Computer Organization and Application

Lecture 7
Concepts of Microprocessors & Microcomputer & Microcontroller

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MICROPROCESSOR 8085

- Reference Book: Ramesh S. Goankar, "Microprocessor Architecture, Programming and Applications with 8085", 5thEdition, Prentice Hall.

- Computer System Architecture- M. Morris Mano

- Structured Computer Organization- Andrew C. Tanenbaum

Details..of Unit-I

- Basic Concepts of Microprocessors.
- Differences among
  - Microcomputer
  - Microprocessor
  - Microcontroller
- What about micro
- Definition of the Microprocessor

Definition

- The earliest microprocessor (the Intel 8088 and Motorola's 6800) recognized 8-bit words.

- Later microprocessors (8086 and 68000) were designed with 16-bit words.

- Today, all processors manipulate at least 32 bits at a time and there exists microprocessors that can process 64, 80, 128 bits

A Microprocessor-based system

- Internally, the microprocessor is made up of 3 main units.
- The Arithmetic/Logic Unit (ALU)
- The Control Unit.
- An array of registers for holding data while it is being manipulated.

Architecture of Intel 8085 Microprocessor
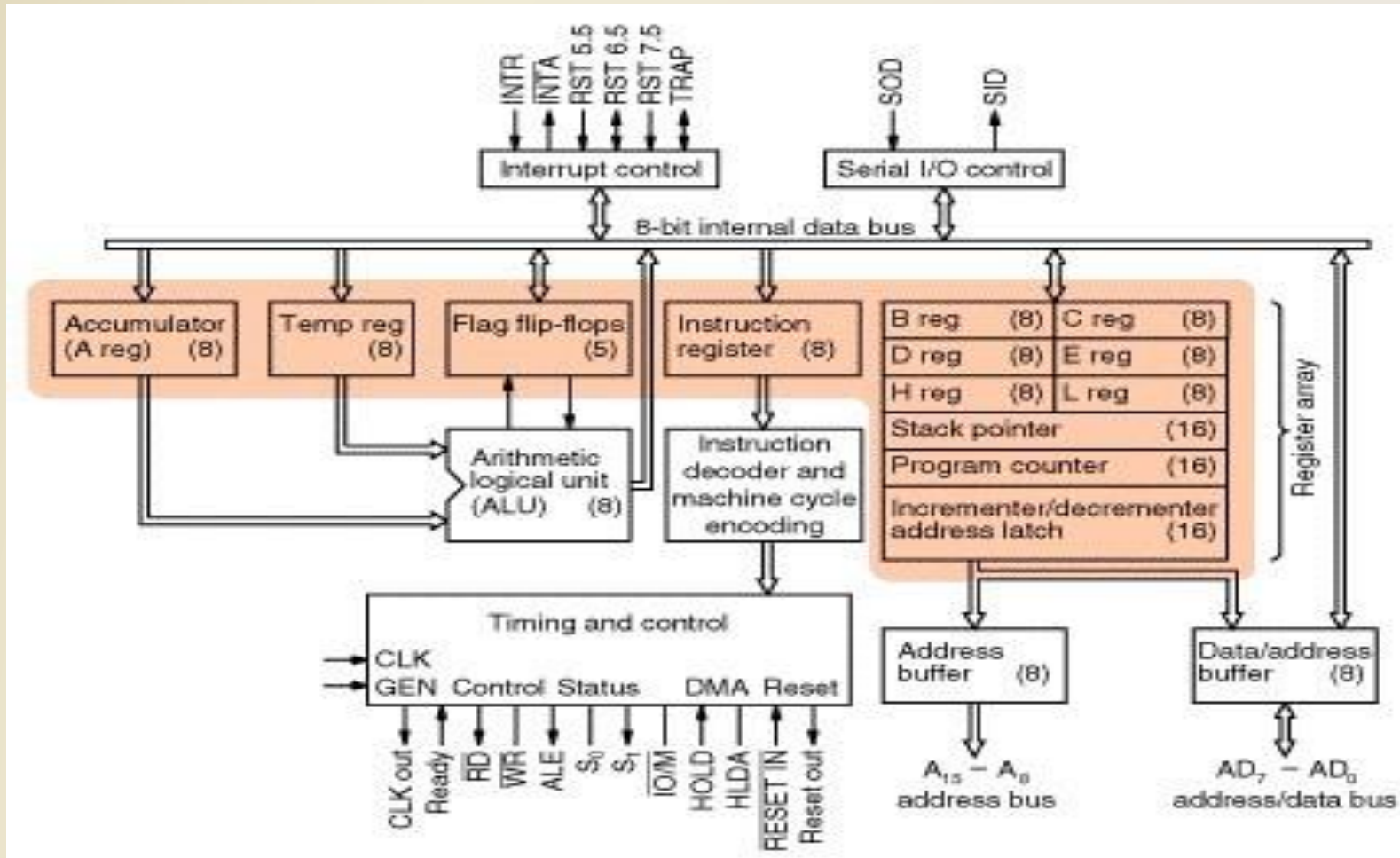
Memory

