FUNDAMENTALS OF MICROPROCESSOR

UNIT 1
INTRODUCTION TO INTEL 8085
(LECTURE NOTES 19 & 21 AUG)
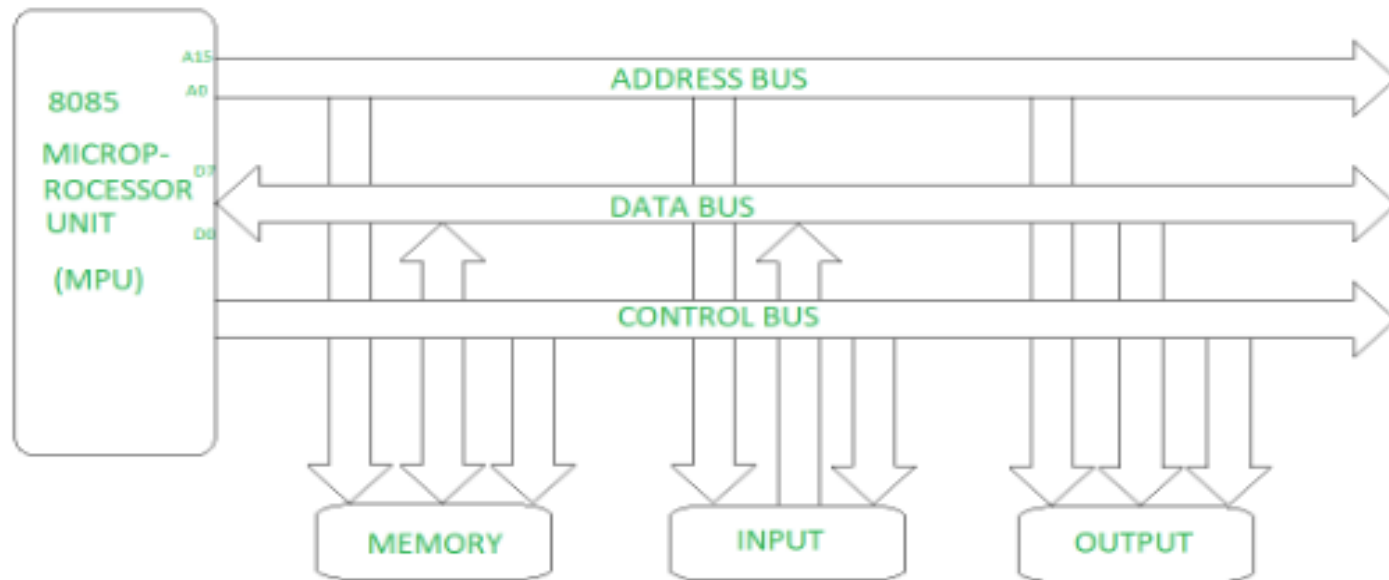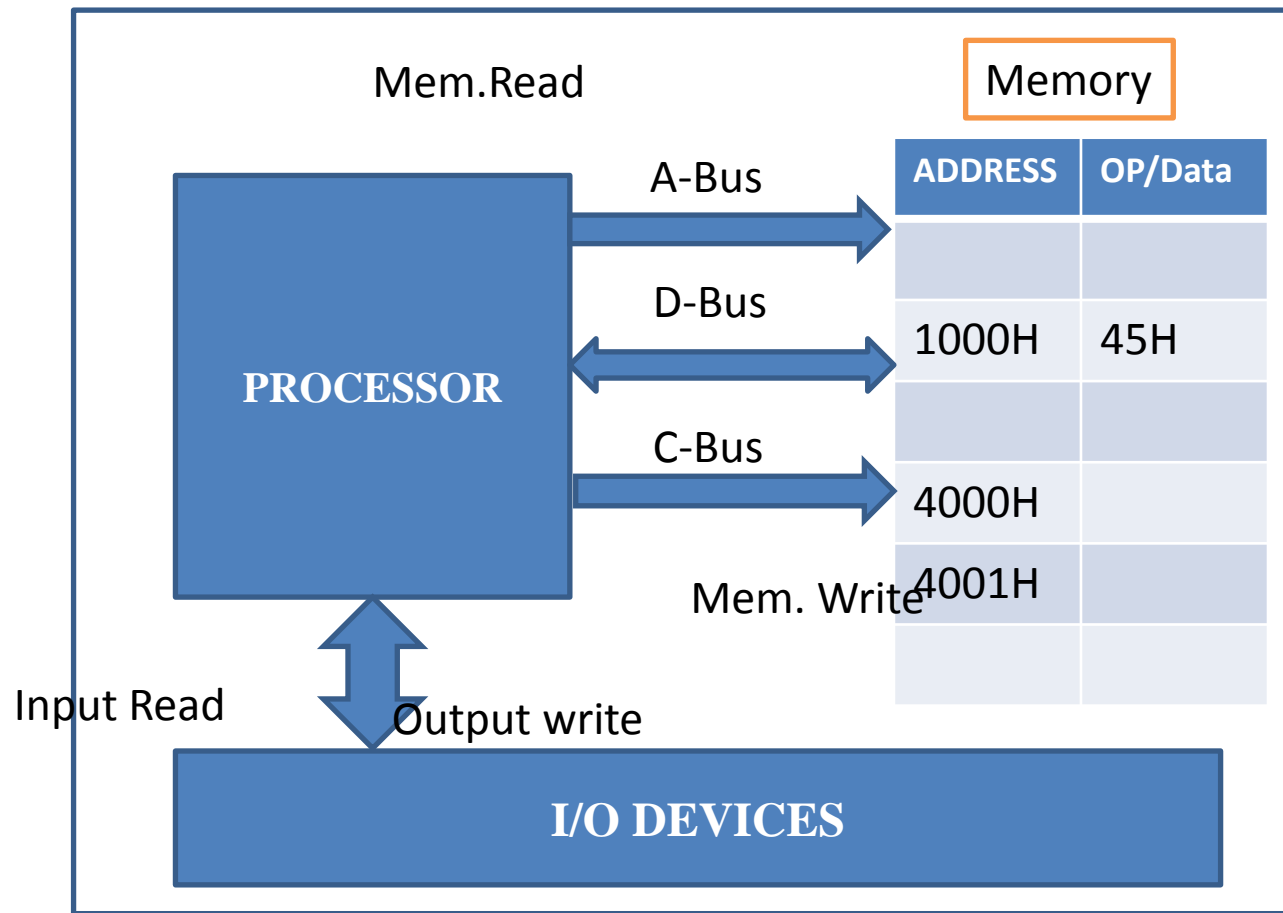
By:

