users.

TYPES OF PROGRAMMING'S LANGUAGES

TYPES OF PROGRANNIN LANGUAGES

DECLARATIVE PARADIGM
- FUNCTIONAL PROGRAMMING LANGUAGE
- LOGIC PROGRAMMING LANGUAGE
- PARALLEL PROGRAMMING LANGUAGE

INPERATIVE PARADIGM
- PROCEDURE PROGRANNING LANGUAGE
- SCRIPT PROGRANNING LANGUAGE
- OBJECTED-ORIENTED PROGRANNING LANGUAGE

→ DECLARATIVE PARADIGMs

*FUNCTIONAL PROGRANNING LANGUAGE
focus on Output of Mathematical function and Evaluations

- SCALA - HASKELL - ERLANG
- ELIXIR

* LOGIC PROGRANNING LANGUAGE
Express series Of facts and rules to Instruct the computers on how to Make decisions

- PROLOG - ABSYS - ALNA-O
- DATA LOG

→ IMPERATIVE PARADIGM

* PROCEDURE PROGRANNING LANGUAGE

follows a sequences of an the statements (or) commands to achieve desired Output

- c and c++   - JAVA
- BASIC - PASCAL

* SCRIPT PROGRANNING LANGUAGE
used to automate repetitive tasks, Manage dynamic web contents (or) support process in large Applications.

- PYTHON - BASH - PERL
- NODE.Js

* OBJECTED-ORIENTED PROGRA-NNING LANGUAGE
Treats-oriented a programs as a group of objecteds called attributes and Methods.

- JAVA - PYTHON - PHP
- RUBY

OOPs CONCEPTS

1. OBJECT : OBJECTS are always called instances Of a class
EX : MY book MY Obj = new MY book ();

2. CLASS : CLASSES are like object constructors for creating objects A CLASS keynord is used to create a class.

3. ABSTRACTION : It Hides the unnecessary Information.

4. INHERITANCE : INHERITANCE is Mainly used for Method of over-riding and R

5. POLYNORPHISN : It performs a single action in different ways.

SIMULATOR:

* The model of your software that allows you to demonstrate its key functions.

Example: • Mobile Simulator
• Network Simulator

EMULATOR:

* The hardware or software that enables one computer system (host) to behave like another computer system (guest).

Example: • JTAG

APPLICATION SOFTWARE:

* An application software is a set of programs, that allows the computer to perform a specific data processing job for user.

Example: word processing, Insurance

SYSTEM SOFTWARE:

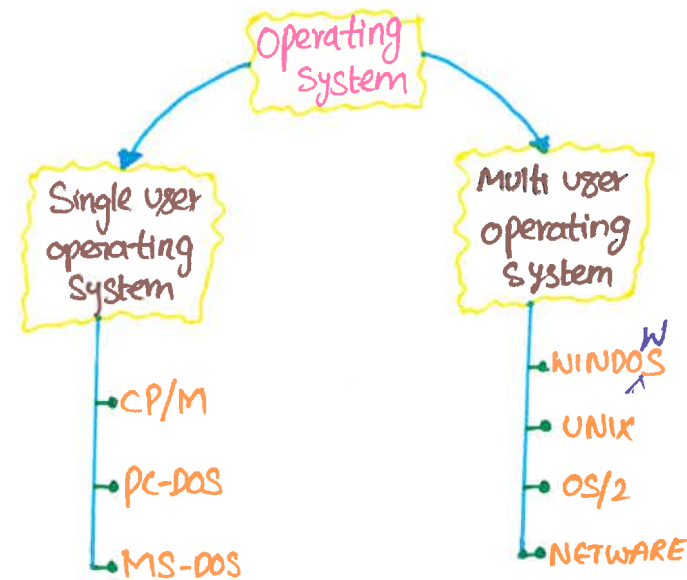A system software is a collection of programs designed to operate, control and extend processing capabilites of computer.

Example: macOS, Linux, Android.

OPERATING SYSTEM:

It is a set of programs, that controls and supervises the operations of computer system & provides the services to computer users.

Operating System → Single user operating system → CP/M, PC-DOS, MS-DOS

Operating System → Multi user operating system → WINDOWS, UNIX, OS/2, NETWARE

FUNCTIONS OF OPERATING SYSTEM:

* It loads itself into the computer memory.

* It allocates various jobs to various resources.

* It controls and co-ordinates the entire computer system.

* It loads user programs and data into the computer memory.

* It controls the various application programs.

EVOLUTION OF OPERATING SYSTEM:

1. SERIAL PROCESSING:

* Strictly sequential, without overlap of the successive processing times on objects or a distinct subsystems.

* Each objects takes same amount of time.

2. BATCH PROCESSING:

* The same type of jobs batch together and execute at a time.

The carrier carries the group of jobs at a time from one room to another.

3. MULTI PROGRAMMING:

* Multiprogramming is a technique to execute the no. of programs simultaneously by a single processor.

4. TIME-SHARING:

* Time sharing (or) multitasking is a logical extension of the multiprogramming.

5. PARALL SYSTEM: A number of processors are executing their job in parallel.

6. DRISTRIBUTION SYSTEM: The processors cannot share a memory or clock.

TYPES OF OPERATING SYSTEM:

1. SINGLE USER OPERATING SYSTEM:

* In this only one user program resides in the main memory of the computer system

2. MULTI-USER OPERATING SYSTEM:

* It can manage input/output and memory allocation of more than one program simultaneously.

3. TIME-SHARING OPERATING SYSTEM:

* It facilitates simultaneous processing of a large number of jobs by creating a conductive environment for interactive processing

4. VIRTUAL STORAGE OPERATING SYSTEM:

* The pooling of physical storage from multiple network storage devices into what appears to be a single storage device that is managed from a central console.

