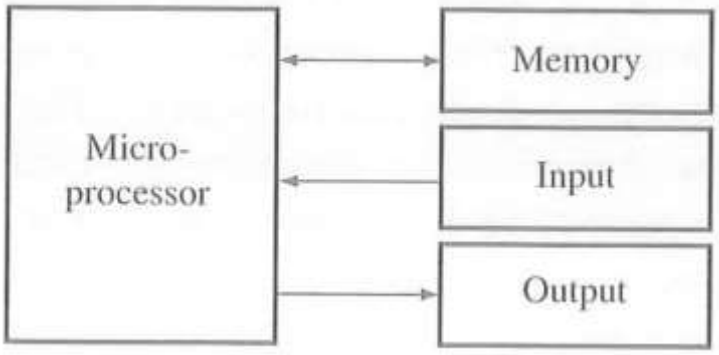
Microprocessor:

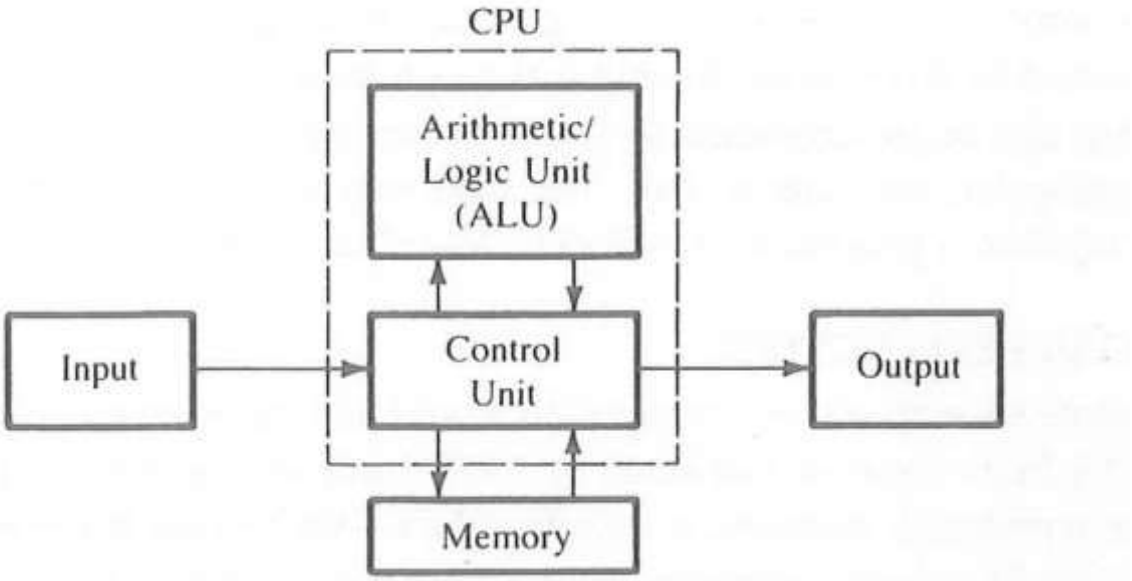
The **microprocessor** is a programmable integrated device that has computing and decision-making capability similar to that of the central processing unit (CPU) of a computer. Nowadays, the microprocessor is being used in a wide range of products called microprocessor-based products or systems.

Programmable Machine:

