

## GENERATIONS

- First Generation :- 1942-55 :- Vacuum Tubes.  
Eg ENIAC, EDVAC, UNIVAC I
- Second Generation :- 1955-64 :- IC's. Transistors.  
Eg IBM 1401, IBM 1620.
- Third Generation :- 1964-75 :- IC's.  
Eg IBM 360, Honeywell 6000
- Fourth Generation :- 1975-80 :- Microprocessors.  
Eg
- Fifth Generation :- 1980 - Present :- ULSI.  
Eg Present Day Computers.

## MEMORY

- \* Processor Registers:-
  - Quickly Accessible.
  - Small amount of fast storage.

## \* Cache Memory - SRAM :-

- Used to increase the performance of CPU.
- Slightly slower but much greater capacity than Processor registers, faster but much smaller than main memory.
- Advantages:-

- \* Faster than main memory.
- \* Stores data for temporary use.
- \* Executes program in a small amount of time.

## - Disadvantages.

- \* Very Limited memory.
- \* Expensive.

## \* Main Memory:-

- ALU can transfer info. betw processor register and locations in main storage (memory address).
- SSRAM is used for
- RAM (Volatile)
- ROM (Non-Volatile)

General info. like programming of booting.

## \* ROM

- Programmable ROM (Once programmed, can't be modified)
- Erasable PROM (Erase data when exposed to UV).
- Electrically EEPROM (Erase data by Electric field).
- MASKED ROM (Can't be Modified)

## \* Auxiliary Memory :-

- Non-Volatile.
  - Slower than Main Memory.
  - CPU doesn't access, Accessed by I/O devices.
  - Ex:- CD, DVD, HDD, SSD
- 
- Magnetic/Optical Memory.
  - Computer may run without it.
  - Permanently stores Data.

## \* Hard Disks :-

- Reynold Johnson, 1956.
- First used on IBM 305 RAMAC.
- Connected by 1 meter SATA cable with Mother Board.

- Flat disks/plates with magnetic material coating.

## \* Optical Storage :-

- CD-ROM
- CD recordable (CD-R); CD Rewritable (CD-RW)
- DVD-Rom
- DVD-R; DVD-RW
- Photo CD.

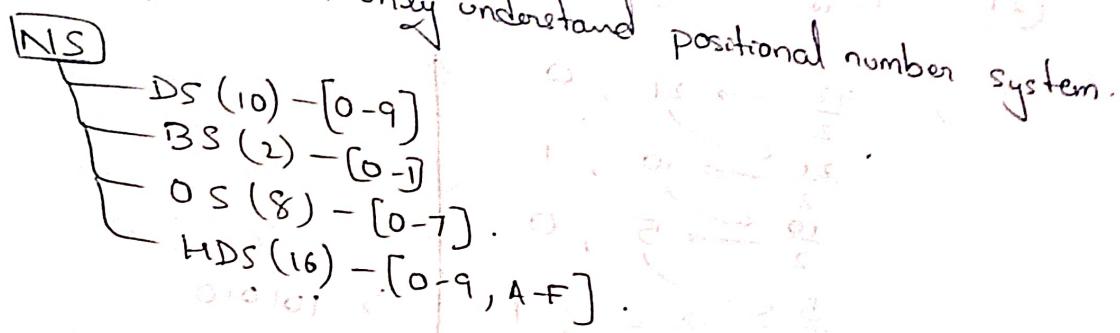
## \* Universal Serial Bus (USB) :-

- Bootable Booting OS.

- High Capacity.
- Application Carriers.
- Secure Storage.

## \* Number System :-

- Digital System



## \* Decimal Number System :-

$$\textcircled{1} \quad 87 = (8 \times 10^1) + (7 \times 10^0)$$

$$\textcircled{2} \quad 725.45 = (7 \times 10^2) + (2 \times 10^1) + (5 \times 10^0) + (4 \times 10^{-1}) + (5 \times 10^{-2})$$

