SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE NAME :19IT301 COMPUTER ORGANIZATION AND ARCHITECTURE

II YEAR /III SEMESTER

Unit 1- **BASIC STRUCTURE OF COMPUTERS**

Topic 1 : Functional units

Functional units of a digital computer

Computer architecture

- ✓It is the conceptual design and fundamental operational structure of a computer system.
- ✓It is a functional description of requirements and design implementations for the various parts of a computer.
- ✓ Computer architecture comes before computer organization.

Computer organization (CO)

- ✓It is how operational attributes are linked together and contribute to realize the architectural specifications.
- ✓CO encompasses all physical aspects of computer systems e.g. Circuit design, control signals, memory types

Functional units of a digital computer

Analogy: “building the design and architecture of house”

- ✓ **Architecture may take more time due to Planning**
- ✓ **Organization is building house by bricks or by latest technology keeping the basic layout and architecture of house in mind.**

Purpose of studying Computer Architecture

To understand internal organization of a computer

To understand design concepts

To become a computer system development Engineer/System software engineer/Network Engineer/Hardware Engineer

19IT301 COMPUTER ORGANIZATION AND ARCHITECTURE

Unit I BASIC STRUCTURE OF COMPUTERS

Functional units – Basic operational concepts – Bus Structures – Performance – Memory locations and addresses – Memory operations – Instruction and Instruction sequencing –– Addressing modes – Assembly language – Case study : RISC and CISC Architecture.

Unit 2 ARITHMETIC OPERATIONS

Addition and subtraction of signed numbers – Design of fast adders – Multiplication of positive numbers - Signed operand multiplication- fast multiplication – Integer division – Floating point numbers and operations

Unit 3 PROCESSOR AND PIPELINING

Fundamental concepts – Execution of a complete instruction – Multiple bus organization – Hardwired control – Micro programmed control – Pipelining: Basic concepts – Data hazards – Instruction hazards – Influence on Instruction sets – Data path and control consideration

