COMPUTER ORGANIZATION AND ARCHITECTURE (WHAT YOU SHOULD KNOW)

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CHAPTER ONE: Introduction

1.1 Introduction

Computer architecture is concerned with the structure and behaviour of the various functional modules of the computer and how they interact to provide the processing needs of the user. Architectural attributes include the instruction set, the number of bits used, I/O mechanisms, techniques for addressing etc.

Computer organisation is concerned with the way the hardware components are connected together to form a computer system.

Organisational attributes include the interfaces, memory technology etc.

WHY STUDY COMPUTER ORGANIZATION AND ARCHITECTURE

- Students need to understand the computer's functional components, their characteristics, their performance and their interactions.
- To structure programs so that they run more efficiently on a real machine
- To know the most cost effective computer for use in an organization
- Computer architecture concepts are needed in other courses

System Bus: A set of conductors that connect the CPU to its memory and I/O devices. [Data lines, Address, Control lines].

Interfaces: Circuitry needed to connect the bus to a device.

Contention : The competition for the shared resources by the different elements

4 Main Components of the computer => CPU, Main Memory, I/O, Interconnection system.

The 4 basic Functions of a computer

- Data Processing
- Data Storage
- Data Movement
- Control

Two arrangements of these components can be described:

➢ The single bus / Single processor architecture: one processing element and all the other components are connected to a single link (the System Bus)

➢ The Multiprocessing System: has several processing elements surrounded by different subsystems and a central link (the system bus) connecting the different subsystems together.

CHAPTER TWO: Data Representation

2.1 Introduction

Data Formats

1. Numeric Formats
    a. Integer / Fixed Point Formats
    b. Floating Point Formats
    c. Binary Code Decimal
2. Alphanumeric Codes

- Do the Practice Questions on Pg 10.

2.2 Representation of Numbers in computers

An **Overflow** is when the result of any operation does not fit in the reserved number of bits.

a. Integers

- Sign Magnitude Format
  - MSB represents the sign
  - Range $-(2^{(n-1)}-1)$ to $(2^{(n-1)}-1)$
  - During Subtraction, if the signs are different, we subtract the smaller number from the larger number and give the result the sign of the large number.
- Complement Format
  - The d digit 2's complement of a d binary integer N can be got in two ways
    - Using $2^d - N$
    - First getting the one's complement (by inverting the bit values), then adding 1.
  - **Overflow in 2's complements** occur when adding two positives and get a negative or adding two negative and get a positive result.

Signed Magnitude Format	**2's Complement Format**
It has two different representation for 0. +0 and -0. (+0 : 0000 0000) & (-0 : 1000 0000)	0 has only one representation (+0 or -0 : 0000 0000).
Sign bit is considered explicitly.	Sign bit is not considered explicitly.
Addition and subtraction are performed on separate hardware.	Addition and subtraction are performed by using adder only.

b. Floating Points Formats

CHAPTER THREE: Logic Circuits