Department of Computer Science and Engineering
PES University, Bangalore, India

Lecture Notes
Python for Computational Problem Solving
UE23CS151A

Lecture #4

Digital Computer – Computer Hardware

By,
Prof. Sindhu R Pai,
Anchor, PCPS - 2023
Assistant Professor
Dept. of CSE, PESU

Verified by,
PCPS Team - 2023

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Dr. Shylaja S S (Director, CCBD and CDSAML Research Centers, Former Chairperson, CSE, PES University)
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Computer:

An electronic device that stores, retrieves, and processes data and can be programmed with instructions. A programmable device designed for performing prescribed operations on data and has links to other devices for receiving the inputs, storing, processing, retrieving it for later use and displaying the data. Computers are available in variety of sizes and configurations.

Types of Computers

- Digital computers
- Analog computers
- Quantum computers
- DNA computers
- Molecular Computers
- Micro-fluidics based computer
- Servers
- Specialized computers - Smart phones, Wearables, Game consoles, TVs

The Digital computer is the most used type of computer and is used to process information with quantities using digits, usually using the binary number system.

Number System

It is defined as the representation of numbers by using digits or other symbols in a consistent manner. The value of any digit in number can be determined by a **digit, its position in the number, and the base of the number system.**

Few Types of Number systems are listed below:

- Binary number system (Base - 2)

  Digits allowed: 0 and 1
- Octal number system (Base - 8)

  Digits allowed: 0 to 7
- Decimal number system (Base - 10)

  Digits allowed: 0 to 9
- Hexadecimal number system (Base - 16)

  Digits allowed: 0 to 9 and A to F (10 to 15)

Problem 1: Provide the binary equivalent of a given decimal number – 53.

2	53
2	26 – 1
2	13 – 0
2	6 – 1
2	3 – 0
	1 – 1

Read from last to first. Solution is $110101_{(2)}$

Problem 2: Provide the decimal equivalent of a given binary number – 110101

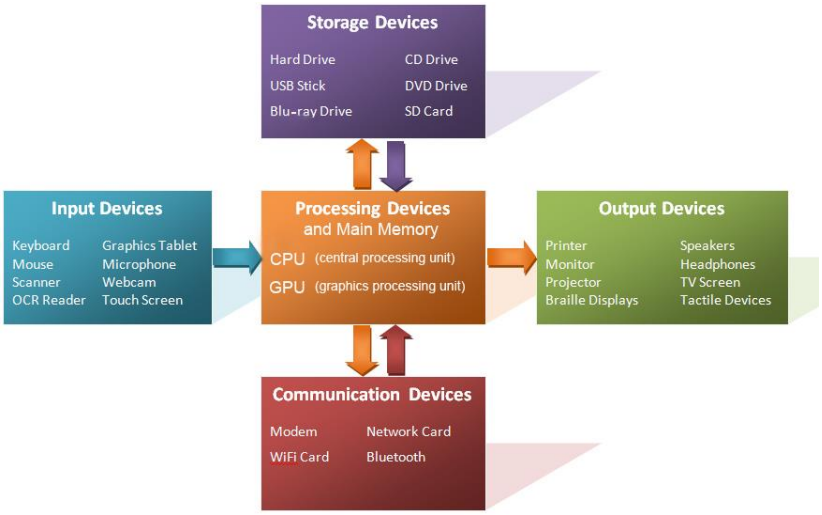
1×2^5 + 1×2^4 + 0x2^3 + 1×2^2 + 0x2^1 + 1×2^0 = 53

Solution is $53_{(10)}$

Computer is composed of **Hardware and Software components.**

Hardware Components:

Comprises of physical parts of a Computer System.



Processing devices:

Central Processing Unit (CPU) - The “brain” of a computer system. Interprets and executes instructions.

Graphics Processing Unit (GPU)

Main Memory:

Memory or space where currently executing programs reside. It is **volatile**. Means the contents are lost when the power is turned off.

Secondary Memory:

It provides long-term storage of programs and data. **Non-volatile**, the contents are retained when power is turned off. Can be magnetic (hard drive), optical (CD or DVD), or flash memory (USB drive).

Input devices:

"Way to tell computer what to do"

You can try to name a few of them from the below picture.

Output devices:

"How computer shows you what it is doing"

Try naming a few of them from the picture.

Communication devices:

A hardware device capable of transmitting an analog or digital signal over the telephone, other communication wire, or wirelessly.

Buses:

A communication system that transfers data between components inside a computer, or between computer and output devices.

- Internal Bus (System Bus: CPU and Main Memory)
- External Bus (Expansion Bus: printer to the computer)

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