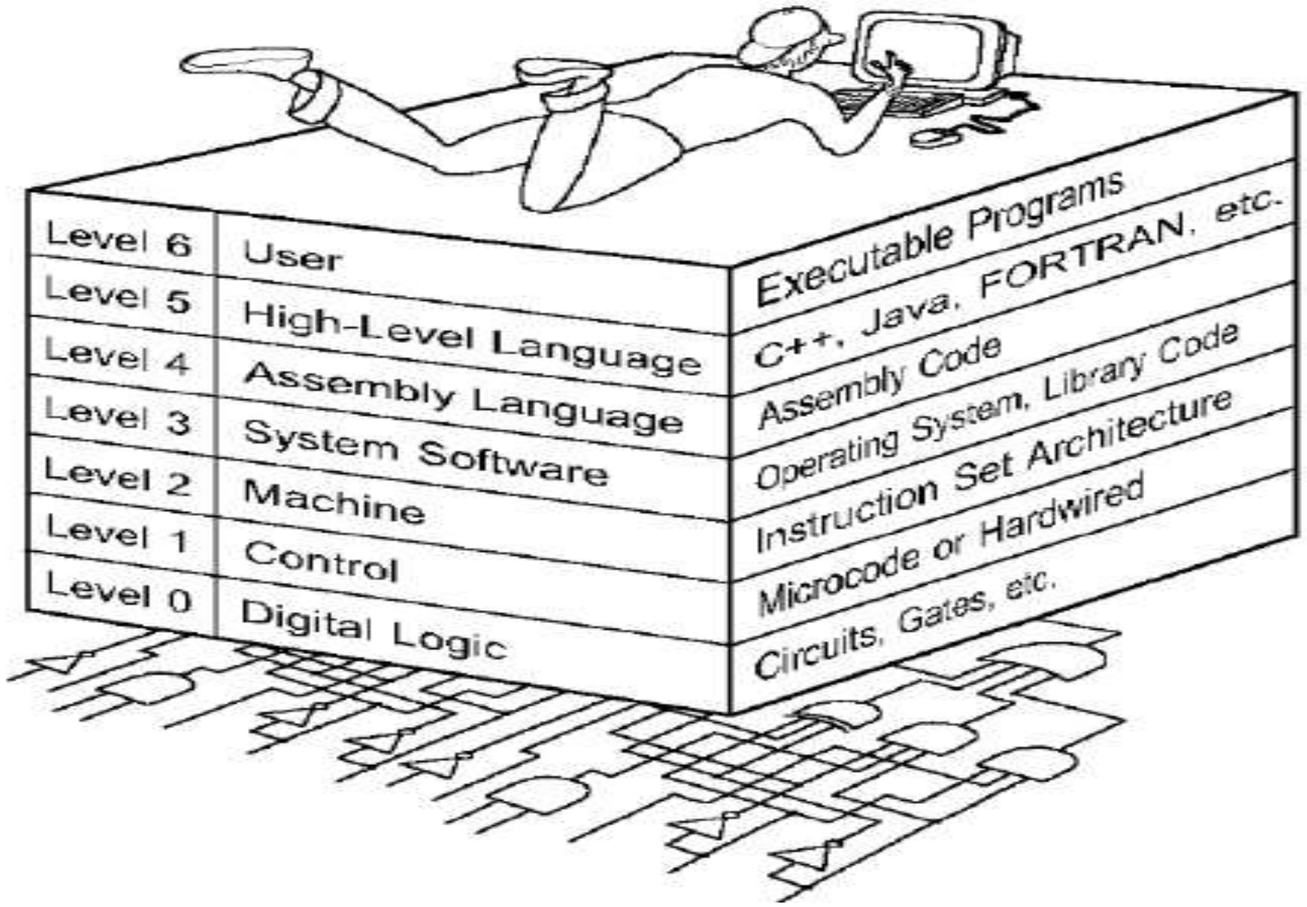
Unit 4 MEMORY SYSTEM

Basic concepts of Semiconductor RAMs - ROMs – Speed, Size and Cost – Cache memories – Performance consideration – Virtual memory – Memory Management requirements – Secondary storage - Case Study: Memory Organization in Multiprocessors

Unit 5 I/O ORGANIZATION AND PARALLELISM

Accessing I/O devices – Interrupts – Direct Memory Access – Buses–Interface circuits – Standard I/O Interfaces (PCI, SCSI, USB) – Instruction Level Parallelism : Concepts and Challenges – Introduction to multicore processor – Graphics Processing Unit

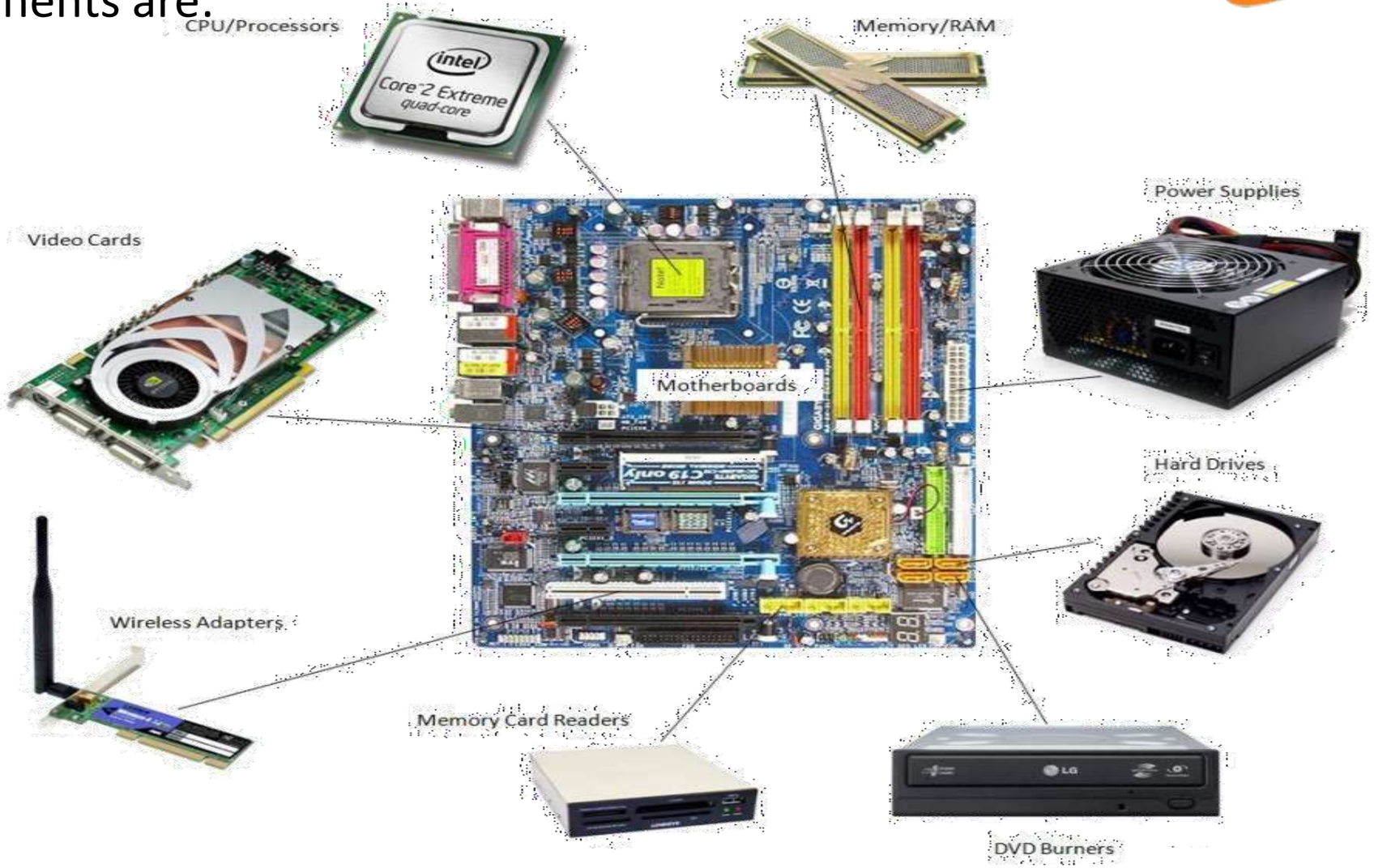
Functional units of a digital computer



Functional units of a digital computer

Five main components are:

