(*) Introduction

Digital design is concerned with the design of DIGITAL electronic circuits.
A DIGITAL COMPUTER can follow a sequence of INSTRUCTIONS, called a PROGRAM, that operates on given DATA. The USER can change programs and/or data according to the specific need.
Examples of digital systems include digital computers, electronic calculators, etc.

Even though DATA and INFORMATION are slightly different terms, they are often used interchangeably.

The main characteristic of a digital system is its manipulation of DISCRETE elements of information, for eg., electric impulses, the decimal digits, the letters of an alphabet, etc.

The JUXTAPOSITION of discrete elements of INFORMATION represents a QUANTITY of information.
For eg., the letters d, o and g placed one after another form the word dog.
Thus, a SEQUENCE of discrete elements forms a LANGUAGE.

Discrete elements of information are represented in a digital system by physical quantities called SIGNALS, such as ELECTRICAL signals (for eg., voltages, currents, etc.).

The signals in all present-day electronic digital systems have only TWO discrete values and are said to be BINARY. This is because MANY-VALUED electronic circuits, for eg., a circuit with ten states (one discrete voltage value for each state), have low RELIABILITY of operation.

Discrete quantities of information arise either from the NATURE of a process or may be QUANTIZED from a continuous process.
For eg., An employee's paycheck is processed using DISCRETE data values such as letters (for name), digits (for salary), and special symbols such as $.
On the other hand, a scientist may observe a CONTINUOUS phenomenon but record only specific quantities in tabular form.

An ANALOG computer performs a direct SIMULATION of a continuous physical system. However, to simulate a continuous physical process in a DIGITAL computer, the quantities must be QUANTIZED.
The terms DIGITAL SIGNAL & ANALOG SIGNAL are sometimes substituted for DISCRETE SIGNAL & CONTINUOUS SIGNAL, respectively.

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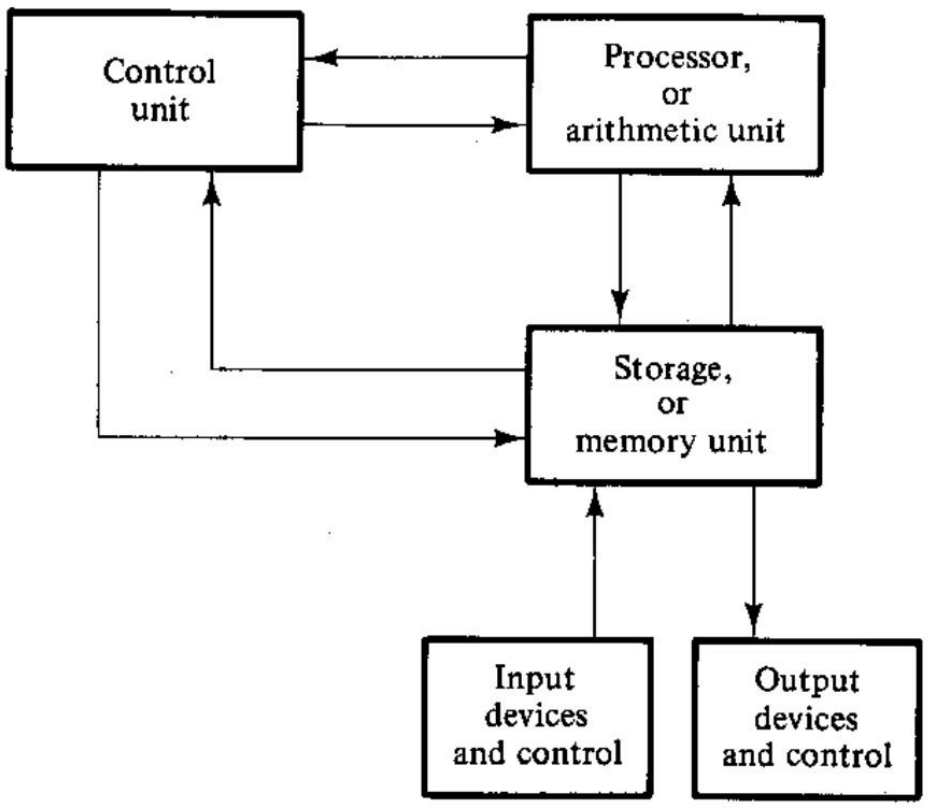

FIGURE 1-1
Block diagram of a digital computer

The MEMORY unit stores PROGRAMS as well as INPUT, OUTPUT and INTERMEDIATE data.

The PROCESSING unit performs data-processing tasks as specified by a PROGRAM.

The CONTROL unit retrieves the INTSTRUCTIONS of a program one by one and for each instruction, it informs the PROCESSOR to execute the OPERATION specified by the instruction.

The PROGRAM and DATA prepared by the USER are transferred into the MEMORY unit by means of INPUT devices, and OUTPUT devices receive the RESULTS of the computations.

(*) Number Systems