CHAPTER-1

Dt - 17-02-24

Computer Evolution and Performance:-

Questions

1. Diff^n b/w Computer Organization & Architecture
2. Define the structure of a processor / structural components of a proces
3. Describe the function of a computer system.
4. Define the terms, core, processor
5. Draw the top-down approach of a multi-core computer system.
6. Define Moore's Law
7. Write a short note on Embedded system, Internet of things, cloud compu
8. Differentiate b/w microprocessor and micro-controller
9. Differentiate b/w application processor & dedicated processor.
10. Differentiate b/w system interconnection & internal Bus
11. Differentiate b/w CISC & RISC operator.

* Computer Architecture and Organization

Computer Architecture	Computer Organization
(i) It describes what the computer does	(i) It describes how the computer does it.
(ii) Computer architecture refers to those attributes of a system that is visible to a programmer or those attributes that have a direct impact on the logical execution of a programme.	(ii) Computer organization refers to the operational units & their interconnections that realise the architectural specification.
(iii) Architecture is always decided first.	(iii) It is decided after the architecture has been fixed.
(iv) Architectural attribute includes the instruction set, the no. of bits used to represent different data types, I/O mechanisms & techniques for addressing memory.	(iv) Organizational attribute includes those hardware details that are transparent to the programmer suggests control signal, interfaces between the computers & peripheral devices & the memory technology used.
(v) Example - it is an architectural issue whether the computer will be having a multiply instruction	(v) It is an organizational issue, how to implement that multiplication instruction, we can use direct multiplication or repetative addition method.
(vi) It deals with high level design issues	(vi) It deals with low level design issue.
(vii) Architecture generally refers to the hardware moduls.	(vii) Organization refers to the actual performance of a processor.

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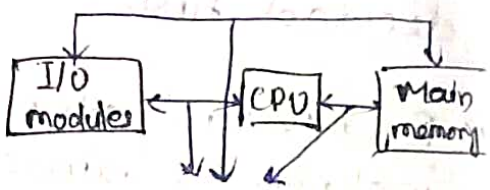
Structure & Function

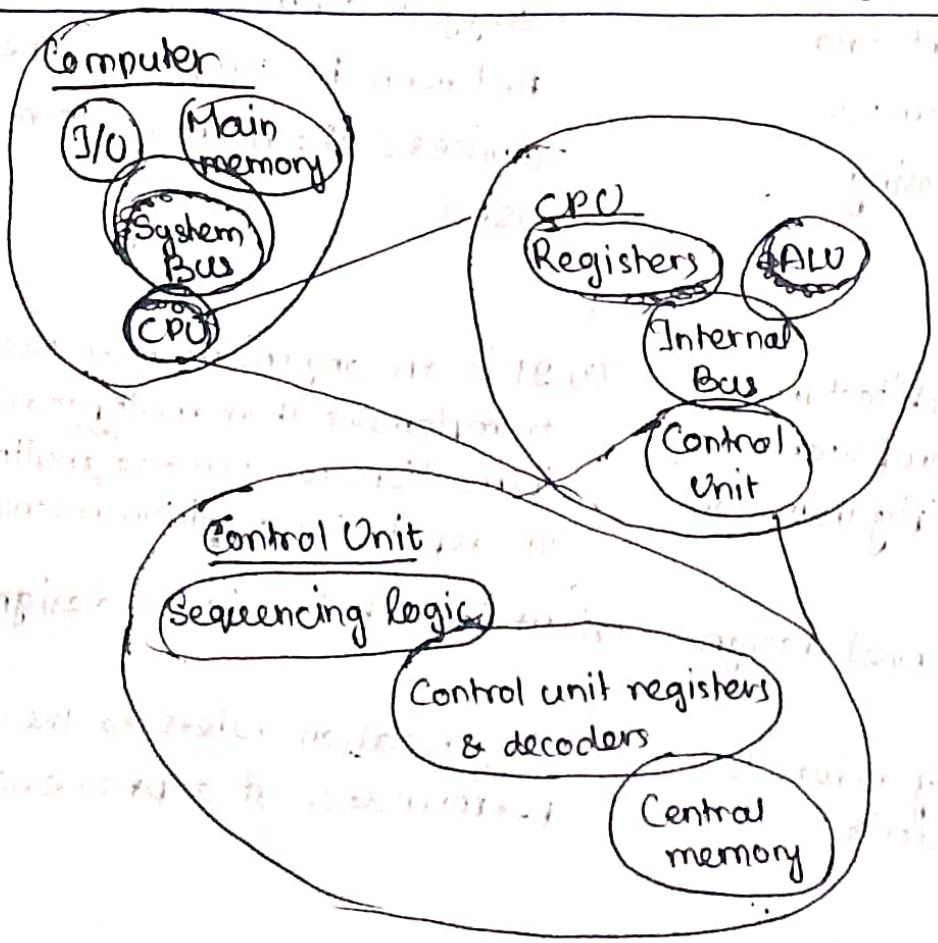
- Structure is the way in which the components are inter-related
- Function defines the operation of each individual component as part of the structure.
- The diff^{n} functions of computer system are
  (i) Data processing
  (ii) Data storage
  (iii) Data movement
  (iv) Control