5. REAL TIME PROCESSING:

* An operating system which supports a real time application, i.e when the event occurs

6. MULTI-PROESSING:

* A multi-processing operating system executes a single job by using multiple CPUs.

7. VIRTUAL MACHINE OPERATING SYSTEM:

* A computer, simulated partly by a program.

* The program which does this simulation in on os program.

8

WINDOWS OPERATING SYSTEM

USING THE COMMAND PROMPT INTERFACE

Text based interface for operating system

COMMANDS

Cls → clear screan

copy → copy a file

Del → Delete a file

ip config → list of IP Address

Ping → send packets to IP

Mkdir → create directories

system INFO → system information

CHK DSK → check disk

REN → Rename

USING WINDOWS POWER SHELL

Automated Objected oriented scripting language

COMMANDS

Get help → Help

Get Process → Display running Process

Stop Process → Teminate process

Get-eventlog → event log

Get-service → list of serving

Dir-files → folders

Get-Job → Running Job

Invoke → Commands for local and remote config

Out-Host → output to commands line

start-stop-cmdlet to → suspend Activity

MS CONFIGURATION

- system utility
- It can be disable or re-enable the software
- Launches Microsoft's system configuration utility
- MS configuration windows contains 5 tabs and then are :
  → General
  → Boots
  → Services
  → Start up
  → Tools

DIFFERENCES BETWEEN 32 & 64 BITS

32 BITS	64 BITS
Needs 32 bits OS	can run in both 32 bits and 64 bit OS
supports windows 7, 8, LINUX compatible	WINDOWS XP, WINDOW VISTA, MAC OS, WINDOWS 10
4 GIB ADD & STABLE SPACE	16 GIB ADDRESSA-BLE SPACE
MEMORY LIMIT 3.2 GIB	17GIB RAM

USING REMOTE DESKTOP

By using steps, It can be followed

STEP1 → start

STEP2 → Right click on computer

STEP3 → select properties

STEP4 → select remote tab

STEP5 → Enter Administrator the Password

STEP6 → select Option

STEP7 → select User Button

STEP8 → Click Add in Remote Desktop

STEP9 → complete one of the task

STEP10 → Enter user name by Clicking enter

STEP11 → Click OK

ENCRYPTION

* Right click on file or folder
* select Properties
* select advanced button-encrypt content
* select OK and close

COMPRESSION

* START → MY COMPUTER
* Double click on folder
* Right click → Properties
* General Job → Advanced → compress
* save disk space → OK

FILE SHARING

* SETTINGS → NETWORKS & Internet → select status → NETWORKS & sharing centre
* change advanced sharing setting
* select NETWORKS → private or the Public
* Turn on NETWORK discovery, or Turn on file and printer sharing → save changes

SHARING USING BASIC FILE SHARING

* Right click on folder → click the Property
* select sharing tab → click share button
* select user
* select sharing permission → click the share button
* Copy the NETWORK path and click done

FILE BACKUP

choose backup setting → start → settings → accounts → window backup

Items to be backup

* one drive folder syncing
* Remeber My Apps
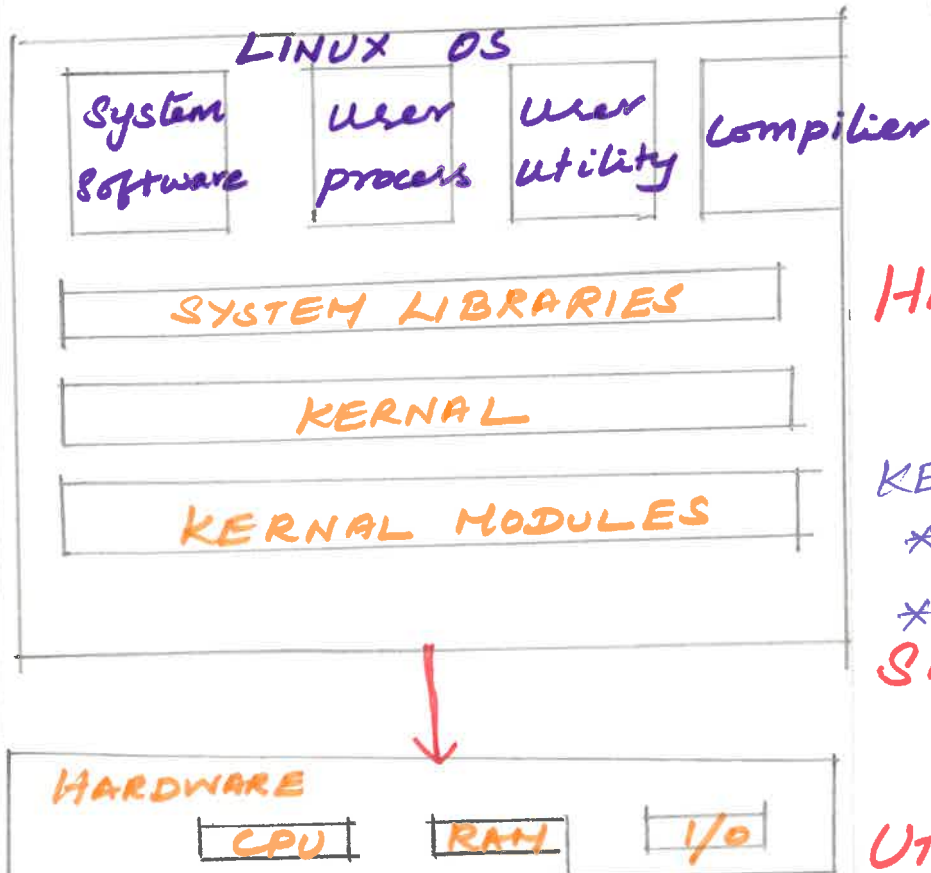* Remember My performance

