FREE EDITION · NOTES + 3 SAMPLE MCQS

CUET · COMPUTER SCIENCE · CLASS XI · CODE 308

Computer System

CUET unit: Computer System

By **UniDrill** · NCERT-grounded study material

WWW.UNIDRILL.IN

📌 Snapshot

- The foundational hardware vocabulary: CPU (with ALU and CU), input devices, output devices, primary memory (RAM/ROM), cache, and secondary storage.
- Computing evolved from the Abacus (500 BC) through ENIAC/Von Neumann architecture to modern microprocessors and wearables — a timeline NTA frequently tests.
- The memory hierarchy runs registers → cache → RAM → secondary storage; know the critical RAM vs ROM vs Cache distinctions.
- The data life-cycle has four aspects: capturing, storage, retrieval, and deletion/recovery — often overlooked by students.
- Software is classified into system software (OS, utilities, device drivers), programming tools, and application software (general-purpose vs customised; FOSS vs proprietary/freeware) — all high-yield CUET areas.

📖 Detailed Notes

2.1 Core concepts

- A **computer** is an electronic device that accepts data (input), processes it, and generates results (output). A computer together with additional hardware and software is called a **computer system**. (NCERT §1.1, p. 1)
- A computer system primarily comprises a **Central Processing Unit (CPU)**, memory, input/output devices, and storage devices — all shown in the block diagram of Figure 1.1. (NCERT §1.1, p. 2)
- The **CPU** is the electronic circuitry that carries out actual processing; it is called the brain of the computer and is also known as the **microprocessor**. Physically it sits on one or more **Integrated Circuits (ICs)** made of semiconductor materials. (NCERT §1.1.1, p. 2)
- The CPU has two main sub-units: (i) **Arithmetic Logic Unit (ALU)** — performs all arithmetic and logic operations, and (ii) **Control Unit (CU)** — controls sequential instruction execution, interprets instructions, and guides data flow through memory, ALU, and I/O devices. The CPU also uses small, fast **registers** for temporary storage of data, instructions, and intermediate results. (NCERT §1.1.1, p. 2)

- **Input devices** convert input data into digital form acceptable to the computer. Examples: keyboard, mouse, scanner, touch screen, braille keyboard, voice input. Data entered is temporarily stored in main memory (RAM). (NCERT §1.1.2, p. 2–3)
- **Output devices** receive data from the computer and convert digital information into human-understandable form. Examples: monitor, projector, headphone, speaker, printer, 3D-printer, braille display monitor. Three common printer types: inkjet, laserjet, and dot matrix. (NCERT §1.1.3, p. 3)
- The **Von Neumann architecture** (Figure 1.4) consists of a CPU, memory, and input/output devices with communication channels. **ENIAC** was the first binary programmable computer based on this architecture. (NCERT §1.2, p. 3)
- Key milestones in computing evolution (Figure 1.5 timeline): Abacus (500 BC) → Pascaline (1642, Blaise Pascal, addition/subtraction) → Analytical Engine (1834, Charles Babbage, basis of modern computers) → Tabulating Machine (1890, Herman Hollerith, punched cards — first step towards programming) → Turing Machine concept (1937) → EDVAC/ENIAC (1945, Von Neumann stored-program concept) → Transistor (1947, Bell Labs, replaced vacuum tubes) → Integrated Circuit (1970) → LSI → VLSI → SLSI. (NCERT §1.2, p. 4)
- **Moore's Law** (1965, Gordon Moore, Intel co-founder): the number of transistors on a chip doubles every two years while costs are halved. (NCERT §1.2, p. 5)
- IBM introduced the first personal computer (PC) in **1981**; Apple introduced Macintosh in **1984**. The growth of the World Wide Web (WWW) in the 1990s made computers indispensable. (NCERT §1.2, p. 5)
- The next wave of computing includes **wearable gadgets** (smart watch, lenses, headbands) and the **Internet of Things (IoT)** powered by artificial intelligence. (NCERT §1.2, p. 5)
- Computer memory is needed to store data and instructions for processing. The term "memory" usually refers to **primary memory**; **secondary memory** is used for permanent storage. (NCERT §1.3, p. 5)
- The basic unit of memory is a **bit** (binary digit 0 or 1). Four bits = **Nibble**; 8 bits (two nibbles) = **Byte**. Bytes are grouped into KB, MB, GB, TB, PB, EB, ZB, YB (each = 1024 of the previous unit). (NCERT §1.3.1, p. 5–6)
- **Primary memory** has two types: (i) **RAM (Random Access Memory)** — volatile, loses data when power is off, used to load programs/data during processing, faster than secondary memory; (ii) **ROM (Read Only Memory)** — non-volatile, contents not lost on power-off, stores rarely-changed data like the boot loader. (NCERT §1.3.2(A), p. 6–7)
- **Cache memory** is placed between the CPU and primary memory to speed up CPU operations. It stores copies of frequently accessed memory locations, reducing average access time. The CPU checks cache first; if data is found (cache hit), primary memory is not accessed. (NCERT §1.3.2(B), p. 7)