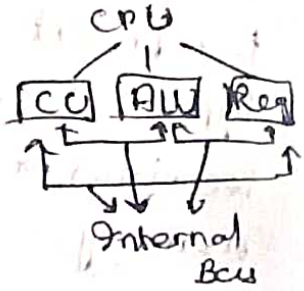
Structure :-

There are 4 main structure component
  (i) CPU - Control unit, ALU, Registers & Internal Bus
  (ii) Main - memory
  (iii) I/O - module
  (iv) System interconnection



Top-down approach of the computer system :-

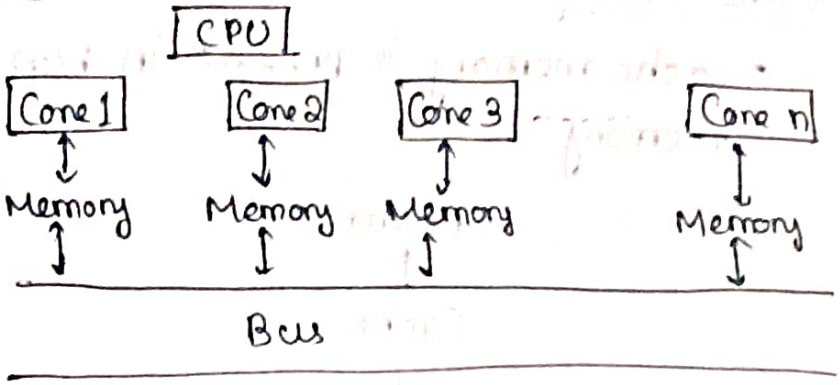




Multi-Core Computer Structure :-

CPU
(Processor)
Uni-cors
↓
Memory
↓
Bus

Uni-core processors



Multi-core computer system

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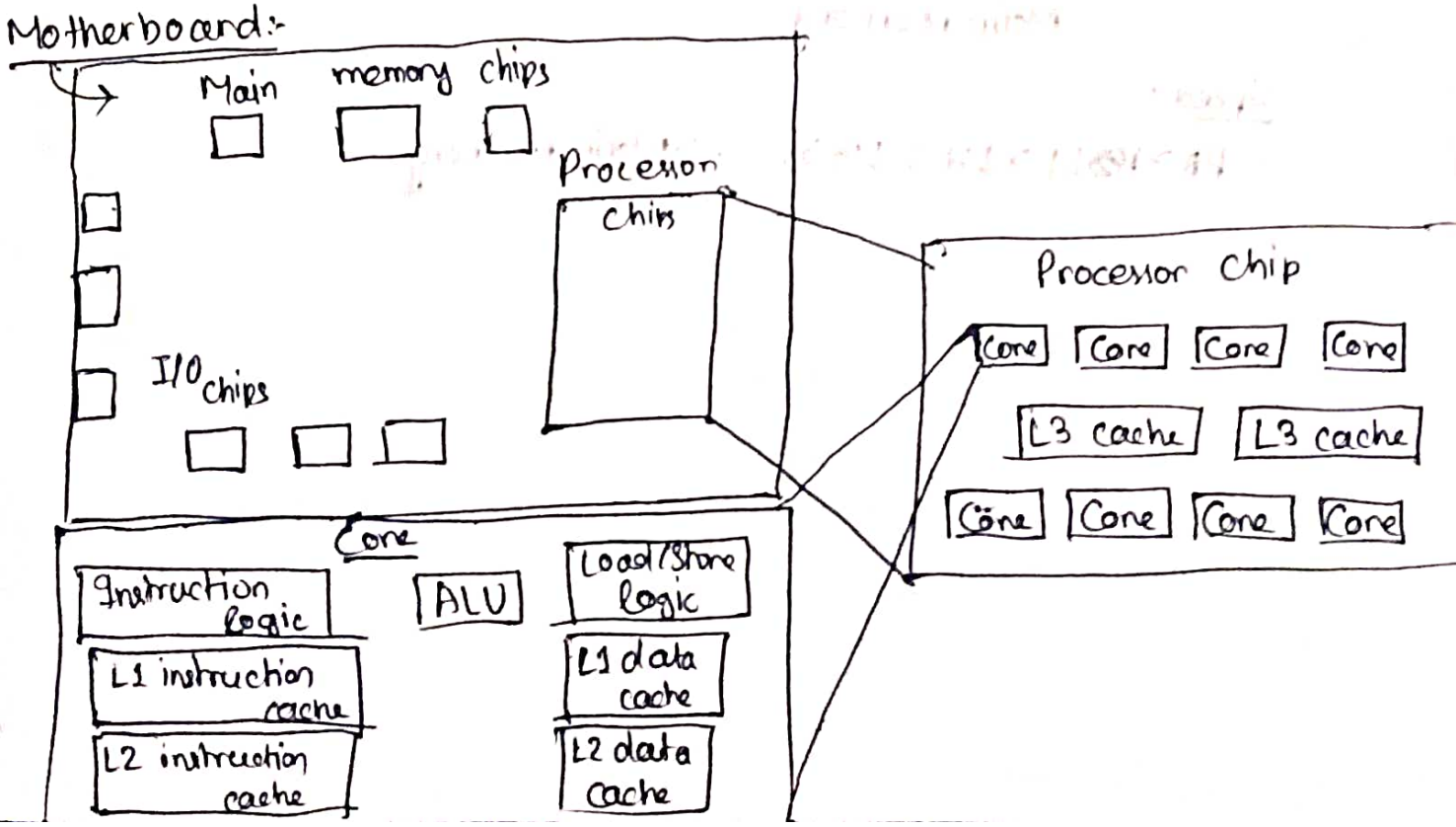
→ Core →

It is an individual processing unit on a processor chip that is equivalent in functionality to a CPU on a single CPU system is known as a core.

→ Processor →

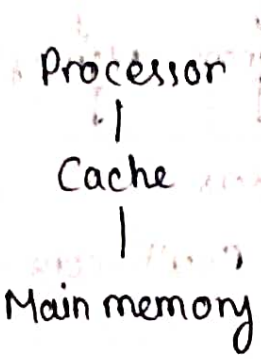
- A physical piece of sillicon containing 1 or more cores is known as a processor. The processor actually interprets & execcutes instructions

→ Simplified view of Main elements of the multicore computer system:-



→ Cache memory :-

- Cache memory is present in b/w the processor & the main memory.



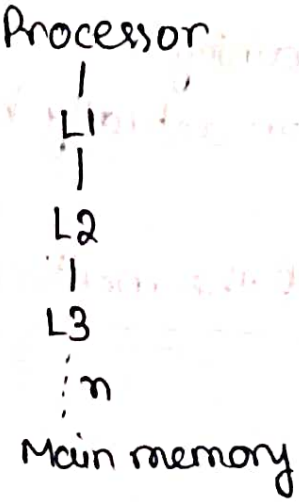