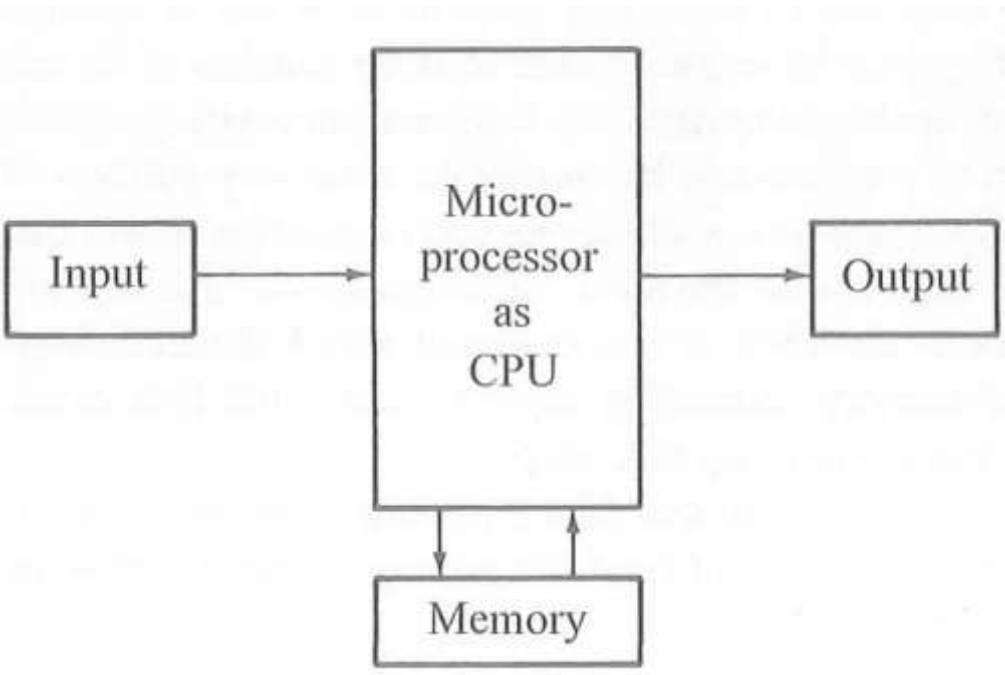
Components-



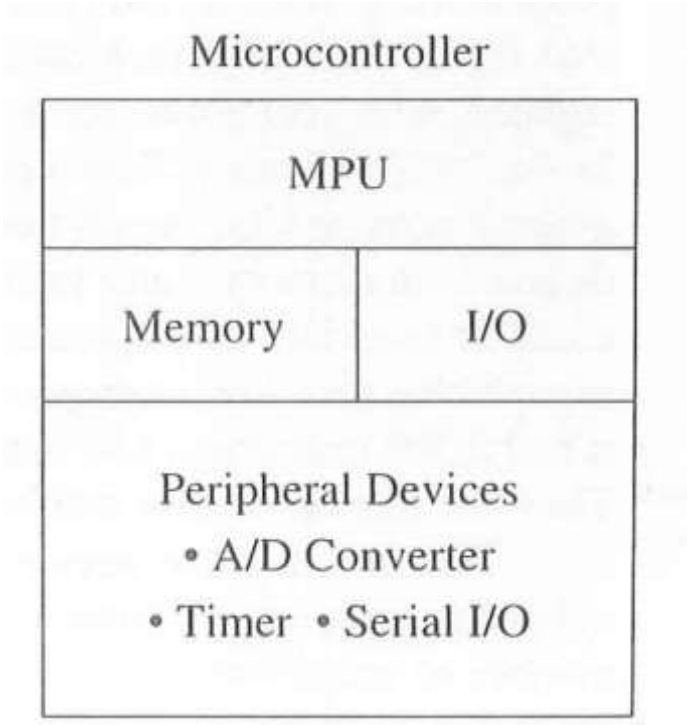
Block Diagram of a Computer-



Block Diagram of a Computer with Microprocessor as CPU:



Block Diagram of a Microcontroller:



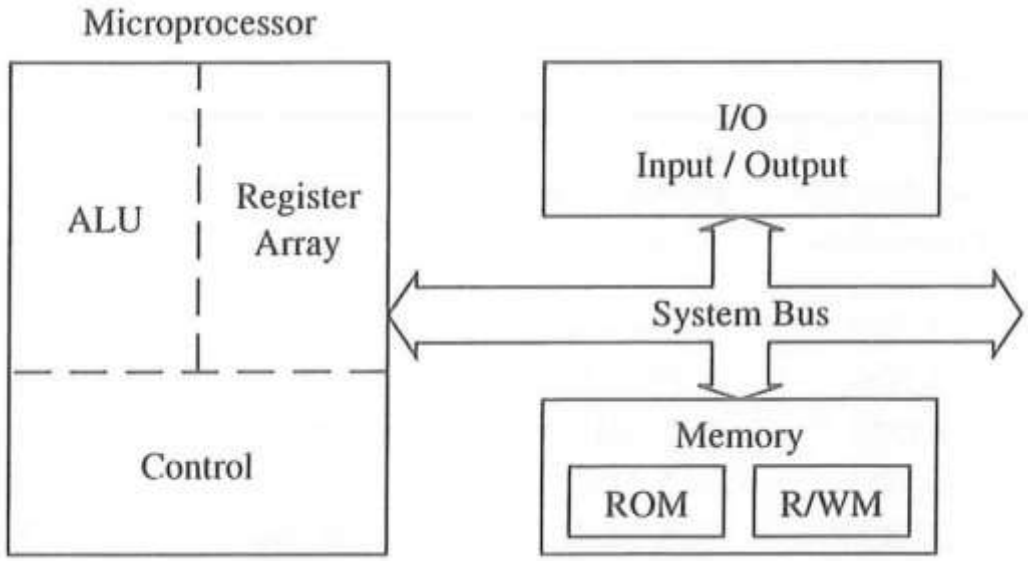
Intel Microprocessors: Historical Perspective

