

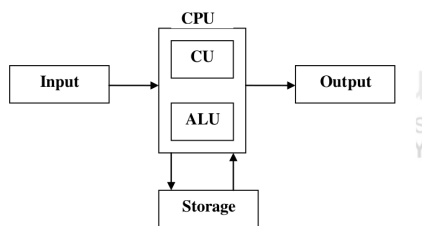
FUNCTIONING OF A COMPUTER

▼ COMPONENTS OF A DIGITAL COMPUTER & THEIR ROLE

A digital computer is an electronic device that receives data, performs arithmetic and logical operations and produces results according to a predetermined program. It receives

data through an input device (usually keyboard) and displays the results to some output device (usually monitor).

▼ Components of a Digital Computer



▼ CPU

▪ Control Unit

The CU controls the execution of instructions by decoding the instruction and generating micro-operations to be performed for executing that instruction.

▪ Arithmetic Logic Unit

The ALU is responsible for performing arithmetic and logic operations.

▪ Registers

▪ Input Devices

▪ Output Devices

▼ Memory

Memory is used as a working storage for temporarily storing the data and intermediate results generated during program execution.

▪ Primary

▪ Secondary

▪ Computer as a Data Processor



Figure 2.2: Data Processing

The main function of a computer is to process the input data according to a specific program to produce the desired output. This is the reason why a computer is often viewed as a data processing device.

- **Language of Digital Computers**

Digital computers are electronic devices which operate on two valued logic (On and OFF). The ability of a transistor to act as a switch is the key to designing digital computers.

- ▼ **NUMBER SYSTEM**

A number system with base r will have r distinct symbols, from 0 to $r-1$. Binary number system ($r = 2$), octal number system ($r = 8$) and hexadecimal number system ($r = 16$) are some of the frequently used number systems in computer science. Binary number system has two distinct symbols 0 & 1; Octal has seven distinct symbols 0,1,2,3,4,5,6,7; and Hexadecimal number system has sixteen distinct symbols namely 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F.

- **Binary Number System**

As stated above, the binary number system has base 2 and therefore uses only two distinct symbols 0 and 1. Any number in binary is written only by using these two symbols.

- **Binary Codes**

Digital computers use binary codes to represent all kinds of information ranging from numbers to alphabets.

A typical machine instruction in a digital computer system could therefore look like a set of 0s and 1s. Many binary codes are used in digital systems. BCD code for representing decimal numbers, ASCII code for information interchange between computer and keyboard, Unicode for use over Internet and Reflected (Gray) code are some commonly studied binary code systems.

- **ASCII & Unicode**

ASCII code is one such seven bit code that is used to identify key press on the keyboard. ASCII stands for American Standard Code for Information Interchange. It's an alphanumeric code used for representing numbers, alphabets, punctuation symbols and other control characters. It's a seven bit code, but for all practical purposes it's an eight bit code, where eighth bit is added for parity.

▪ **CONCEPT OF INSTRUCTION**

The CPU is a semiconductor integrated circuit chip consisting of a large number of transistors. In personal computers, the CPU is also referred by the term Microprocessor. Every CPU is capable of performing certain instructions (known as machine instruction).

The machine instructions that a CPU can execute demonstrates its capability. Every processor is capable of performing certain operations. An instruction refers to an operation that can be performed by the processor directly.

Every instruction is comprised of two parts: opcode and operands. The opcode specifies the operation to be performed and the operands provide the data on which the operation is to be performed.

▼ **ELEMENTS OF CPU AND THEIR ROLE**

CPU has three major identifiable parts: Control Unit (CU), Arithmetic & logic Unit (ALU) and a set of Registers.

The CPU chip is interfaced with other components of the computer through a system bus (printed wires on the mother board) which has three sets wires forming Control Bus, Data Bus and Address Bus

▼ Registers

▪ User-visible registers

used to store temporary data items and other user accessible information useful for machine or assembly language programmers.

▪ Control & Status Registers

used by control unit to control and coordinate the operation of the processor.

▼ Control Unit

The Control Unit of the processor is that unit which controls and coordinates the execution of instructions by the processor.

▼ micro-operations

▪ hardwired logic

▪ Programmable Read Only Memory (PROM)

▪ Arithmetic and Logic Unit

The Arithmetic and Logic Unit is that part of the CPU that actually performs arithmetic and logical operations on data.