Speed of procession :-

Processor > Cache > Main memory

Size :-

Processor < Cache < Main memory

→ Multilevel cache organization :-



Speed :-

P > L1 > L2 > L3 > .... > Main memory

Brief History of Computers

Refered to the Lab side

→ Moore's law :-

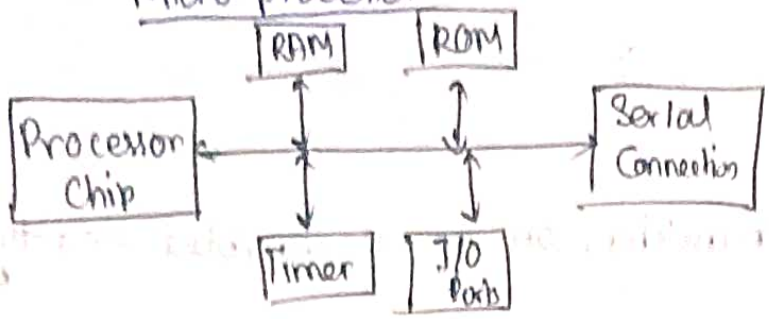
It states that the no. of transistors on an IC doubles exactly after every 18 months (1.5 years)

Conclusion of Moore's law

- The cost of chip/IC has decreased.
- Packaging density increased.
- Operating speed increased.
- The electronic devices has become smaller in size.
- Power consumption has reduced
- Heat generation reduced

CISC	RISC
- Complex Instruction Set Computer	- Reduced Instruction Set Computer
- Ex- Desktop computer, x86, Main frame computer, super computers	- Ex- ARM(Architecture Embeded Systems)
- More emphasis is given on hardware design	- More emphasis is given on software design
- Less registers are used	- More registers are used
- More addressing modes are used	- Lesser addressing modes are used.
- Here more efficient use of RAM.	- Very High use of RAM.

