

Comprehensive Board Notes & Illustrated Diagrams

UNIT 1: FUNDAMENTALS OF COMPUTER

Complete chapter breakdown following the Sindh Textbook Board curriculum. Includes historical evolution, computer architecture, hardware components, operations, and software taxonomy.

TARGET BOARD

BISE Karachi / Sindh Boards

MODULE

Theory + Block Diagrams

EXAM PREP

Short & Long Question Focus

Mechanical & Electro-Mechanical Eras

Abacus (3000 B.C.)

1st Prototype

Known as counting frame. Used to teach basic arithmetic operations.

Napier's Bones (1612 A.D.)

John Napier

10 bone/wood rods used specifically for multiplication and division.

Pascaline (1642 A.D.) & Leibniz (1694)

Blaise Pascal

Pascaline added 8-figure numbers. Leibniz's Stepped Reckoner did all 4 basic math operations.

Charles Babbage (Father of Computer)

- **Difference Engine (1822):** Steam-powered automatic calculator working on difference equations.
- **Analytical Engine (1837):** First general-purpose computer design featuring ALU, memory, and punched card input.

Hollerith's Tabulating Machine (1890)

Electro-mechanical punched card reader used in US Census. Reduced data compilation from 7 years to 6 months.



The 5 Computer Generations

BOARD EXAM FAVORITE

1ST GEN

1940 – 1956

- **Tech:** Vacuum Tubes
- **Memory:** Magnetic Drums
- **Lang:** Machine (0s/1s)
- **Ex:** ENIAC, UNIVAC

2ND GEN

1956 – 1963

- **Tech:** Transistors
- **Memory:** Magnetic Core
- **Lang:** Assembly, FORTRAN
- **Ex:** IBM 7094, 1401

3RD GEN

1964 – 1971

- **Tech:** ICs (Chips)
- **Input:** Keyboard/Monitor
- **Lang:** COBOL, Pascal
- **Ex:** IBM 360, IBM 370

4TH GEN

1971 – Present

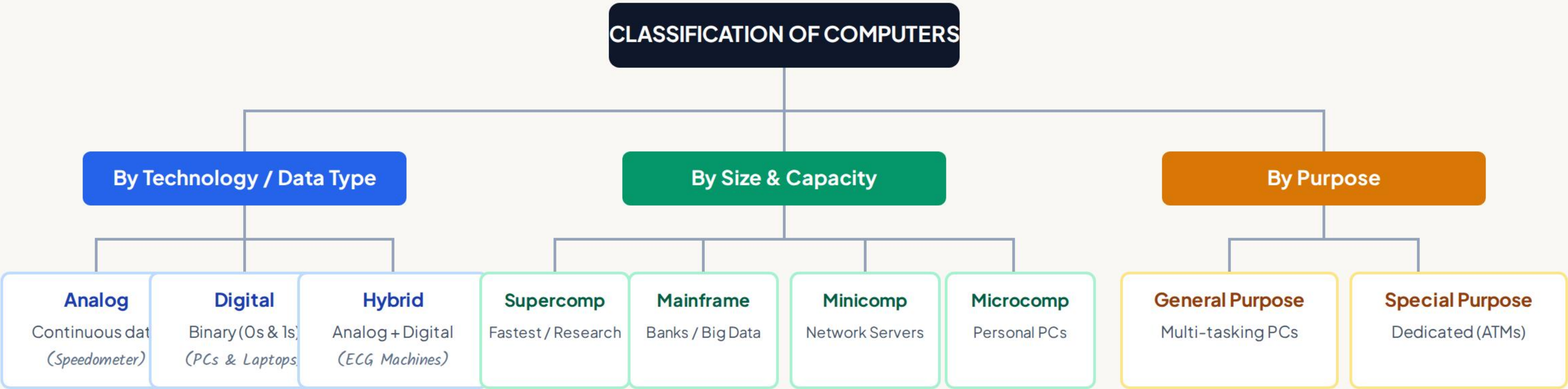
- **Tech:** Microprocessors
- **Memory:** RAM, ROM, VLSI
- **Lang:** C, C++, Java, GUIs
- **Ex:** Apple Mac, IBM PC