- **Secondary memory** is non-volatile, has larger capacity than primary memory, is slower and cheaper, and cannot be accessed directly by the CPU — contents must be brought into main memory first. Examples: HDD, CD/DVD, Memory Card, SSD (faster data transfer), pen/flash drives. (NCERT §1.3.2(C), p. 7)
- **Data Capturing** is gathering data from different sources in digital form — via keyboard, barcode readers, remote sensors, satellites, social media, etc. (NCERT §1.3.3(A), p. 7–8)
- **Data Storage** is storing captured data for future processing. Large organisations use **data servers** for vast data. Decreasing cost of digital storage devices has simplified storage. (NCERT §1.3.3(B), p. 8)
- **Data Retrieval** is fetching data from storage for processing. Minimising data access time is crucial for efficiency. (NCERT §1.3.3(C), p. 8)
- **Data Deletion and Recovery**: Deleting data marks its address as free without actually erasing bits. Data recovery is possible if the space has not been overwritten. Security concerns include unauthorised deletion (by malware/hackers) and unauthorised recovery from discarded devices. Mitigation: passwords, encryption, and proper data-shredding tools before disposal. (NCERT §1.3.4, p. 8–9)
- **Software** is a set of instructions and data that makes hardware functional to complete a desired task. It cannot be touched or viewed physically. Software and hardware together complete any task. (NCERT §1.4, p. 9)
- Software is broadly classified into three categories: (i) **System software**, (ii) **Programming tools**, and (iii) **Application software** (Figure 1.9). (NCERT §1.4.1, p. 10)
- **System software** provides basic functionality by interacting directly with hardware. It includes: (A) **Operating System** (most basic system software; manages application programs; examples: Windows, Linux, Macintosh, Ubuntu, Fedora, Android, iOS); (B) **System Utilities** (maintenance and configuration tools — disk defragmentation, formatting, anti-virus, disk cleaner); (C) **Device Drivers** (interface between a specific device and the OS; manages operation of that device at the hardware level). (NCERT §1.4.2, p. 10–11)
- **Application software** works on top of system software and caters to end-user needs. Two broad categories: (A) **General Purpose Software** — ready-made for a broad audience (e.g., LibreOffice Calc, Adobe Photoshop, GIMP, Mozilla browser, iTunes); (B) **Customised Software** — tailor-made for specific organisations or individuals (e.g., school management software, accounting software). (NCERT §1.4.3, p. 11–12)
- **FOSS (Free and Open Source Software)**: source code is freely available for use and improvement. Examples: Ubuntu, Python, LibreOffice, OpenOffice, Mozilla Firefox. **Freeware**: free to use but source code not available. Examples: Skype, Adobe Reader. **Proprietary software**: must be purchased from the copyright holder. Examples: Microsoft Windows, Tally, Quickheal. (NCERT §1.4.4, p. 12)

2.2 Definitions to memorise

Term	Definition	Page
Computer	Electronic device that accepts input, processes it, and generates output	1
Computer System	Computer + additional hardware + software working together	1
CPU	Electronic circuitry that carries out actual processing; brain of the computer; also called microprocessor	2
ALU	Sub-unit of CPU that performs all arithmetic and logic operations	2
Control Unit (CU)	Sub-unit of CPU that controls sequential instruction execution and guides data flow	2
Registers	Small, fast memory locations within the CPU chip for temporary storage of data, instructions, intermediate results	2
Integrated Circuit (IC)	Silicon chip containing entire electronic circuit on a very small area	4
Bit	Basic unit of computer memory; binary digit (0 or 1)	5–6
Nibble	4-bit group	6
Byte	8-bit group (two nibbles)	6
RAM	Volatile primary memory that loses data when power is off; used during processing	6
ROM	Non-volatile primary memory; contents not lost on power off; stores rarely changed data like boot loader	6–7
Cache Memory	High-speed memory between CPU and primary memory; stores frequently accessed data to reduce access time	7
Secondary Memory	Non-volatile, large-capacity storage not directly accessible by CPU; includes HDD, SSD, CD/DVD	7
Data Recovery	Process of retrieving deleted, corrupted, or lost data from secondary storage devices	8–9
Software	Set of instructions and data; makes hardware functional; cannot be touched physically	9
System Software	Software that provides basic functionality by interacting directly with computer hardware	10
Operating System	Most basic system software; manages other programs; provides security and access to users	10
Device Driver	Interface between a specific hardware device and the operating system	11
FOSS	Free and Open Source Software — freely available with open source code for use and improvement	12