Micro processor



- It is the basic unit of computer system
- The circuit is larger
- Can't be used in compact system
- Cost is more
- Power saving is less
- Ex. Desktop computers

Micro controller

Processor RAM ROM

Timmer I/O ports, serial Connectio

- It is the basic unit of embade system.
- The circuit is very ~~small~~ compact
- It is always used in compact system.
- Cost is less
- Power saving is more.
- AC, Microwave Oven

HW

Write short note on IOT & Cloud computing

IOT

- The Internet of things (IoT) describes the network of physical objects that are embeded with sensors, software and other technologies for the purpose of connecting & exchanging data with other devices and systems over the internet.
- An IoT ecosystem consists of web-enabled smart devices that use embedded systems to collect, send and act on data they acquire from their environments
- IoT devices share the sensor data they collect by connecting to an IoT gateway which acts as a central hub where IoT devices can send data.
- Main components used in IoT
  * Low power embedded system: Less battery consumption, high performance are the inverse factors that play a significant role during the design of electronic systems

* Sensors:- It is a physical device that measures and detects certain physical quantities and converts it into signal which can be provided as an input to processing or control unit for analysis purpose.
Ex:- Temperature Sensor, Image Sensors, IR Sensors etc.

* Control units:- It is responsibile for all logical operations that are carried out here

- Characteristics of IoT:-
  * Massively scalable & efficient
  * IP- based addressing will no longer be suitable in the upcoming future.
  * Devices typically consume less power. When not in use, they should be automatically programmed to sleep.

- Modern Applications
  * Smart Grids & energy saving
  * Smart cities
  * Health care
  * Earthquake detection
  * Waterflow monitoring
  * Traffic monitoring

- Advantages
  * Improved efficiency & automation of tasks
  * Increased convenience and accessibility of information
  * Better monitoring and control of devices & systems
  * Cost savings

- Disadvantages
  * Security concerns and potential for hacking or data breaches
  * High initial investment costs
  * Limited battery life on some devices
  * Complexity & increased maintenance requirements.

Cloud Computing:-

- It is the delivery of computing services including servers, data base, storage, networking etc over the internet to offer faster innovation flexible resources & economies of scale.
- Uses of cloud computing are
  * Storage, backup & recovery of data
  * Delivery of software on demand
  * Development of new applications & services
  * Streaming videos & audios
- Architecture of cloud computing:
  * Front end (User interaction enhancement)
    Ex- Fat client, Thin client
  * Back end platforms (Cloud computing engines)
    Ex- Services & Storage
  * Cloud-based delivery and a network
    Ex- Internet, Intranet, Intercloud.
- Types of Cloud Computing:-
  * Infrastructure as a Service (IaaS)
  * Platform as a Service (PaaS)
  * Software as a Service (SaaS)
- characteristics of Cloud Computing:-
  * Scalability
  * Save Money
  * Reliability
  * Physical Security
  * Outsource Mangement
- Advantages of cloud computing:-
  * Cost Efficiency
  * Flexibility & Scalability
  * Collaboration & Accessibility
  * Automatic maintenance & updates