Hence,
    This is a file backup

9

Linux Operating System

* Version - UNIX operating System
* UNIX Compatibility

Components Of Linux System

KERNAL
* Major activities done
* Provides Abstraction
* Low level hardware

LINUX OS
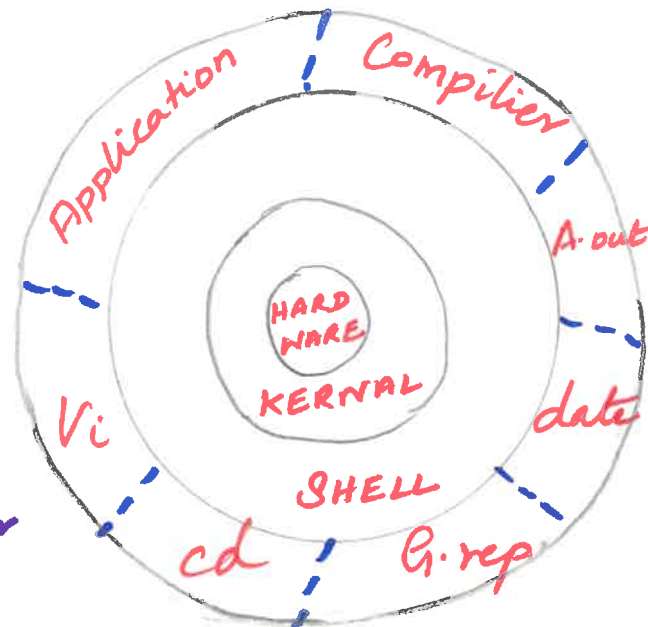| System Software | User process | User utility | Compiler |
SYSTEM LIBRARIES
KERNAL
KERNAL MODULES

HARDWARE
| CPU | RAM | I/O |

SYSTEM LIBRARY
* Special Functions
* System Utilities
* Implements Functionalities

SYSTEM UTILITY
* Specialized
* Individual level

BASIC Features Of LINUX
* Portable   * Multi user
* Open Source * Shell
* Multi programming * Security
* Hierarchial file system

HARDWARE LAYER:
* Peripheral devices
* RAM, CPU etc

KERNAL
* Interacts directly with h/w
* Low level Services

SHELL:
* Hiding Complexity
* Commands - Uses

UTILITIES:
* Major Role in Program
* Functionalities Of OS
* Activated

BASH COMPILER:
Produces file Containing Binary code readable by the machine

KERNELS
* Central part of an Operating system
* Interface between User application and hardware
* Manages memory and CPU time

Types Of Kernels
- Microkernels
- Monolithic kernels
- Hybrid kernel
- Nano kernel
- Exo kernels

Functions Of Kernel
- Resource Management
- Memory Management
- Device Management
- System Calls

KERNAL MODE
- Direct access to System Resource
- Whole System fails on Interrupt

- kernal mode also known as Master Mode privileged mode
- Shares virtual address space
- Mode bit is zero
- Essential functionality is permitted.
- System crash is severe and more complicated.

USER MODE
- Application program executes and starts
- Single process fails on Interrupts
- It is also known as Slave mode or Unpriveleged
- Separates Virtual address space
- Mode bit is one
- User program can be executed.
- System Crash can be recovered.

10

Window File System
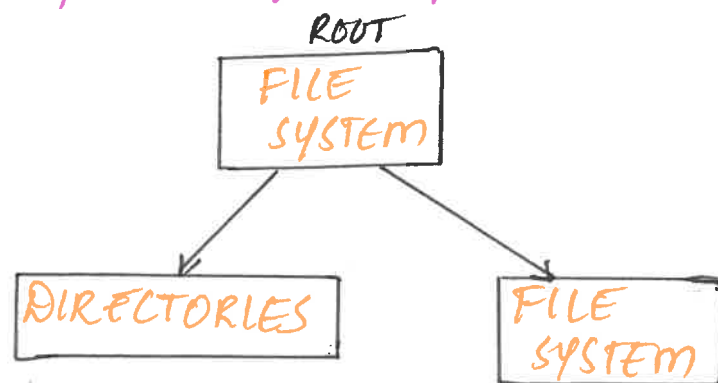
Two Major File System

NTFS → Modern OS

FAT → Old DOS

NTFS [New Technology File System]

FAT [File Allocation Table]

OTHER TYPES OF FILE SYSTEM

- Disk file Systems
- Flash File Systems
- Tape File Systems
- Database File Systems
- Transactional file System
- Network file System
- Shared disk file System
- Special file System

ROOT

```
        FILE
       SYSTEM
      /      \
DIRECTORIES   FILE
             SYSTEM
```

Linux File System

Three types of files

→ Ordinary /regular Files
→ Special files
→ Directions

Linux Directory Commands

→ Pwd command
→ mkdir command
→ rmdir command
→ IS Command
→ cd command

KERNAL

VIRTUAL FILE SYSTEM

(EXT3) (HPF3) (VFAT)

(EXT4) (Free BSD) (API)

HARDWARE

COMMANDS

$ cat > filename
↳ Cat Command

$ Cat Filename
↳ Display Contents

$ pwd
↳ Print working directory

$ mkdir dirname
↳ mkdir Command

$ rmdir dirname
↳ rmdir comand

$ cp old-file new_file
↳ cp command (copy)

$ rm filename
↳ rm (remove)

$ mv old_file new-filename name
↳ mv command (move)

$ wc filename
↳ w command (no of word)

SHELL PROGRAMMING

These are of three types

Bourne shell
↳ Stephen Bourne

Korn Shell
— David Korn

C shell
— Bill Joy.