## \* Binary Number System :-

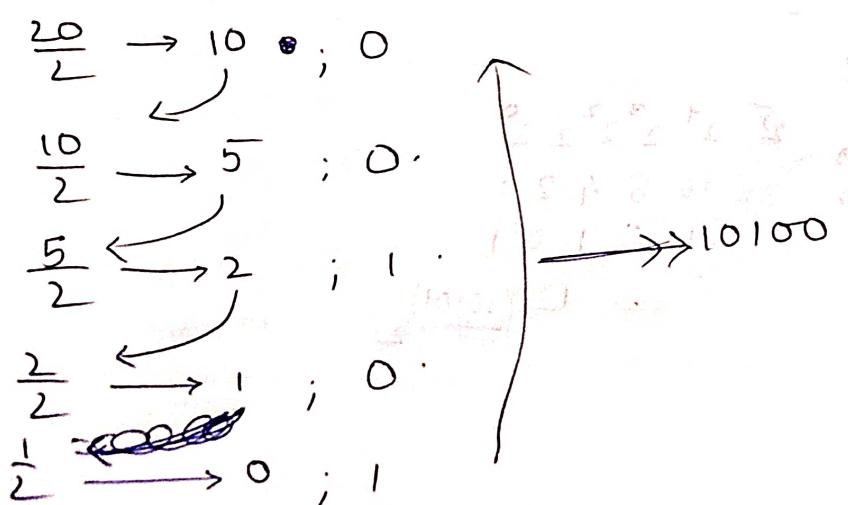
- 4 digit position  $\rightarrow \overline{(0 \text{ to } 15)}_{10}$  <sup>Decimal</sup>

- 7 digit position  $\rightarrow \overline{\underline{1}}(0 \text{ to } 127)$

- Eg -  $\overline{\underline{1001}}$  <sup>most significant bit (MSB)</sup>  
<sup>least significant bit (LSB)</sup>

## \* Decimal to Binary :-

$$\textcircled{1} \quad 20 \rightarrow ?$$



$$\textcircled{2} \quad (42)_{10} \rightarrow (?)_2$$

$$\begin{array}{rcl} \Rightarrow & \frac{42}{2} \rightarrow 21 ; 0 \\ \Rightarrow & \frac{21}{2} \rightarrow 10 ; 1 \\ \Rightarrow & \frac{10}{2} \rightarrow 5 ; 0 \\ \Rightarrow & \frac{5}{2} \rightarrow 2 ; 1 \\ \Rightarrow & \frac{2}{2} \rightarrow 1 ; 0 \\ \Rightarrow & \frac{1}{2} \rightarrow 0 ; 1 \end{array}$$

$$\begin{array}{l} (42) = (0 \times 2^5) + 0 \\ (42) = (1 \times 2^4) + 0 \\ (42) = (0 \times 2^3) + 1 \\ (42) = (1 \times 2^2) + 0 \\ (42) = (0 \times 2^1) + 1 \\ (42) = (1 \times 2^0) + 0 \end{array} \Rightarrow 101010$$

$$(2 \times 1) + (0 \times 2) + (1 \times 4) + (0 \times 8) + (1 \times 16) + (0 \times 32) = 26$$

$$\Rightarrow (42)_{10} = (101010)_2 = (101010)_8 = (101010)_H = 26$$

$$\textcircled{3} \quad (24)_{10} = (?)_2$$

\* Binary to Decimal

$$\begin{array}{l} 101101 = (0 \times 2^0) + (1 \times 2^1) + (0 \times 2^2) + (1 \times 2^3) + (1 \times 2^4) + (0 \times 2^5) \\ \Rightarrow 2^5 2^4 2^3 2^2 2^1 2^0 \\ \Rightarrow (1 \times 2^5) + (0 \times 2^4) + (1 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (1 \times 2^0) \\ \Rightarrow 45 \end{array}$$

$$\Rightarrow (101101)_2 = (45)_{10}$$

\* Binary :-

$$\begin{array}{r} \text{eg } (21)_{10} \\ \downarrow \\ \begin{array}{cccccc} 2^6 & 2^5 & 2^4 & 2^3 & 2^2 & 2^1 & 2^0 \\ 64 & 32 & 16 & 8 & 4 & 2 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 & 1 \end{array} \\ \hline (101011)_2 \end{array}$$