Term	Definition	Page
Freeware	Software free to use but without available source code	12
Proprietary Software	Software that must be purchased from the copyright holder	12
Microprocessor	A CPU implemented on a single chip	2
ENIAC	First binary programmable computer built on Von Neumann architecture	3
Pascaline	Mechanical calculator built by Blaise Pascal in 1642	4
Analytical Engine	Programmable mechanical computer designed by Charles Babbage in 1834; basis of modern computer	4
Tabulating Machine	Punched-card machine designed by Herman Hollerith in 1890 — first step toward programming	4
Moore's Law	Prediction by Gordon Moore (1965) that transistor count on a chip doubles every two years while cost halves	5
Data Capturing	Gathering data from sources in digital form	7
Data Storage	Storing captured data for future processing	8
Data Retrieval	Fetching stored data for processing	8
System Utility	System-software tool for maintenance and configuration (e.g., disk defragmenter, antivirus)	11
General Purpose Software	Ready-made software for a broad audience (e.g., LibreOffice Calc)	11
Customised Software	Tailor-made software developed for a specific organisation	12

2.3 Diagrams / processes to remember

- **Figure 1.1 (p. 2): Block Diagram of a Computer System** — shows Input Device → CU (CPU) ↔ ALU (CPU) ↔ Primary Memory ↔ Secondary Storage Devices → Output Device. Directed lines represent flow of data and signals. Essential to recall for questions asking which component does what.
- **Figure 1.4 (p. 3): Von Neumann Architecture** — simplified diagram: Input → Central Processing Unit ↔ Memory → Output. ENIAC was the first computer built on this architecture.
- **Figure 1.5 (p. 4): Timeline of Key Inventions in Computing Technology** — sequence: 500 BC (Abacus) → 1642 (Pascaline) → 1834 (Analytical Engine) → 1890 (Tabulating Machine) → 1937 (Turing Machine) → 1945 (EDVAC/ENIAC) → 1947 (Transistor) → 1970 (IC). Dates and inventors are high-frequency NTA targets.
- **Figure 1.6 (p. 5): Exponential Increase in Transistors in ICs** — illustrates Moore's Law; transistor count doubles every ~2 years from 1940s to 2020s.

- **Figure 1.9 (p. 11): Categorisation of Software** — layered diagram showing User → User Interface → Application Software / Programming Tools → System Utilities → Operating System → Device Drivers → Hardware; also shows FOSS vs Proprietary/ Freeware axis.

2.4 Common confusions / NTA trap points

- **RAM vs ROM**: Students often confuse volatility. RAM is volatile (data lost on power off); ROM is non-volatile. NTA distractors swap these. Remember: ROM stores the boot loader (startup program) permanently.
- **Cache vs RAM**: Cache is faster than RAM but slower than CPU registers. Cache is placed between CPU and primary memory — not between CPU and secondary memory. A distractor may place cache at the wrong level.
- **Secondary memory cannot be accessed directly by CPU**: Contents must first be loaded into primary memory. NTA often offers "CPU reads directly from HDD" as a plausible wrong option.
- **FOSS vs Freeware**: Both are free to use, but FOSS provides source code while freeware does not. NTA may list Ubuntu as freeware (wrong — it is FOSS) or Adobe Reader as FOSS (wrong — it is freeware).
- **General-purpose vs Customised software (NCERT § 1.4.3, p. 11-12).** General-purpose software (e.g., LibreOffice Calc) is ready-made for a broad audience; customised software is built for a specific organisation. Students mix up examples — Tally is proprietary and can also be customised.
- **Memory units use 1024, not 1000 (NCERT § 1.3.1, p. 6).** 1 KB = 1024 bytes, 1 MB = 1024 KB. NTA exploits the SI vs binary kilo confusion.
- **Deleted data is recoverable until overwritten (NCERT § 1.3.4, p. 8).** Deletion only marks the space free. NTA distractor: claims deletion securely erases data.
- **A CPU register is faster than cache (NCERT § 1.1.1 / § 1.3.2(B), p. 2 / 7).** Register sits inside the CPU; cache is between CPU and RAM. Order of speed: register > cache > RAM > secondary.
- **3D printers are output devices (NCERT § 1.1.3, p. 3).** They produce physical objects from a digital design. NTA distractor: lists 3D printer as input device.
- **Operating systems range across platforms (NCERT § 1.4.2, p. 10).** Windows, Linux, Macintosh, Ubuntu, Fedora, Android, iOS are all operating systems. Students may incorrectly classify Android as merely application software.
- **Device drivers are system software (NCERT § 1.4.2(C), p. 11).** They sit between OS and a specific hardware device — not application software.

🎯 Practice MCQs

📊 PYQ Alignment

Computer System fundamentals are one of the highest-yield areas for CUET Computer Science, typically contributing 5–7 questions per paper; NTA favours memory-type distinctions (RAM/ROM/Cache), software classification (system/application/FOSS/proprietary), and the computing evolution timeline (dates and inventors) — making every section equally important for exam preparation. See PYQ archive for Computer Science.