Functions of shell

— command line interpretation
— program initiation
— input-output redirection
— Pipeline connection
— substitution of filenames
— maintanance of variables
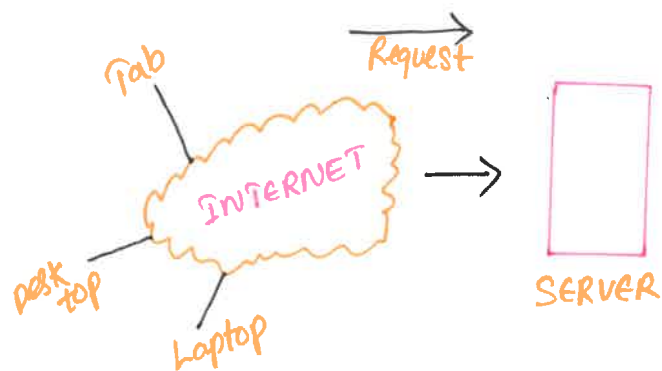— Environment control
— shell programming

Sample Program :

```
echo Enter a number
read a
echo Enter another number
read b
if test $a -eq $b
then
    echo "Number are equal"
else
    echo "Numbers are not equal"
fi
```

TYPES OF COMPUTING

CLIENT SERVER COMPUTING

* Client request a resources server provides.
* Server serve many clients
* Client with one server.

CHARACTERISTICS OF CLIENT-SERVER

* Works on system of request & response. Client sends request → server responds.
* Client & server follows communication protocol at application layer.
* Denial of service attack

ADVANTAGES OF CLIENT-SERVER:

* All data at same place.
* Server need not be close to client.

---

* Easy to replace, upgrade or relocate client.
* Client & server need not build on similar platform.

DISADVANTAGES:

* Server → overload → congestion
* Server fails → Total network fails
* Cost of setting & maintaining is high.

TIME-SHARING COMPUTING:

* Many people use a particular computer at same time.
* Multitasking on time sharing is extension of multiprogramming.
* Processor time is shared.
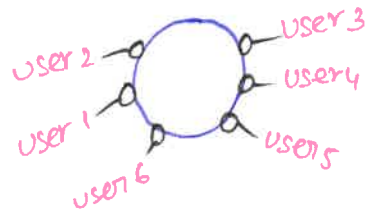
CHARACTERISTIC OF TIME-SHARING:

* Active state * Ready state * waiting state

ADVANTAGES:

* Each user get equal opportunity
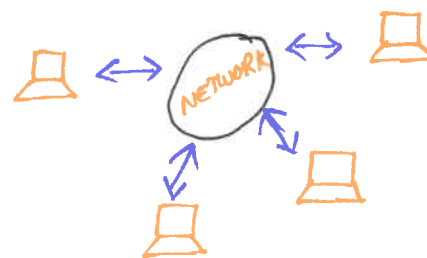* less duplication of software
* Cpu idle time is reduced.

DISADVANTAGES:

* Reliability problem
* Data communication problem.

DISTRIBUTED COMPUTING

* Multiple nodes - physically seperate but linked together using network.

CHARACTERISTICS OF DISTRIBUTED SYSTEM:

* It can be client/server or peer to peer system.
* CLIENT/SERVER SYSTEM: client request and server provides resources
* PEER TO PEER SYSTEM: All task are equally divided between nodes.
 → Nodes interact with each others as shared resources.

ADVANTAGES:

* Distributed system are connected each other to share data.
* Nodes can be added easily.
* failure of one node can still communicate with each other.

DISADVANTAGES:

* Security issue
* Data can be lost
* Database is difficult to Handle
* overloading may occur.

PARALLEL COMPUTING

* To slove a problem
* Algorithm divides the problem into small instructions.
* Multiple processing elements simultaneously.
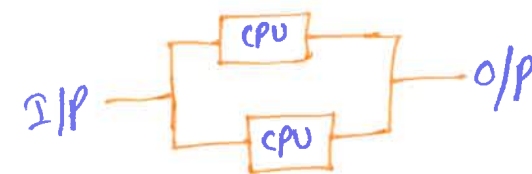
CHARACTERISTICS OF PARALLEL COMPUTING:

* BIT LEVEL PARALLELISM:
* Increases processor size
  eg: 16 bit addition. — 8 bit higher order
  — 8 bit lower order.

INSTRUCTION LEVEL PARALLELISM:

* Instruction can be recorderd and grouped.
* later executed concurrently.

TASK PARALLELISM:

* Decomposition of task into subtask.
* Sub task execute concurrently.

ADVANTAGES:

* Saves time
* can handle complex large data sets.

DISADVANTAGES:

* Addressing is difficult.
* program should have low coupling & high cohesion.

12

Grid Computing

* Grid Computer - More diverse & Spatially scattered — not physically connected.

* Decentralized network - Made of loosely coupled device - work together for massive operation

Internet — Computer system
Grid users — Grid Server — Storage resources
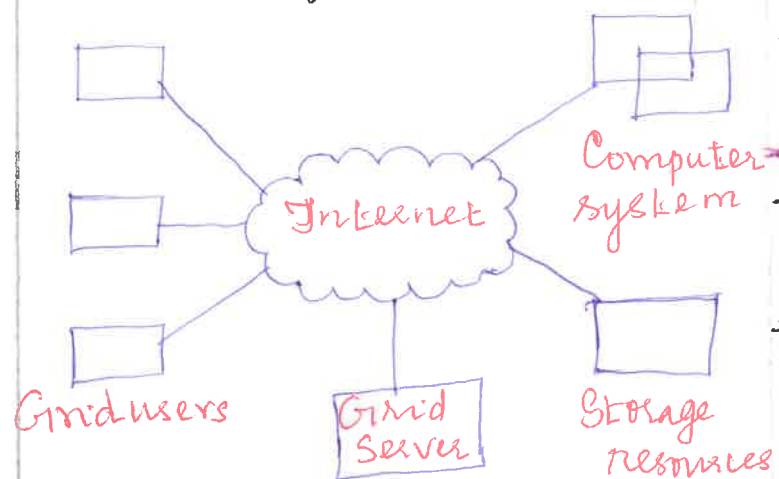
Characteristics of grid

Large scale - deals with few to millions of resources

Geographical distribution - located at different places.