5TH GEN

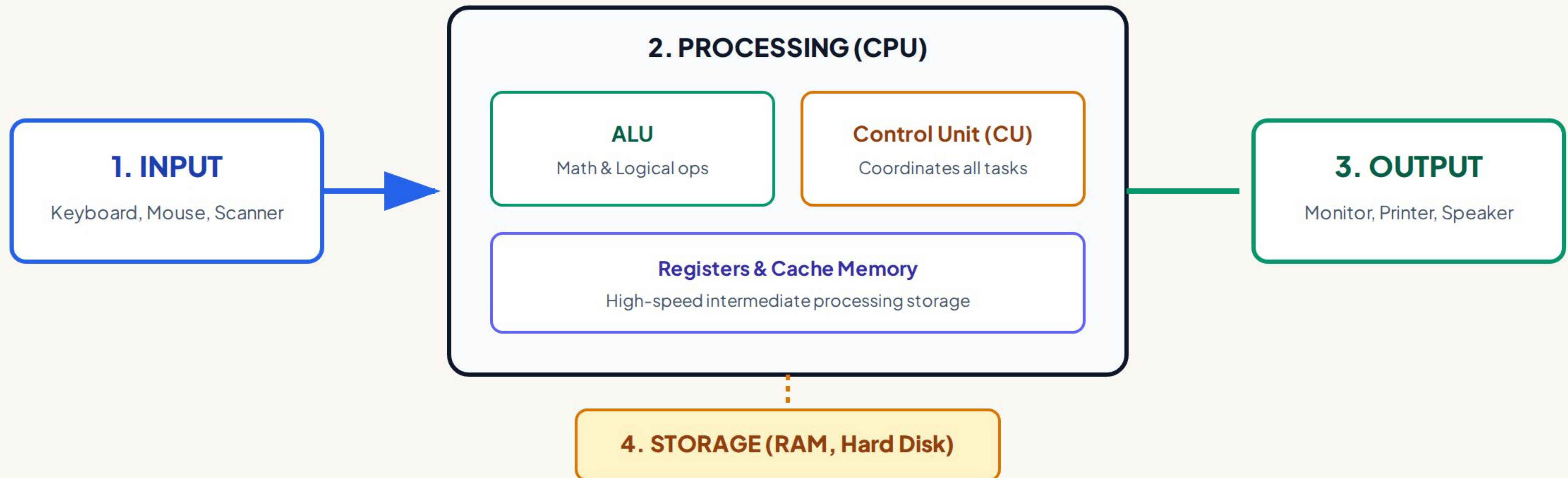
Present & Beyond

- **Tech:** AI & Robotics
- **Feature:** Self-learning, NLP
- **Fields:** Deep Learning, Expert Systems
- **Ex:** Humanoid Robots

Classification of Computers



4 Basic Computer Operations



System Unit & Motherboard



What is the Motherboard?

Main printed circuit board made of layered fiberglass with copper conductive traces. Acts like the human nervous system to connect all hardware.

Key On-Board Components

Microprocessor socket, RAM memory slots, expansion slots (PCIe), chipsets, power connectors, and external I/O ports.

System Buses (Data Highways)