\* Hexadecimal :- (0-9; A-F)

$$(A)_{16} = (10)_{10}$$

B

C

D

E

$$(F)_{16} = (15)_{10}$$

$$\begin{array}{r} \text{E} \\ \text{---} \\ \begin{array}{c} 9 \\ | \\ \text{A} \\ | \\ \text{---} \\ \text{F} \end{array} \\ \text{---} \\ \begin{array}{r} 1001 \\ | \\ 1010 \\ | \\ 1111 \end{array} \end{array}$$

$$\begin{array}{r} 3F \\ | \\ \text{---} \\ \boxed{1001 \ 1111} \end{array}$$

\* Binary to Hexadecimal to Decimal.

$$\begin{array}{r} 1100 \ 1010 \ 0101 \ 0111 \\ | \quad | \quad | \quad | \\ \text{C} \ \text{A} \ \text{5} \ \text{7} \\ \hline & & & \\ +2 \ 10 \ 5 \ 7 & & & \leftarrow \text{Decimal (Binary to Decimal).} \end{array}$$

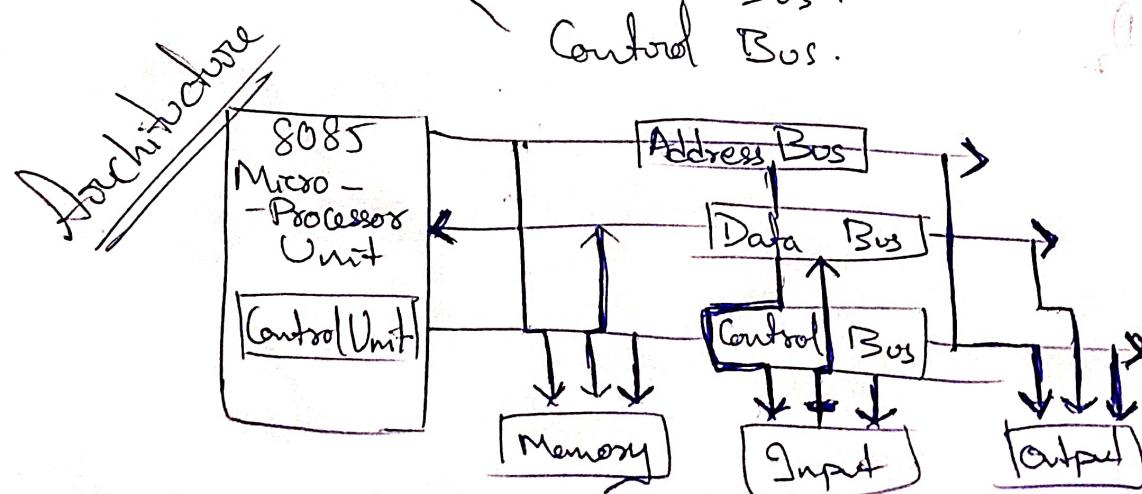
\* Octal :- (0-7) to Binary.

$$\begin{array}{r} (25)_8 = \\ | \quad | \\ \text{---} \\ (010101)_2 \end{array} \quad \begin{array}{r} (40)_8 \rightarrow (00110000)_2 \\ | \quad | \quad | \quad | \quad | \quad | \\ \text{---} \end{array}$$



- \* System Bus in computer architecture
- The electric pathway that joins different components inside the comp. to transfer data / instruc. / info.
  - It is a shared transmission medium.
  - Signal transmitted by one device is available for reception by all the devices connected to the bus.
  - Only one device can transmit at a time to avoid garbling.
  - Bus consists of multiple pathways which sends signal in binary forms.
  - Several lines can transmit parallelly at a time.

- \* System Bus :-
- A bus connects major computer components (processor, memory, I/O) is called system Bus.
  - Connects to devices with about 50-100 lines.
  - Sys Bus :-
    - Address Bus
    - Data Bus
    - Control Bus.



### \* Data Bus :-

- Bus that transmits data.
- Bidirectional Bus. (16, 32 or 64)

### \* Address Bus :-

- Used to identify particular location in main memory.
- Unidirectional Bus. (16, 20 or 24).

### \* Control Bus :-

- They control Data and Address Buses.
- Memory Read

" Write

I/O Read

Wait

→ Connectors :- To connect cable to ports.