Resource Sharing - Belongs to different Organisation & different people share.

Pervasive access - Grid should extract maximum Performance with available resources.

Advantage:

* No server - Not Centralized except Control node
* Heterogenous machines
* Task performed parallely across various Physical location

Disadvantage:
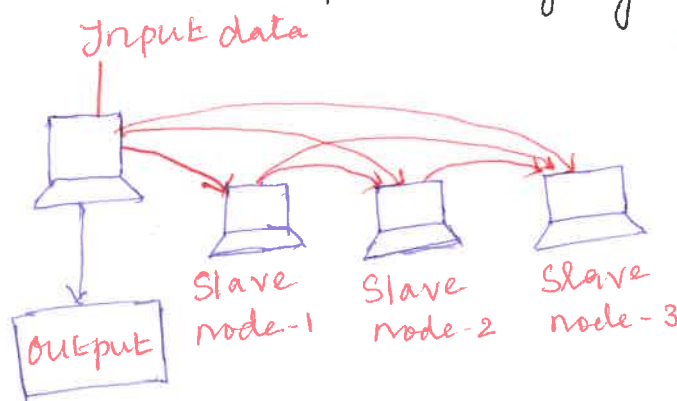
* Super fast inter connect needed
* Licensing mee be a Problem
* Groups may be reluctant.

Cluster Computing

* Several Computers linked on Network like node.
* Connected Computer — Single system.

Input data
Output
Slave node-1   Slave node-2   Slave node-3

Characteristics of cluster

High Availability & failure Cluster
* Uninterrupted Service & resources availability.
* If node declines, application given to other node.

Load Balancing Clusters:
* All traffic from node run equal program & Machines
* few nodes on tracking orders.

High Availability & Load Balancing

* Both features are associated which boost availability & scalability

Distributed & parallel Processing Cluster

* Used in huge Computational task
* Used in Numerical Computing & financial analysis

Advantage	Disadvantage
* Cost efficient	* More power Consumption
* Processing Speed	* Poor Performance
* resource availability	* Difficult to Manage
* Expandability	
* flexibility	

Cloud Computing

* Virtualization - based technology
* Create, Configure, Customize apps

Network
Laptop
Tablet
Smart phone — Cloud Computing — Database
Server   Mobile
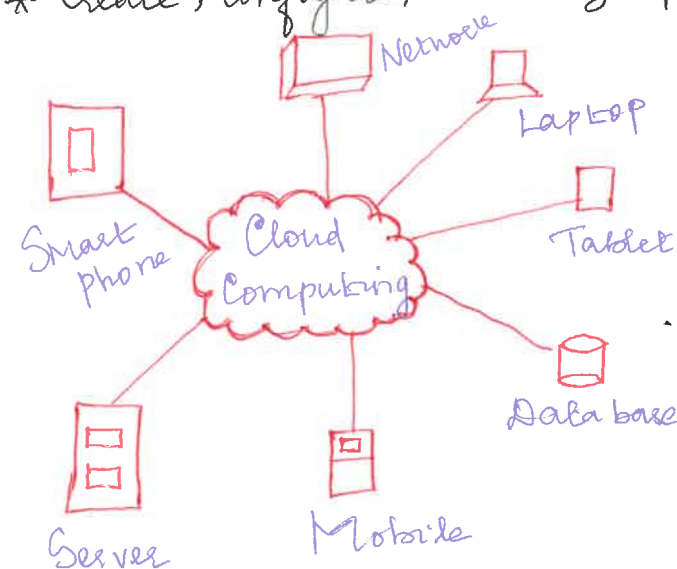
* Development Platform, hard disk Software application & database

Characteristics of Cloud
1. Agility — Shares resources
2. High Availability & reliability
3. Scalability - On demand resource

4. Multisharing
5. Low Cost, Maintenance.

Advantage
* Backup & restore data
* Collaboration & accessibility
* Mobility & pay Per use
* Unlimited Storage Capacity
* Data Security

Disadvantage:
* Internet Connectivity
* Vendor lock in - transfer service
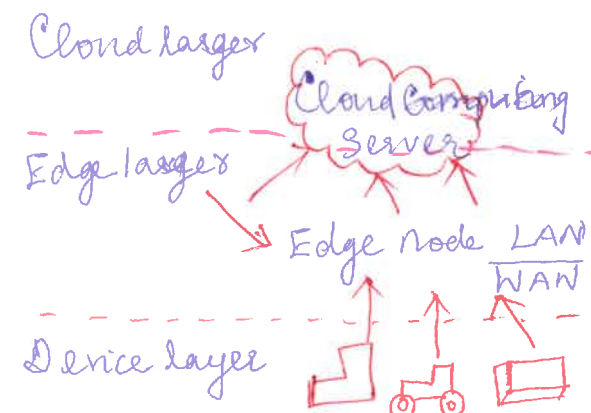* Security
* limited Control - Service provider

Edge Computing

* Decentralization of Network
* Data & Stoge - close to Network
* Process in network gateway- instead of cloud.
* Reduce long distance Processing & Slow Communication.