Control Bus

Carries control commands

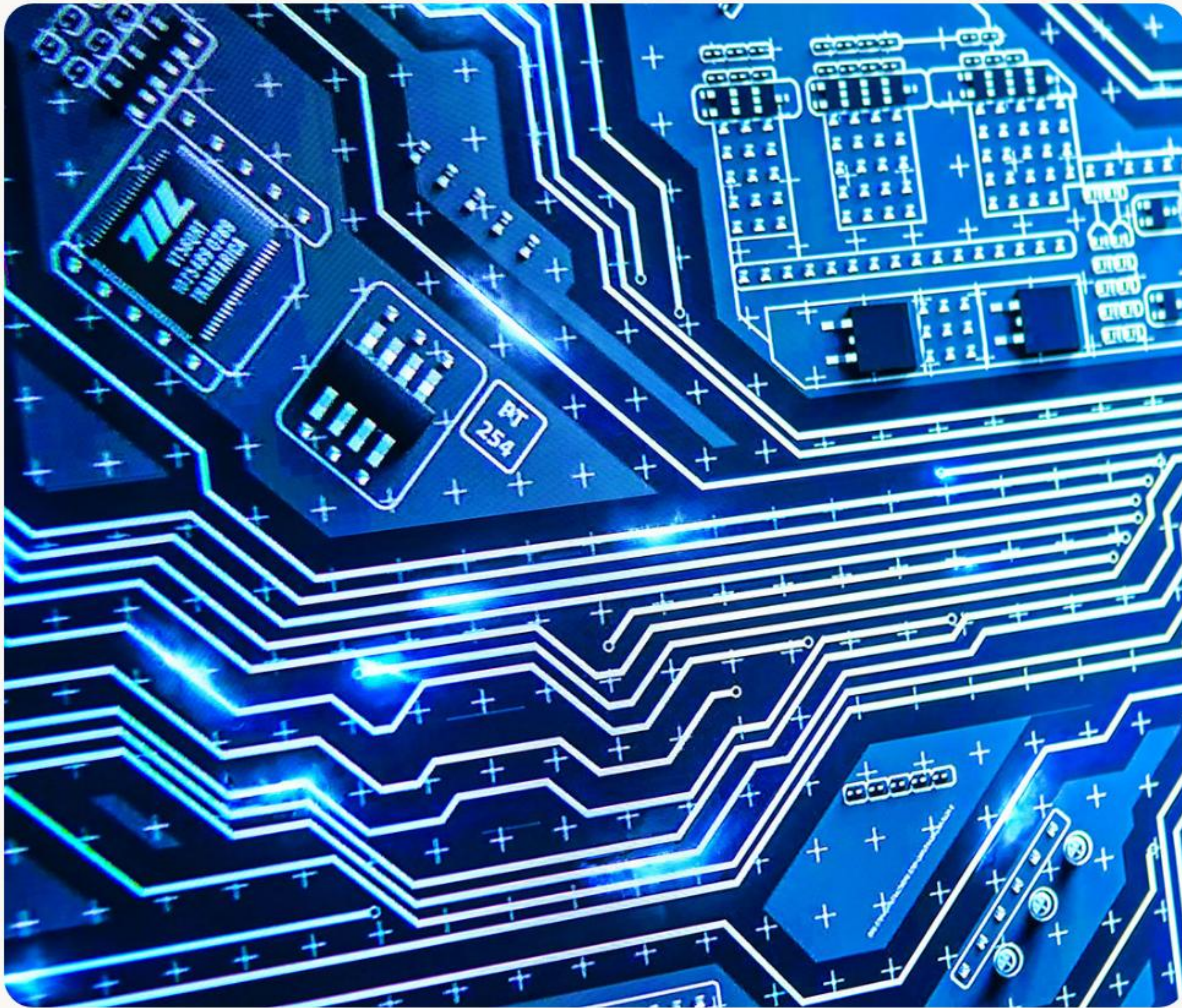
Data Bus

Transfers actual data

Address Bus

Specifies memory locations

Microprocessor (CPU) Architecture



1. Arithmetic Logic Unit (ALU)

Executes arithmetic calculations (+, -, *, /) and logical comparisons (<, >, =).

2. Control Unit (CU)

Acts as a traffic policeman. Controls data flow and coordinates operations without executing calculations.

3. Clock

Generates electronic pulses to synchronize instruction cycles. Speed measured in MHz and GHz.

4. Registers & 5. Cache Memory

Registers: High-speed internal temporary storage (8, 16, 32, 64-bit).