→ Mother Board (Mobo) :- Largest Circuit Board.

Video Network Wired Net.

Holds all the major parts.

Small circuit boards are plugged into it.

### \* Server :-

- Offers service to devices connected to it.

- Server is known as host on a network.

- Devices connected to it are clients.

- Racks are mounted inside data centre.

### \* Why? :-

- 24x7 service

- Cope up with a number of clients accessing.

- Capable of computing and handling tasks.

### \* Types of Server:-

- File Server:- Files can be accessed, stored and shared with clients.
- Web Server:- Holds and stores webpages for clients.
- Database Server:- Holds database systems.
- Application Server:- Holds applications for clients.
- Game Server:- For online games.

### \* Bootloader:-

- Responsible for booting a computer.
- Executes a small program on ROM to initialize RAM and load OS into RAM.

### \* File System:-

- Data Structure that OS uses to control how data is stored and retrieved.
- Information is stored in blocks on the disks.

#### → Naming:-

- FAT (16 or 32 bit Windows).
- NTFS (Recent Windows OS).
- UNIX doesn't enforce meaning for suffix.
- DOS enforces.

#### → File structure:-

- Byte Sequence.
- Record Sequence.
- Tree.

- File Types :-
    - Regular
    - Directories.
  - File Access :-
    - Sequential
    - Random.
  - Sys Call for Files :-
- |          |                  |
|----------|------------------|
| - Create | - Append         |
| - Delete | - Seek           |
| - Open   | - Get Attributes |
| - Close  | - Set Attributes |
| - Read   | - Rename         |
| - Write  |                  |

### → Directories :-

- ↳ Single Level :-
  - ↳ Hierarchical :-
- 
- 
- Path Names :-
- |            |             |
|------------|-------------|
| - Absolute | - Relative. |
|------------|-------------|

- \* Allocating Blocks to Files :-
- Contiguous :-
  - (+) Easy to implement
  - (+) Good Read performance
  - (-) Disk becomes fragmented.
- Linked List :-
  - (+) No disk fragmentation
  - (-) Random access is slow.

- Linked lists using table :- (+) Put pointers in table on memory  
(-) Table becomes too big.

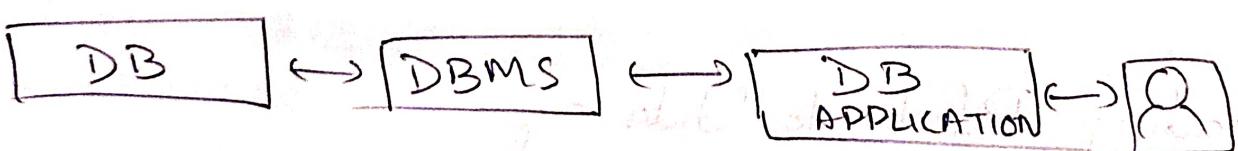
### \* Drawbacks of file systems to store data :-

- Data inconsistency.
- Difficulty in Accessing.
- Data isolation.
- Integrity Problems.
- Concurrent access by multiple users.
- Security Issues.

\* Database:- Organised collection of data on computer disk for easy and efficient use.

\* Database Management System:- A set of programs used to define, administer and process database & its applications conveniently and efficiently.