Cloud layer — Cloud Computing Server
Edge layer — Edge Node   LAN WAN
Device layer

Challenges in Edge Computing
* Privacy & Security
* Scalability → Heterogenous device → Devices - dynamic
* Reliability — alert failure of node
* Speed - fast Communication
* Efficiency - Availability of

Application:
* Transportation - Sensor data
* Health Care - Smart watch
* Oil & gas Monitoring - Remote
* Traffic Management - Autonomous Car
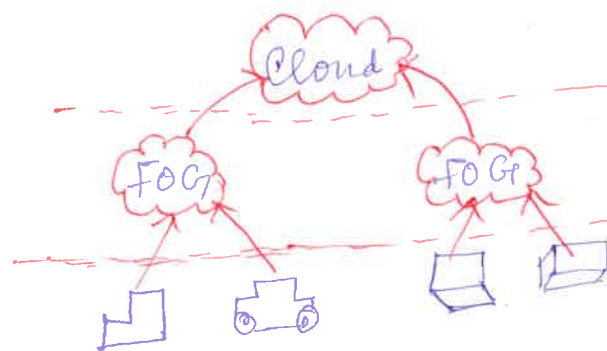* Video Orchestration - hotspot

Advantage	Disadvantage
* Speed, Cost effective	More Storage
* Security, Scalability,	Cyber Security
Fast Processing	issue, Expensive.

FOG Computing
* Edge Computer — Large data
* Fog node filters
* Analyse - Important data

Characteristics
* Uses Selected data
* Analyse data
* Large Services - large geographical locations

Advantage
* less data sent
* Distance travelled less data
* Reduce response time
* Improves security

Disadvantage
* Congestion, Power, Scheduling task, Data management.

Quantum Computing
* Uses Quantum mechanics
* Deals Complex Calculation.

$$\frac{0+1}{\sqrt{2}}$$

Characteristics
* qubit - Quantum info
* Super position - holds 0,1 Combinate
* Entanglement - Strong Correlation.

Advantage	Disadvantage
* Cyber security	* Difficult to
* Crypto graphy	Engineer to
* Fast and effective	build & program
* Calculation in	* Pro Noise
few Seconds	Create errors

Cognitive Computing
* Attempt to mimic human brain
* Use Artificial Intelligence, Neural network, Machine learning

Roles
* Process enormous data to answer queries
* links human & Machines
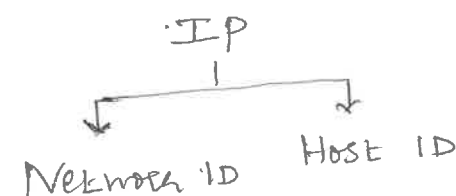* Four layers
  → Understand
  → Reason
  → Learn
  → Interact

Advantage
* Analyse Patterns
* Spot business opportunities
* Take Care - Critical Process

Disadvantage
* Security risk
* Development time — more
* Complex technology

IP Address
* Universally accepted addressing Method
* Network layer adding - 32 bit

IP address Class

	8 bit	8 bit	8 bit	8 bit	Starts with
Class A	N	H	H	H	0
Class B	N	N	H	H	10
Class C	N	N	N	H	110

Class A :-
1: 0.0.0.0 - 127.0.0.0
16,777,214 - address

Class B : 128.0.0.0 - 191.254.0.0
65,534 - IP addresses

Class C : 192.0.1.0 - 223.255.254.0
254 - addresses

Class D : 224.0.0.0 - 239.255.255.255
Multicast

Class E : 240.0.0.0
Reserved for mc

Network address:
- IP ends with 0's in all host bit - Network address

Broadcast address:
- IP ends with 1s in all host bit — directed broadcast

Example
1. The IP address 150.255.255.254 is Class B address
2. The IP address 126.12.3.5 is Class A address
3. The IP address 223.120.50.1 is Class C address.
4. The IP address 172.15.2.3 is Public address
5. The IP address 192.168.4.50 is Private address.
6. The IP address 192.169.4.50 is Public address.
7. The IP address 224.169.4.50 is Multicast address
8. The IP address 172.17.2.3 is Private address
9. The IP address 10.1.2.5 is Private address.
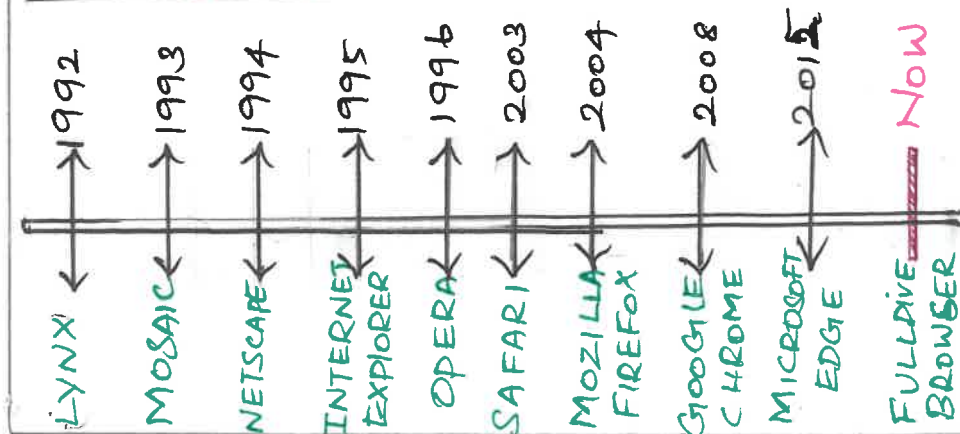10. The default subnet Mask for the Class A IP address is 255.0.0.0.
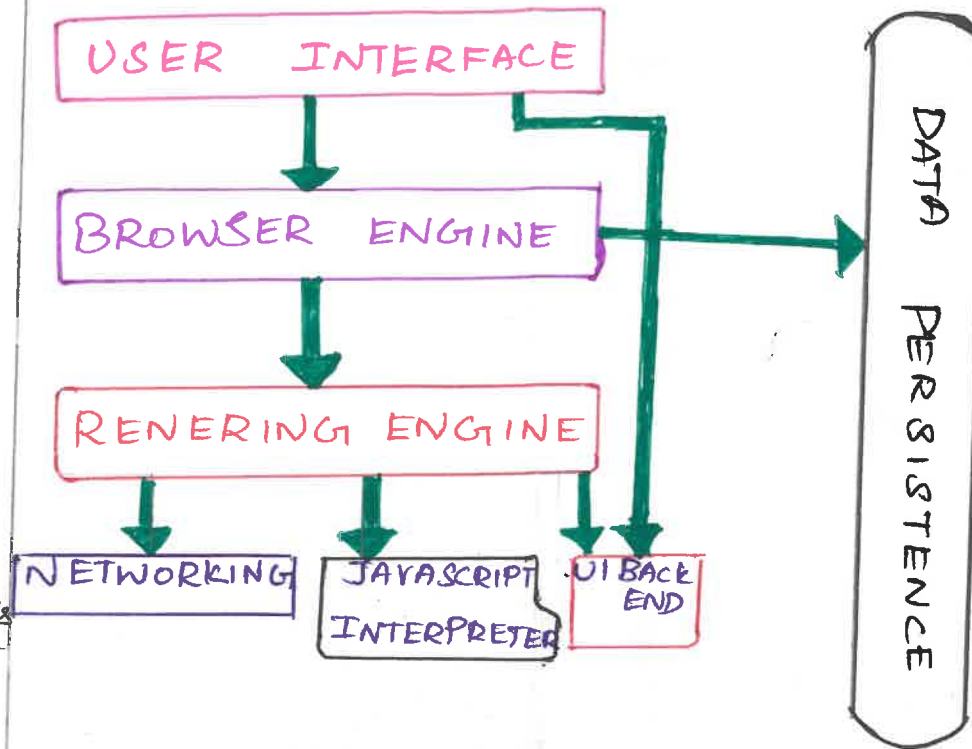
ARCHITECTURE