Cache: Intermediate buffer memory (Internal L1 / External L2, L3).

Input & Output Devices

Input Devices

Text Entering:

Keyboard (sends scan codes via controller chip).

Pointing Devices:

Mouse, Joystick, Trackball, Touchpad.

Optical Scanners:

OMR (Mark), OBR (Barcode), OCR (Character).

Specialized Input:

MICR (Cheques), Touchscreen, Microphone.

Output Devices

1. Soft Copy (Volatile Display / Sound)

- **Monitors:** CRT vs Flat Panel (pixels)
- **Data Projectors:** Digital Light Lenses
- **Speakers:** Sound/Audio output

2. Hard Copy (Permanent Paper Print)

- **Printers:** Impact vs Non-Impact
- **Plotters:** Large-format maps, engineering blueprints, billboards.

Primary vs Secondary Memory

COMPARISON TABLE

Feature	Primary Storage (RAM / ROM)	Secondary Storage (HDD / SSD / USB)
Volatility	RAM is Volatile (loses data on power off). ROM is non-volatile.	Non-Volatile (retains data permanently).
Speed & Access	Extremely fast direct access by CPU.	Slower access speed compared to RAM.
Storage Capacity	Limited capacity (e.g., 8GB - 32GB RAM).	Massive capacity (e.g., 512GB SSD to 10TB HDD).
Primary Role	Holds active programs and BIOS startup code during processing.	Stores user files, OS, software installations permanently.

System Software vs Application Software

1. System Software

Controls overall hardware operations and coordinates system tasks.

Operating System:

Master control program (Windows, Linux).

Device Drivers:

Translators enabling Plug and Play hardware.

Utility Programs:

Antivirus, Disk Cleaner, Defragmenter.

Translators:

Assembler, Compiler (all at once), Interpreter (line-by-line).

2. Application Software

Programs designed for end-users to perform specific tasks.

Productivity Software:

MS Word, MS Excel, PowerPoint.

Business Software:

Billing, inventory, payroll systems.

Entertainment Software:

Video games, media players.

Educational Software:

LMS, interactive e-learning modules.

Emerging Tech & IT Careers

CAREER SCOPE



Emerging Tech Trends

- **Artificial Intelligence (AI):** Mimics human learning, reasoning & problem solving.
- **Robotics:** Automated machines with sensory feedback.
- **Wireless & VR:** 5G, GPS tracking, and immersive virtual reality simulation.

Key IT Career Pathways

- | | |
|-------------------------|--------------------------|
| • Software Engineer | • Network Administrator |
| • Database Admin (DBA) | • Web & Graphic Designer |
| • Info Security Analyst | • CS/IT Educator |

Quick Recall • High Frequency Board Exam Points

Unit 1 Board Exam Checklist

1. Charles Babbage

Father of Computer. Designed Analytical Engine (1837) with ALU and integrated memory concept.

2. CPU Components

Consists of ALU (Arithmetic/Logic), Control Unit (Traffic Policeman), Clock, Registers, and Cache.

3. Compiler vs Interpreter

Compiler translates entire program at once; Interpreter translates line-by-line.

4. RAM vs ROM

RAM is volatile temporary workspace; ROM is non-volatile permanent memory containing boot settings.

Image Sources



https://edtechmagazine.com/k12/sites/default/files/uploads/1623_calculatingclock.jpg

Source: edtechmagazine.com



<https://images.unsplash.com/photo-1717444309231-8ef42dfe2936?fm=jpg&q=60&w=3000&auto=format&fit=crop&ixlib=rb-4.1.0&ixid=M3wxMjA3fDB8MHxwaG90by1wYWdlfHx8fGVufDB8fHx8fA%3D%3D>

Source: unsplash.com



<https://cdn.hswstatic.com/gif/microprocessor-1.jpg>

Source: computer.howstuffworks.com



<https://images.presentationgo.com/2025/06/futuristic-ai-robot-concept.jpg>

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