URBAN EDGE

Chapter :- 01

COMPUTER FUNDAMENTALS.

* Computer is a high speed electronic data processing machine.
* Basic components of modern digital comp -
  - Input device
  - output device
  - CPU
  - Mass storage device & memory.

* Advantages of comp :-
1) High speed
2) Accuracy.
3) Storage capability
4) Versatality
5) Reliability
6) Diligence
7) Reduction in paper work & cost.

* Disadvantages of comp :-
1) No I.Q
2) Dependency
3) No feeling.
4) Environment.

Hardware	Software
• Physical components of a comp. eg = Monitor, keyboard..	used to describe a collection of comp progms, procedures & documentation that perform some task on a computer. eg = M. office, Adobe...
* Types :- 1) Input devices 2) output devices 3) Removable data storage → CD, USB 4) data ports. → USB.	Types :- 1) System (S) 2) programming (S) 3) Application (S).

* Computer Generations :- (5)

1) First (G) :- 1940 - 1956.
* developed by using vaccum tubes.
* Input was based on punched cards & paper tape & output was displayed on printouts
* This comp worked on binary-coded concept (0-1)
* eg :- ENIAC, UNIVAC.

2) Second (G) :- 1956 - 1963
* Developed by using Transistor technology.
* In comparison with 1st (G), size of 2nd (G) was smaller.
* Computing time taken by 2nd (G) was lesser as compared with 1st (G).

3) Third (G) :- 1963 - 1971.
* Developed using Integrated circuit (IC)
* size of comp was smaller as compared to 2nd (G).
* Computing time taken by comp was lesser.
* This comp consumed less power & less heat.

4) Fourth (G) :- 1972 - 2010.
* Developed by using microprocessor tech..
* Comp became very small in size (portable)
* Generate very low amount of heat.
* It is much faster & accuracy became more reliable.
* Became available for common people as well.

5) Fifth (G) :- 2010 - on wards.
* Comp (G) was being catagorized on the basis of hardware, but in 5th (G) also included software.
* This comp had high capability & large memory capacity.
* working become fast & multiple tasks could be performed simultously.
* eg -> AI ; parallel processing, Nano technology.

* Types of comp :-

1) PC :- Single user comp having moderatly powerful microprocessor.
* These System are normally linked together to form a network.

2) workstation :-
* A Single user comp similar to PC, however has a more powerful microprocessor.
* Used for software development, engineering applications & have mass storage device.

3) Minicomp :-
* Multi-user comp, capable of supporting 100's of users simultously.

4) Mainframe :-
* multi-users comp capable of supporting 100's of users but Software is different.

5) Super comp :-
* Extremly fast comp, which can execute 100's of millions of instructions / sec.

* Comp language & its types :-

- A language consist of all instructions to make a request to System for processing a task.
- Languages are classified into 2 types.

Lang.
- Low level (L)
  - Machine (L)
  - Assembly (L)
- High level (L).
  - 4th (G) (L).

I * Low level (L) :-

* Are the machine codes in which instructions are given (o &/) to comp.
* fun → To operate, manage & manipulate the hardware & system components.

① Machine (L) / (1GLs) :- is the 1st (G) lang developed for communicating with a comp.
* Main adv → no need of translators, comp directly understand.
* Disadv → It is hard to find errors in a written prgm.
* It is a machine dependent & used by a single type of comp.

② Assembly (L) / 2GLs :-
* It has almost similar structure & set of commands as Machine (L).
* prgms have been written using words, names & symbols in assembly (L) are converted to machine (L) using assembler.
* Comp only understand machine (L), that's y we need a assembler to convert assembly (L) to machine (L).

* Adv → written only for a single type of CPU & does not run on any other CPU.

II High Level Lang :-
* Most used & more considered Prgming (L) that hlp a programer to read, write & maintaine.
* It is an 3rd (G) (L) that is used.
* They are less independent to a particular type of comp & require a translator.
* eg → c, pascal, Python.

① Fourth (4) (L) / 4GL :-
* They are closer to human lang than other high level lang.
* They are intended to be easier for users than Machine (L), assembly (L) & old high level (L).