- Disadvantages of cloud computing
* Security concerns -

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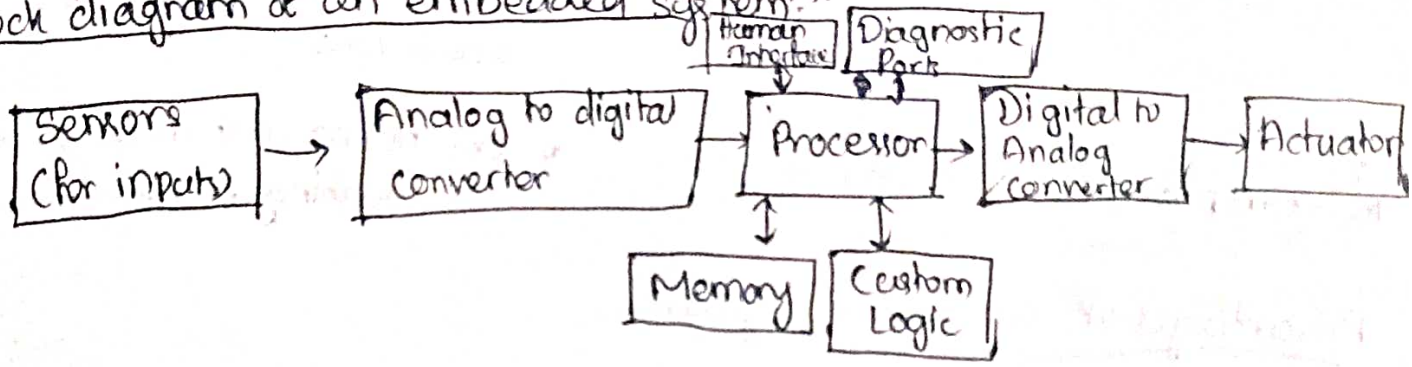
Embedded System :-

The term embedded system refers to the use of hardware in electronics & system software within a single product

- Block diagram of an embedded system :-



- Working principle of embedded System :-
* Input is provided through the sensor.
* Then analog signal is converted into digital signal ~~& goes to~~ processor
* Processor process digital signals & store them in memory
* Digital-to-analog Converters change the digital data from the processor into analog data
* Actuators compare actual output to memory stored output and choose the correct one.

- Similarity b/w embedded system & general ~~propos~~ purpose computer
* Both of them have the ability to fix bugs; to improve security & to add functionality
* Both the platform supports ~~code security~~ wide variety of application

- Dissimilarities b/w embedded system & general purpose computer
* In embedded system the software can do a specific work only.
* Efficiency is more important in case of embedded system (in terms of power consumption, size, weight)
* Human interface in embedded system is very simple.

Diff" b/w application processor & dedicated processor

Application processor	Dedicated processor
* They are define by the processors ability to execcute complex OS liake Linux, Windows, Mac etc.	* They are dedicated to one or a small no. of specific task, required by the processor
* It is general purpose in nature	* It is dedicated to a specific task & always design to reduce size & cost.
* Ex- Smartphones,	* Ex- Home automation system, washing machine,

Advantages of embedded System:-

* Greater reliability
* Low power consumption
* Compact size
* Scalibility
* Fast performance

IOT (Internet of Things)

- IoT is a system of inter related computing devices, mechanical & digital machines, objects & human beings that are provided with UIDs (Uniaue Identifiers) & the ability to transfer data over a netwo without the need of human to human or human to computer interface.

- Generations of IOT

1) IT - (Information Technology) - PCs, Servers, Routers, Firewall
2) OT (Operational Technology) - Machines or appliances with embedde IT, SCADA, Kiosks
3) PT (Personal Technology) - Smartphone, Smartwatch, E-book Reade
4) Sensor & Actuator Technology - It includes all the single purpose devices
Ex- AC, Washing machines

Areas of application of IOT :-

* Consumer applications - Health monitoring system, home automation
* Commercial applications - Transportation
* Industrial applications - Manufacturing, Agricultural industries
* Infrastructure application - Smart city, Smart energy
* Military application - Survilance, Sensors in robotics
* ~~Cloud computing~~

Cloud Computing :-

A model for enabling widespread, convinent, on demand, network access to a shareed pool of configurable computing resources that can be rapidly provisioned & released with minimal mangement effort or the service providers information.

Cloud Services :-

There are 3 basic cloud services: ~~are~~ it

a) SaaS - Software as a service
b) PaaS - Platform as a service
c) IaaS - Infrastructure as a service

a) SaaS - Cloud provides service to costemers in the form of software (application software), running on and accessible in the cloud. The applications are accessible through web brocoser. It solves the complexity of software installation, maintainance upgrades & patches.
Ex:- gmail, Google gmail service, sales force, which keeps track of the ~~cost~~ customers.

b) PaaS - Cloud provides service to customers in the form of a platform on which the customers applications can run. It provides a no. of development tools such as programming languages run time environments and other tools that help in developing need application.
Eg- Google App Engine
Staesforce1 platform

c) IaaS - The customer has access to the underlying cloud infrastructure. IaaS offers the customer processing, storage & other fundamental computing resources

Ex:- Amazon Elastic Compute Cloud.