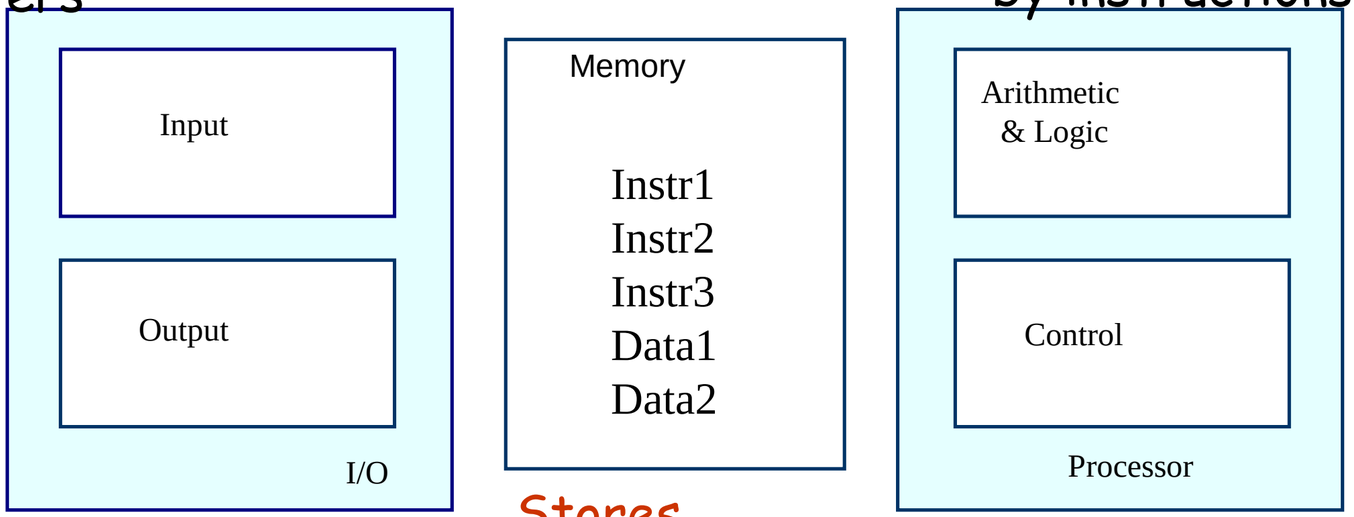
1. ALU
2. Control
3. Input
4. Output
5. Memory



Functional units of a computer

Input unit accepts information:
- Human operators,
- Electromechanical devices (keyboard)
- Other computers

Arithmetic and logic unit(ALU):
- Performs the desired operations on the input information as determined by instructions in the memory



Output unit sends results of processing:
- To a monitor display,
- To a printer

Stores information:
- Instructions,
- Data

Control unit coordinates various actions
- Input,
- Output
- Processing

Functional units -CPU

- The *processor is the active part of the computer, following the* instructions of a program.
- It adds numbers, tests numbers, signals I/O devices to activate, and so on.
- Occasionally, people call the processor the CPU, central processing unit.
- It consists of

1. ALU
2. Control unit

Functional units

1. ALU : It performs the arithmetic operations
2. Control unit:

✓ It tells the ALU, memory and I/O devices , what to do according to the wishes of the instructions of the program.

✓ Control unit Provides timing and control signals to perform operations in the computer

Functional units -Input devices

Input and output devices act as an interface between the user and the computer.

✓A device sends data to a computer system for processing is called as input device

➢Mouse, keyboard, joystick, GPS, camera, microphone etc..

Functional units -Output devices

✓A device that receives and then reproduces or displays the results of that processing is called an output device

✓Output: Speaker, printer, monitor, LEDs, radio transmitter etc..

Functional units-memory

Computer memory is any physical device capable of storing digital information temporarily.
Store programs and data
Two classes of storage

- Primary storage (RAM, ROM)
  - Fast
  - Programs must be stored in memory while they are being executed
  - Large number of semiconductor storage cells
  - Processed in words
  - Memory hierarchy – cache, main memory
- Secondary storage – larger and cheaper

Assessment

a). What is computer Architecture?_____

_____

_____

b) Mention the purpose of Functional units of a computer

Ans:1.ALU_____

2. Control _____

3.Input device _____

4.Output device _____

5. Memory _____

Reference

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, McGraw-Hill, 6th Edition 2012.
2. David A. Patterson and John L. Hennessey, “Computer organization and design”, MorganKauffman /Elsevier, 5th edition, 2014.
3. William Stallings, “Computer Organization and Architecture designing for Performance”, Pearson Education 8th Edition, 2010
4. John P.Hayes, “Computer Architecture and Organization”, McGraw Hill, 3rd Edition, 2002
5. M. Morris R. Mano “Computer System Architecture” 3rd Edition 2007