* prgm Translators :-

* A translator is a prgming lang processor that converts a comp prgm into from 1 Lang to another. (Source code into machine code).

(T) → Translator

* purpose of (T) :- It translates high-level lang prgm into a machine lang prgm that CPU can understand & detects errors in the prgm.

→ Types of (T) :- (3).

1) Compiler :-
* used to convert high-level prgming (L) to low-level prgming (L).

1) Compiler	2) Interpreter.
* used to convert high level p.(L) to low-level p.(L). & converts whole prgm in 1 session & reports error detected after the conversion.	used to convert high level to low level p.(L) but, it converts the prgm 1 at a time & reports errors detected at once, while doing the conversion.
* It is a processor-dependent & platform dependent	It is more portable than compiler as it is not processor-dependent.
* Takes time to do its work.	(I) is faster than compiler as it immediately executes the code by reading.

③ Assembler :-
* used to translate assembly (L) to machine (L).
* It is like a compiler for assembly (L), but interactive like an interpreter.
* It is difficult to understand as it is low-level (L).

→ Von-Neumann Model :- (1945)

* It consist of a CU, ALU, Registors & I/O.
* Based on stored-prgm comp concept, where instruction data & prgm data are stored in same memory.
* A von-Neumann Based comp -
1) uses a single processor.
2) uses 1 memory for both instructions & data.
3) Excicutes prgms following the fetch-decode-execute cycle.
* Components of this model -
1) CPU (3) Memory unit
2) Buses. (4) I/O unit.

1) CPU :-	2) ALU
* Defined as electronic circuit responsible for executing the instructions of a comp prgm. * Components of CPU - ALU, CU, variety of registors.	performs Arithmetic (+, -, *, ÷) & logic (AND, OR, NOT) operations.

3) Control Unit	Memory unit
* controls the operations of all parts of comp but doesnot carry any data.	* collection of storage cells together with associated circuits needed to trasfer info in & out of storage * memory stores binary info in grps of bits → words. * Internal str of memory unit is specified by no. of words it contain & no. of bits in each word

* fun :-
a) Coordinate & manage all the units of comp.
b) Doesn't not process / store data.
c) Communicates with I/O devices for transfer of data.

(M) → Memory

* Memory unit is divided into primary (M) & secondary (M).

(:) primary (M) → RAM & ROM.

RAM	ROM
* Random Access (M)	Read only (M)
* It is a temporary (M)	permanent (M)
* Also → volatile (M) bcz data can be lost when the power is off	Also → Non-volatile (M) bez chips doesnot lose data even power off.
* RAM has high Storage capacity than ROM.	ROM is slow process than RAM.

(:) secondary (M) → (hard disk) referred as Storage not a (M).

→ Input Unit :- used to provide data & control signals to an info processing system

i) keyboard :-
- → Typing keys — A-Z, a-3
- → Numeric keys — 0-9
- (instead of mouse) →
- → Control keys — Home, DH, pg↑↓ ....
- → function keys — $f_1 - f_{12}$
- → Sple purpose keys — Enter, shift ....

2) Mouse → cursor control device
3) Joystick → pointing device & similar to mouse
4) Light pen → select a displayed menu item / draw pictures on monitor.
5) Track ball → use instead of mouse.
6) Scanner → works like a photocopy machine.
7) Digitizer → converts analog to digital form. used by comp to create a picture of whatever the camera had been pointed at
8) Microphone → To input sound in digital form.
9) Magnetic Ink Card Reader (MICR) → Mainly used in banks for cheque purpose.
10) optical character reader (OCR) → used to read a printed txt.
11) Bar Code Readers → used for reading Bar code data.

→ Output Unit :- It converts info into human readable form. (txt, image, graphics)

1) Monitors - (VDU) → forms tiny dots → pixels, arranged in a ▭ form.
2) Graphic plotter :- used to draw images with ink pen. plotter → 1st comp output device that could print graphics.