Mobile Network:

BSc - Basic Station Control
BTS - Base Transreceiver Station
MSC - Mobile Switching Center
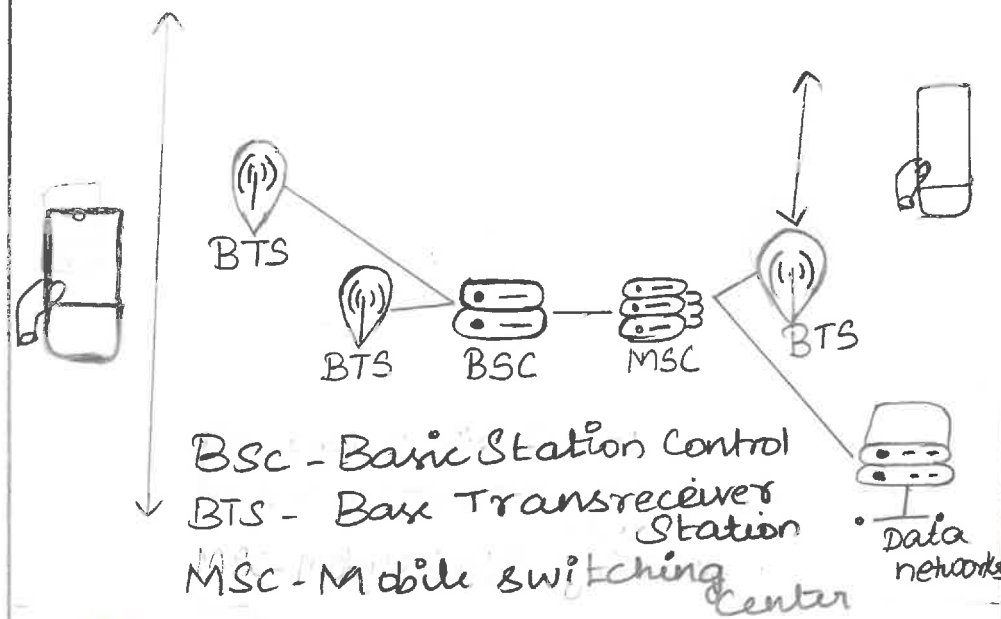
Wifi: Wireless Fidelity

* Wireless Networking technology
* Local area networking
* Freedom from wires.
* Exchange data wirelessly.
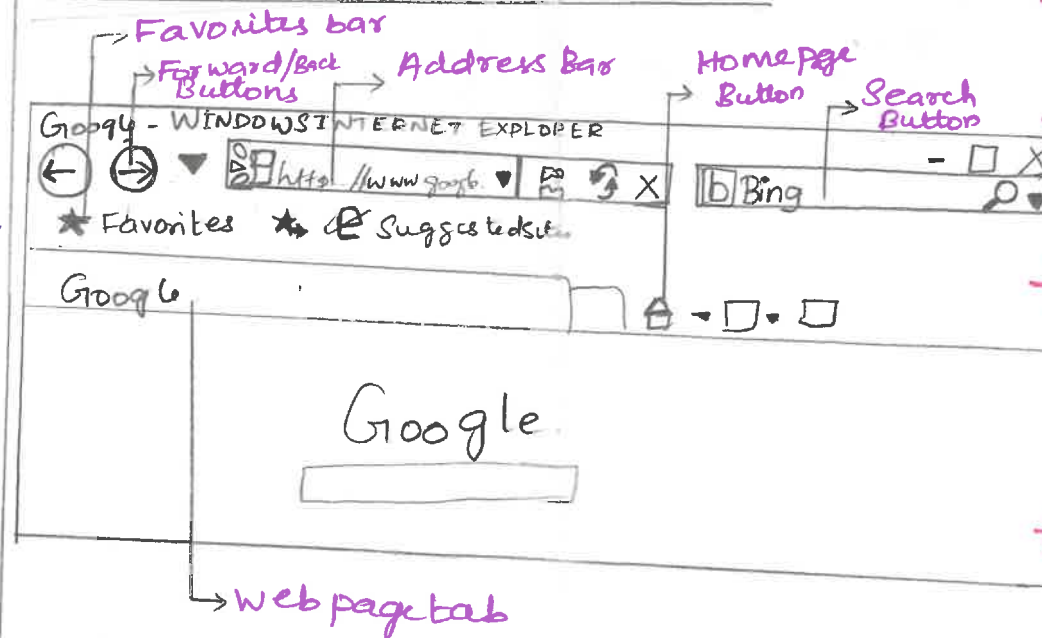* Available to many devices like
  → Computer
  → Camera
  → Smart phones.