Processor	Year of Introduction	Number of Transistors	Initial Clock Speed	Address Bus	Data Bus	Addressable Memory
4004	1971	2,300	108 kHz	10-bit	4-bit	640 bytes
8008	1972	3,500	200 kHz	14-bit	8-bit	16 K
8080	1974	6,000	2 MHz	16-bit	8-bit	64 K
8085	1976	6,500	5 MHz	16-bit	8-bit	64 K
8086	1978	29,000	5 MHz	20-bit	16-bit	1 M
8088	1979	29,000	5 MHz	20-bit	8-bit*	1 M
80286	1982	134,000	8 MHz	24-bit	16-bit	16 M
80386	1985	275,000	16 MHz	32-bit	32-bit	4 G
80486	1989	1.2 M	25 MHz	32-bit	32-bit	4 G
Pentium	1993	3.1 M	60 MHz	32-bit	32/64-bit	4 G
Pentium Pro	1995	5.5 M	150 MHz	36-bit	32/64-bit	64 G
Pentium II	1997	8.8 M	233 MHz	36-bit	64-bit	64 G
Pentium III	1999	9.5 M	650 MHz	36-bit	64-bit	64 G
Pentium 4	2000	42 M	1.4 GHz	36-bit	64-bit	64 G

*External 8-bit and internal 16-bit data bus

Organization of a Microprocessor-Based System:

Microprocessor-Based System with Bus Architecture:



MICROPROCESSOR

The microprocessor is a clock-driven semiconductor device consisting of electronic logic circuits manufactured by using either a large-scale integration (LSI) or very-large-scale integration (VLSI) technique. The microprocessor is capable of performing various computing functions and making decisions to change the sequence of program execution. In

Arithmetic/Logic Unit This is the area of the microprocessor where various computing functions are performed on data. The ALU unit performs such arithmetic operations as addition and subtraction, and such logic operations as AND, OR, and exclusive OR.

Register Array This area of the microprocessor consists of various registers identified by letters such as B, C, D, E, H, and L. These registers are primarily used to store data temporarily during the execution of a program and are accessible to the user through instructions.

Control Unit The control unit provides the necessary timing and control signals to all the operations in the microcomputer. It controls the flow of data between the microprocessor and memory and peripherals.

MEMORY

Memory stores such binary information as instructions and data, and provides that information to the microprocessor whenever necessary. To execute programs, the microprocessor reads instructions and data from memory and performs the computing operations in its ALU section. Results are either transferred to the output section for display or stored in memory for later use. The memory block shown in Figure 1.3 has two sections: **Read-Only memory** (ROM) and **Read/Write memory** (R/WM), popularly known as **Random-Access memory** (RAM).

The ROM is used to store programs that do not need alterations. The monitor program of a single-board microcomputer is generally stored in the ROM. This program interprets the information entered through a keyboard and provides equivalent binary digits to the microprocessor. Programs stored in the ROM can only be read; they cannot be altered.

The Read/Write memory (R/WM) is also known as *user memory.* It is used to store user programs and data. In single-board microcomputers, the monitor program monitors the Hex keys and stores those instructions and data in the R/W memory. The information stored in this memory can be easily read and altered.

I/O (INPUT/OUTPUT)

The third component of a microprocessor-based system is I/O (input/output); it communicates with the outside world. I/O includes two types of devices: input and output; these I/O devices are also known as *peripherals.*

SYSTEM BUS

The system bus is a communication path between the microprocessor and peripherals; it is nothing but a group of wires to carry bits. In fact, there are several buses in the system that will be discussed in the next chapter. All peripherals (and memory) share the same bus; however, the microprocessor communicates with only one peripheral at a time. The timing is provided by the control unit of the microprocessor.

How dose Microprocessor Work?

Architecture of Intel 8085 Microprocessor