3) printers

Impact (p) [print by sticking them on ribbon]
- Line (p) [1 line at a time]
- Character (p) [1 character at a time]
  - Dot matrix (p)
    - * mainly used in markets.
    - * Each character is printed in the form pattern of dots.
  - Daisy wheel.
    - * mainly used in word processing in office.
    - * Head → wheel pins → characters.

Non-impact (p).
- Laser (p)
  - * high speed & high quality
  - * Expensive
- Inkjet (p)
  - * "
  - * "
  - * slows

* Impact (p)	* Non Impact (p)
* print by sticking them on ribbon	* Print characters without using ribbon.
* Very low consumable cost	* Faster than impact (p)
* very noisy	* Not noisy
* low quality	* High quality
* 2 types → Line & Character (p).	* 2 types → Laser (p) & Inkjet (p).

1 bit → 0 or 1.

→ Memory Hierarchy :-

* (M) is required in comp to store data & instr.
* Data & instruction are accessed through (M) address.
* Faster (M) speed → higher the price.

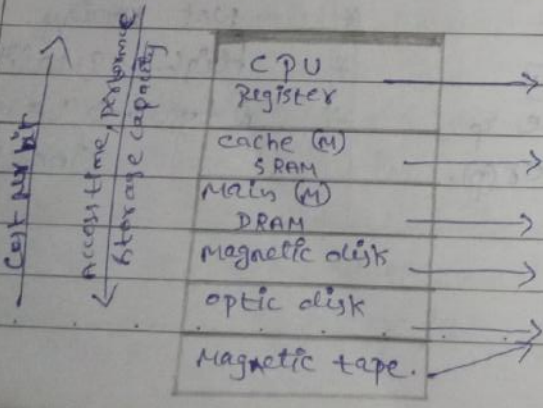
→ Memory (M) Design / characteristics :-

a) Capacity → Global volume of instr the (M) can store.

b) Access time → Time interval b/w read/write request & availability of data.

c) performance → Speed gap rises b/w CPU & main (M) due to large difference in access time.

d) cost per bit → from bottom to top in hierarchy cost per bit rises.



→ Based on location space :- (4 types)

1) Register (M) :-

* Smallest & fastest (M) in a comp.
* Located in CPU in the form of registers.
* It temporary holds frequently used data, instr & (M) address used by CPU.

→ MAR (M. address (R)) → Holds (M) location of the data.
→ MDR (M. Data (R)) | MBR (M. Buffer (R)).
→ PC (Progm counter) → store address of nxt instr to be executed.
→ CIR (current instr (R)).
→ AC (Accumulator) → store ALU results.

2) Cache (M) :-

* Extremly fast (M) b/w RAM & CPU.
* Store frequently requested data & instr.
* Used to reduce the avg time to access data from main (M).

→ L1 cache → accessed without any delay.
→ L2 cache → take more clock cycle to access data than L1
→ L3 cache → take more clock cycle to access data than L2.

Adv	Dis adv
* Faster than main (M) * Store data temporary use	Has limited capacity very expensive.

3) primary (M) / main (M) :-	Secondary (M)
* Fastest (M) available * Each word store as cells. * It is volatile * very expensive.	slower than primary non volatile less expensive than primary (M).

→ RAM

SRAM	DRAM. (Dynamic RAM)
* Each cell made of flip flop that store 1 bit. * Doesn't need to refresh like DRAM * used in specified applications	Each cell made of 1 transistor & 1 capacitor that store 1 bit of data. need to be refreshed 1000's time a second which takes up processor time. used in common comp

1 milli sec → 1000 sec
1 Nanosec → Billions of 1s

ROM

PROM (programable ROM)	EPROM (Erasable PROM)
* Can be programmed using a spl hardware.	can be erased & then programmed using electrical signals.

UVEPROM	EEPROM
* Erased using UV rays * Not safer & easy.	Erased using electrical signals. safer & easy than UV rays

4) Secondary (M) :-
* Are magnetic & optical memories.
* known as backup (M).
* Non-volatile (M)
* Data is permanently used even power is off
* Slower than primary (M)
* Comp may run without sec (M).
* eg - Hard disk, USB, Magnetic tape.