History of web browser:

LYNX 1992
MOSAIC 1993
NETSCAPE 1994
INTERNET EXPLORER 1995
OPERA 1996
SAFARI 2003
MOZILLA FIREFOX 2004
GOOGLE CHROME 2008
MICROSOFT EDGE 2015
FULL DIVE BROWSER Now

Architecture of Web Browser

USER INTERFACE

BROWSER ENGINE

RENERING ENGINE

NETWORKING   JAVASCRIPT INTERPRETER   UI BACK END

DATA PERSISTENCE

Features of Web Browser:

Favorites bar
Forward/Back Buttons
Address Bar
Home page Button
Search Button

Google - WINDOWS INTERNET EXPLORER
http //www.go⌐b   b Bing
Favorites   Suggested sites

Google

→ webpage tab

World Wide Web:

→ Inter Connected System
→ Collection of websites or webpages

Example:
→ www.google.com
→ www.Facebook.com

Search Engines

* Google   * Yandex
* YAHOO   * DuckDuckgo
* Bing   * Ask.com
* Rediff   * Ecosia
* Gurreji.com   * QMAMU

Web Application	Desktop Application	Cloud Application
No installation & updating Needed	Responsive	Quick and easy access
Very convenient	Take control over experience	Scalability
updates are usually handle	Difficult to use remotely	Direct response to user actions
More expensive than desktop application	Updated Periodically	Very high uptime
Remote Servers could be Comprised	Comprehensive integration	Rich user Experience
Must have Continous internet Connection to Function	Computer Program that runs Locally on computer devices.	Performs a processing task on a Local computer or workstation

15

GOOGLE APPS:

Docs:

* Google docs is an online work processor included as a part of free.

* It's fully compatible with microsoft word.

* Access your work from any device.

* With Docs, you can creat and edit text document right in your web browser.

Drives:

* Google drive is a free cloud-based storage services.

* Google drive can enable users to store and access files in online.

* You can store your files securly and open or edit them from any device using drive.

CLOUD BASED APPLICATIONS

SLIDES:

* Google slides is a presentation program include as a part of free.

* The app is compatible with microsoft power point file formats.

* comment on text within individual objects.

SHEETS:

* Google sheets is a spreadsheet program included as a part of free.

* Google sheets enable users to creat, update and modify spreadsheet in real time.

BASIC FORMULAS...

* = (SUM)   * =(ABS) * = (MAX)
* = (AVERAGE)   * = (RAND) * = (MIN)
* = (UPPER)   * = (LOWER) * = (NOW)

TEXT FUNCTION: STATISTICAL FUNCTION   MATHEMATICAL FUNCTIONS
eg: * = (LEFT)   eg: * = (MIN)   eg: * =(NOW)
    * = (RIGHT)   * =(AVERAGE)   * =(DATE)
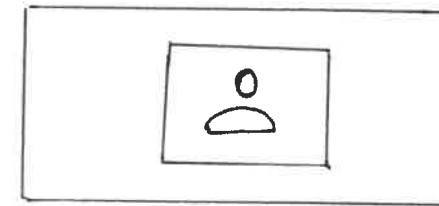
CLASS ROOM:

* Guide, learn, share work.

* Manage student devices.

* Powerfull app.

INSTALL THE CLASSROOM APP:

1. Open the device.
2. Tap play store.
3. Find and Install the Google classroom app.

DIFFERENT ACCOUNTS:

* School account.

* personal google account.

* Google workspace account.

CALENDER:

* Get the official google calender app.

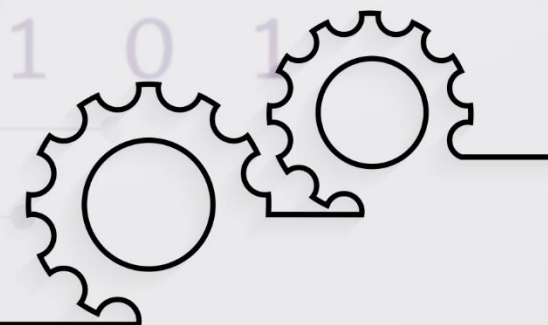* Quickly Switch b/w month, week view.

* Events from Gmail, flight, concert.

FORMS: CREAT A NEW FORM:

* forms.google.com click blank or choose a template.

* drive.google.com new > scroll to google forms.

* Name your form and add description.

* Add a header, change the theme and background color or font style.

MEET:

* A video conferencing service from google.

* Google video calling APP.

* Go to meet.google.com

* Top right → URL bar

* click → Install.

* The meet app appears in appdock.

JAMBOARD:

* A digital white board.

* collaborate in real time using either the Jamboard device, web browser or mobile app.

16

SIMATS

SCHOOL OF ENGINEERING

Approved by AICTE | IET-UK Accreditation

Engineer to Excel

Saveetha Nagar, Thandalam, Chennai - 602 105, TamilNadu, India