ATIFA AQUEEL

Guest Teacher

Electronics Engg. Section

University Women's Polytechnic, AMU

BUS ORGANIZATION OF 8085 MICROPROCESSOR

- Bus is a group of conducting wires which carries information, all the peripherals are connected to microprocessor through Bus.

- It is a communication path between microprocessor and memory/peripherals.

Bus organization system of 8085 Microprocessor

- There are three different types of buses used in microprocessor

1. Address Bus

2. Data Bus

3. Control Bus

- **ADDRESS BUS (A-Bus):** It is a group of conducting wires which are used to carry the address of memory and I/o devices

- Address bus is unidirectional because data flow in one direction, from microprocessor to memory or from microprocessor to Input/output devices.

- The address bus of INTEL 8085 is of 16bits ranging from 0000 H to FFFF H, (H denotes Hexadecimal).

- The microprocessor 8085 can transfer maximum 16 bit address which means it can address up to 2^{16} or 65, 536 (64K) different memory location.

- The Length of the address bus determines the amount of memory a system can address. Such as a system with a 32-bit address bus can address 2^32 memory locations.

- **DATA BUS (D-Bus)**:
- It is a group of conducting wires which carries Data only.
- Data bus is bidirectional because data flow in both directions, from microprocessor to memory or Input/Output devices and from memory or Input/Output devices to microprocessor.
- Length of Data Bus of 8085 microprocessor is 8 Bit (That is, two Hexadecimal Digits), ranging from 00 H to FF H. (H denotes Hexadecimal).
- When it is write operation, the processor will put the data (to be written) on the data bus.
- When it is read operation, the memory controller will get the data from specific memory block and put it into the data bus.
- The width of the data bus is directly related to the largest number that the bus can carry, such as an 8 bit bus can represent 2 to the power of 8 unique values, this equates to the number 0 to 255.
- The word length of a processor depends on the width of data bus that's why Intel 8085 is called as 8-bit processor.
- Similarly a 16-bit processor has 16 bit data bus.

- **CONTROL BUS (C-Bus):**

- It is a group of conducting wires, which is used to carry necessary control signals between the microprocessor and memory and I/O devices.

- Microprocessor uses control bus to process data, that is what to do with selected memory location.

- Examples of control signals are $\overline{RD},\overline{WR},IO/\overline{M}\ etc$:

- The µP issues IO/ $\overline{M}$ signal to indicate whether it will communicate with IO device or memory.

- If IO/ $\overline{M}$ signal is high, µP wants to communicate with an IO device.

- If IO/ $\overline{M}$ signal is low, µP wants to communicate with an memory.

- When the µP sends a low $\overline{RD}$ signal, it means µP wants to read information.

- When the µP sends a low $\overline{WR}$ signal, it means µP will perform write operation i.e it will send data to the device.

CONTD...

Control Signals	IO/ $\overline{M}$	$\overline{RD}$	$\overline{WR}$
Memory Read	0	0	1
Memory Write	0	1	0
I/O Read	1	0	1
I/O Write	1	1	0