- Memory Map and Addresses.

- The three cycle instruction execution model.

- To execute a program, the microprocessor "reads" each instruction from memory, "interprets" it, then "executes" it.

- (Fetches/Decode/Execute)

- Machine Language.

- The 8085 Machine Language

- Assembly Language

  - Defines a symbolic code for the   instructions. "mnemonics".

8085 Microprocessor Architecture

- 8-bit general purpose µp
- Capable of addressing 64 k of memory
- Has 40 pins
- Requires +5 v power supply
- Can operate with 3 MHz clock
- 8085 upward compatible

8085 MicroprocessorArchitecture..

- System Bus –wires connecting memory & I/O to microprocessor
  - Address Bus Unidirectional
    - Identifying peripheral or memory location
  - Data Bus Bidirectional
    - Transferring data
  - Control Bus
    - Synchronization signals
    - Timing signals
    - Control signal

Intel 8085 Microprocessor..

- Microprocessor consists of:

  - Control unit: Control microprocessor operations.
  - ALU: performs data processing function.
  - Registers: provide storage internal to CPU.
  - Interrupts
  - Internal data bus

The Internal Architecture

- The Program Counter (PC):
    - Control the sequencing of the execution of instructions.
- The Stack pointer:
    - The stack pointer is also a 16-bit register that is used to point into memory.
    - LIFO

Unit-II

- **Introduction to 8085 Assembly Language Programming:**
  - The 8085 Programming Model
  - Instruction Classification
  - Instruction
  - Data and Storage
  - Writing assembling and Execution of a simple program
  - Overview of 8085 Instruction Set
  - Writing and Assembling Program

Instruction and Data Formats

- Each instruction has two parts.
  - The first part is the task or operation to be performed. This part is called the "opcode" (operation code).
  - The second part is the data to be operated on Called the "operand".

The 8085 Instructions

- Data Transfer Operations
  - (MOV, MVI, LDA, and STA)
- Arithmetic Operations
  - (ADD, ADI, SUB, SUI)
  - Arithmetic Operations Related to Memory
- Logic Operations:
  - (ANA, ANI, ORA, ORI, XRA and XRI,Complement, Rotate,Compare)
- MOV M B:
  - Copy the data from register B into a memory location.
- LDAX Rp (LoaD Accumulator eXtended)
- LXI Rp, <16-bit address>(Load eXtended Immediate)
- The instruction LXI B 4000Hwill place the 16- bit number 4000 into the register pair B, C.

The 8085 Instructions…

- Operation: Load an 8-bit number into the accumulator.
- **MVI   A, 32**
  - Operation: MVI A
  - Operand: The number 32
  - Binary Code:
    - 0011 1110   3E   1st byte.
    - 0011 0010   32   2nd byte.

The 8085 Instructions..

- Branch Operations:
  - Two types: Unconditional branch. Go to a new location no matter what. (JMP, CALL, RET)
  - Conditional branch. Go to a new location if the condition is true. (JZ, JNZ, JC, JNC, JP, JM)
- Machine Control Operations
  - HLT--Stop executing the program. NOP--No operation