* collection of bits → packet.

→ Tertiary storage :- Storage designed for the purpose data backup
* eg = tape drives, robotic driven disk array

→ Comp Hardware components :-

1) SMPS [Switch mode power supply] :-
* power supply unit of a comp.
* fun → convert wall voltage AC power to lower voltage DC power.

2) Motherboard :-
* Main printed circuit board found in micro comp.
* fun → Allows communication b/w many of crucial electronic components of comp.
* considered as backbone of a comp.
* support a single type of cpu.

(3) Add-on cards.
* Hardware unit that can be added to a comp to use its capabilities
* eg = Network card, Sound card.

4) Network card
* NIC is electronic device that connects a comp to comp networks usually a LAN
* considered a piece of comp hardware.
* It commonly use a no.. of protocols → IEEE 802.11. or wireless LAN

5) Sound card
* provides sound to our system

6) Display card
* used to connect the monitor to system.

* without D. card will not get the output on monitor.

→ Comp ports :- It is a point of connection b/w comp & its peripheral devices.
common peripherals → mouse, keyboard ....

1) Serial port
* used to connect ex. modems & older comp mouse.
* 2 versions → 25 pin & 9 pin.

(2) parallel(p)
* It is a interface b/w comp & peripheral devices.
* It is a 36 pin

(3) PS/2 →
* Connector used to connect mouse & keyboard
* It is a 6 pin Din. Connector

(p) → port.

(4) USB	(5) VGA port	(6) Audio (p)
* It can connect all Ex. USB devices. * Comp provide 2 USB (p). * 3 types → Type A, Type B, micro USB	* It is a D-Sub connector consisting of 15 pins in 3 rows. * The connector → DE-15.	* Connect speakers, mic, comp.

(7) power connector	(8) DVI	(9) RCA connector
Connect to comp's power cable that plugs into power box.	[digital video interface] * High speed digital interface b/w display controller	* Carry composit video & stereo audio signals over 3 cables.

(10) mini-DVI

(11) Micro-DVI

(12) Component video → Interface where video signals are split into more than 2 channels.

(13) HDMI [High Definition media Interface] → Digital (T) used to connect high definition & ultra high definition devices.

(14) RJ-45. | Ethernet → Networking tech. used to connect Internet to comp.

⇒ Adaptors :- It is a hardware that convert transmitted data frm 1 presentation ~~form~~ to another.

1) Display (A)	(2) USB (A)	(3) Nwork (A)	(4) Host bus (A)
used to transmit signal to monitor	for printers, keyboard ...	To attach to any nwork	To connect hard disks.

→ Network cables :-

(1) Coaxial cables =	(2) Twisted pair cables =
* used to connect Tv sets to home antenas * Has standared for 10 Mbps Ethernet cables. * Has a single copper conductor at its corner.	* Ethernet T. pair (c) contain up to 8 wire wound together in pairs to minimize E. magnetic interfrence

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* coaxial cable

① Thick (c)	② Thin (c).
* Also → Thicknet.	* Also → Thinnet.
* Has an extra protective plastic cover to help keep moisture away from center conductor.	* used in sch. network specially linear bus.
* Disadv → Does not bend easily & difficult to install	* 10 Base 2 → carry ethernet signals.
* 10 Base 5 → carry ethernet signals	

(3) Fiber optics =
* consist of center glass core surrounded by several layers of protective materials.
* Also made it the standard for connecting networks b/w buildings.

(4) Serial & parallel cables
* used for pc-pc networking.
→ null model cables.

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* Transmit signals over longer distance than (c) & twisted pair.
* center core of fibre cables made from glass plastic.
* 2 types → single mode & multi mode.

(5) USB cables =
* connect a comp with a peripheral devices. Watches, fleam other comp.

(6) cross over cables :-
* eg → Null modem cables.
* It joins 2 network devices of same type.

→ comp configration :- The way a system is set up.
* May be hardware / software or both.
eg:- In pc, it consist of 8GB main memory, a hard disk, a modem....