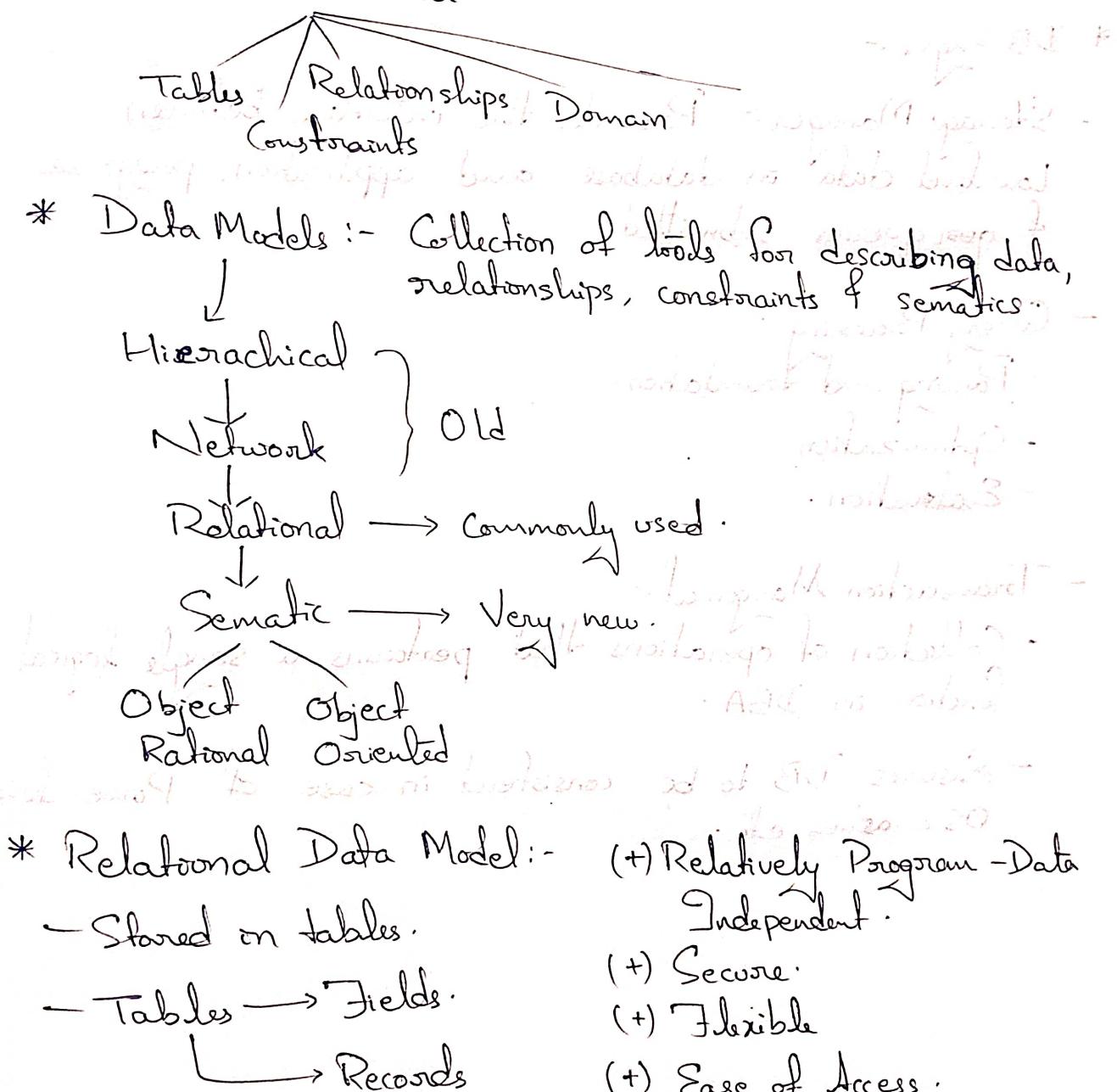
\* Database Application:- An interface that allows user to enter and manipulate data.



### \* Levels of abstraction:-

- Physical Level
- Logical Level
- View Level.

- \* Instance :- Actual content of Database at a particular point of time.
- \* Logical Schema & Physical Schema
- \* Physical Data Independence :- Ability to modify physical Schema without altering logical Schema.
- \* Database Schema :-



- \* Relational Data Model :-
- Stored on tables.
- Tables → Fields.
- ↳ Records

- (+) Relatively Program - Data Independent.
- (+) Secure.
- (+) Flexible
- (+) Ease of Access.
- (-) Proper training is required to create Data Model.

- \* Data Definition Language :- Notation for designing Database schema.
  - SQL → Widely used
    - ↳ Non-Procedural Language
  - XML → Used for browsing
    - ↳ Basis for new gen. data interchange formats

### \* DB Engine :-

- Storage Manager :- Provides the interface between low level data in database and application program f ~~for~~ queries submitted.
- Query Processing :-  
  - Parsing and translation.
  - Optimization
  - Evaluation.
- Transaction Management :-  
  - Collection of operations that performs a single logical function in DBA.
  - Ensures DB to be consistent in case of Power loss, OS crashes, etc.