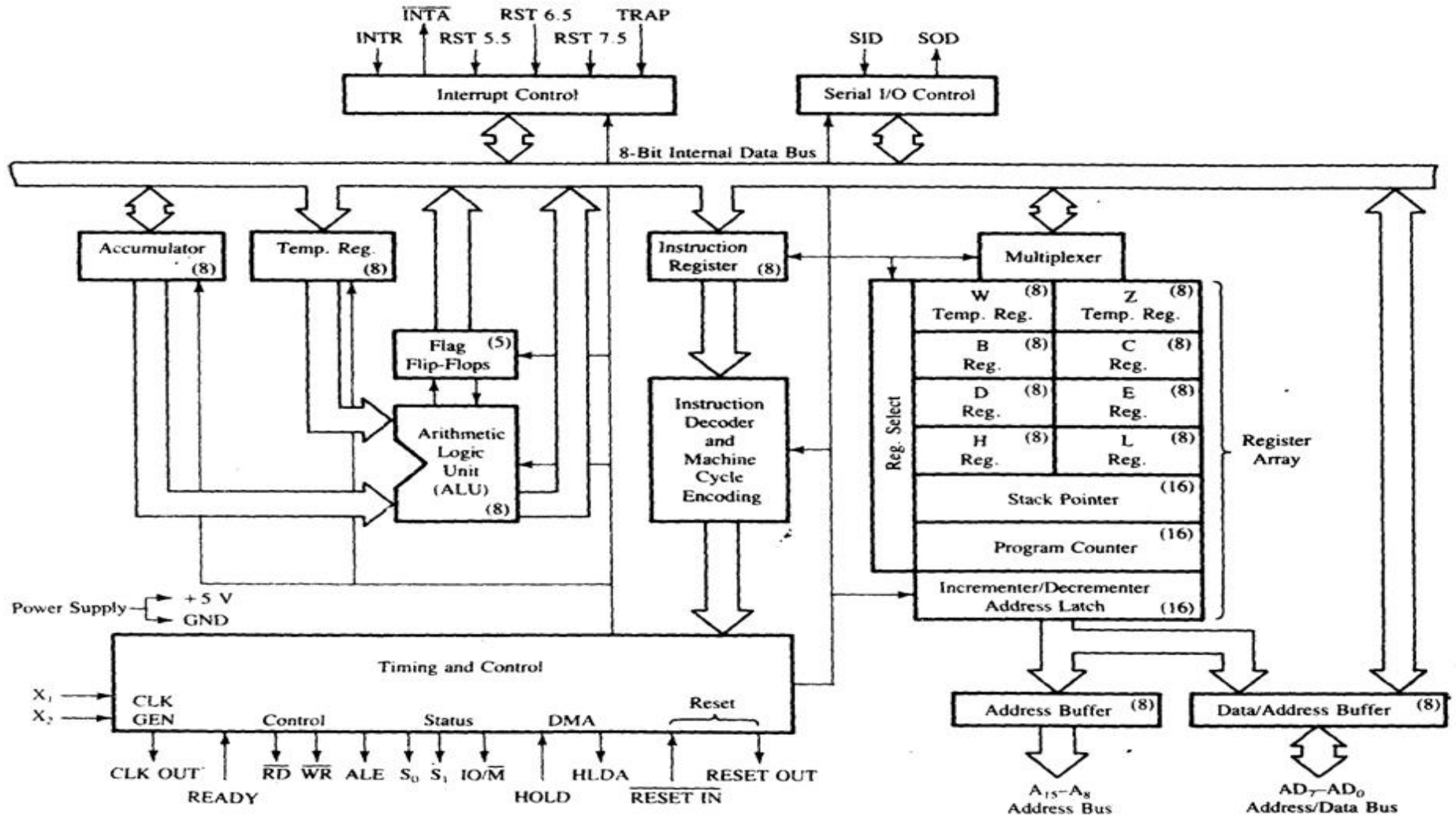# MEMORY ADDRESSING CAPABILITY OF A MICROPROCESSOR

- The memory addressing capability of a microprocessor depends on the width of its address bus.

- If a microprocessor has N address lines, it can directly address 2^N memory locations.

- If a microprocessor has 16 address lines, it can directly address 2^{16} or 65536 or 64K memory locations. ($2^{16} = 2^6 \times 2^{10} = 64 \times 1K = 64K$)

- One memory location stores 1 byte information. Hence a microprocessor having 16 address lines can directly address 64K bytes of memory.

- Therefore, the addressing capability of a microprocessor is 2^N bytes where N= No.of address lines

> **1 byte = 8 bits**
> **1 nibble = 4 bits**
> **1 word = 16 bits**

8085 μP ARCHITECTURE

KEY FEATURES

- Some key features of 8085 Microprocessor.
1. The Intel 8085 is an 8-bit general-purpose microprocessor.
2. It has an 8-bit data bus. This means that 8 bits of data can flow around in the innards of the microprocessor.
3. Apart from the data bus, it also has a 16-bit address bus, which addresses up to 64KB.
4. It also has a 16-bit program counter & a 16-bit stack pointer.
5. There are six 8-bit registers which are arranged in pairs: BC, DE, HL.
6. It requires a voltage supply of +5V to operate at 3.2MHZ single-phase clock frequency
7. The Intel 8085 comes as a 40-pin IC package.
8. It has 74 basic instructions and 246 opcodes.

The 8085 is based on Von-Neumann architecture, where the data and instructions are in the same memory space without any distinction between them.

THE ARCHITECTURE OF THE 8085

- Clearly, we can see the different functional units in the architecture:
1. Accumulator
2. Arithmetic and Logic Unit
3. General-purpose register
4. Program counter
5. Stack pointer
6. Temporary register
7. Flag register
8. Instruction register and decoder
9. Timing and control unit
10. Serial Input/output control
11. Interrupt Control
12. Address buffer and address-data buffer
13. Address bus and data bus