

# Computer and pc software

## Q1 (a)

**Trace the evolution of computers from mechanical calculators to the fifth generation, and identify how each technological shift enabled a new kind of real-world application.**

**Answer:**

### **Introduction:**

The development of computers has not been a sudden invention but a long journey of technological progress. From simple mechanical calculators to today's advanced artificial intelligence-based systems, each generation of computers brought a new breakthrough that transformed how humans solve problems and perform tasks.

### **Body:**

- **Mechanical Calculators (Before First Generation):**

Devices like the Abacus and Pascal's calculator were the earliest tools used for arithmetic operations. They were not computers in the true sense but laid the foundation for automated computation.

- **First Generation (1940s–1950s): Vacuum Tube Computers**

These computers used vacuum tubes for circuitry and magnetic drums for memory. They were very large, consumed huge power, and generated heat. Real-world applications included military calculations, weather forecasting, and scientific research. For example, ENIAC was used for ballistic calculations during World War II.

- **Second Generation (1950s–1960s): Transistors**

The invention of the transistor revolutionized computers. They became smaller, faster, and more reliable. Computers of this generation were widely used in business organizations for payroll processing, banking systems, and accounting.

- **Third Generation (1960s–1970s): Integrated Circuits (ICs)**

Integrated Circuits allowed the placement of thousands of transistors on a small chip. This greatly increased speed and efficiency while reducing cost. During this time, commercial applications expanded, including airline reservation systems, inventory control, and university research.

- **Fourth Generation (1970s–1980s): Microprocessors**

The microprocessor put the entire CPU on a single chip. This was the beginning of the era of personal computers. With affordable PCs, applications such as word processing, spreadsheets, and home computing became common. Software companies like Microsoft and Apple grew during this period.

- **Fifth Generation (1980s–Present): Artificial Intelligence and Beyond**

Fifth-generation computers are based on artificial intelligence, machine learning, and natural language processing. They focus on decision-making, robotics, expert systems, and voice recognition. Applications like voice assistants (Siri, Alexa), self-driving cars, and healthcare diagnostic systems are practical outcomes of this generation.

### **Conclusion:**

In conclusion, each technological shift in computer generations—from vacuum tubes to AI—opened the door for new applications in science, business, communication, and personal use. The journey shows how computers evolved from being huge machines used only by scientists to becoming an inseparable part of everyday human life

## **Q1 (b)**

**Draw a labelled diagram of the internal data flow in a digital computer and explain how instructions are fetched and executed using a practical example, such as calculating total marks.**

**Answer:**

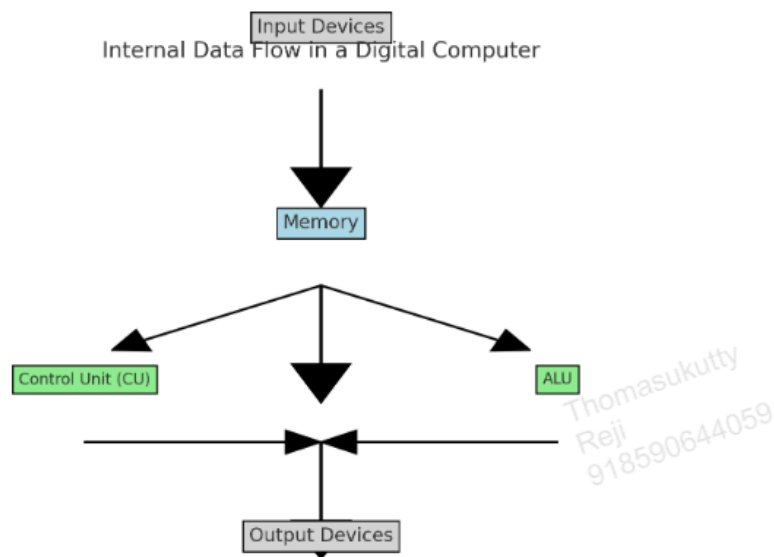
**Introduction:**

The working of a computer is based on a systematic flow of data and instructions between its various parts. This concept was first formalized in the Von Neumann architecture, which explains how input, storage, processing, and output are interconnected.

**Body:**

- **Diagram (to be drawn in assignment):**

The **diagram below** represents this cycle:



- **Explanation:**

1. **Input Stage:** Data and instructions are provided to the computer through devices such as a keyboard or scanner.
2. **Memory Storage:** The data is stored temporarily in RAM. The Control Unit then decides which instruction to fetch.
3. **Processing:** The Control Unit (CU) fetches instructions one by one from memory, decodes them, and sends them to the Arithmetic Logic Unit (ALU) for execution.

4. **Output Stage:** After the execution of instructions, the final result is sent to an output device like a monitor or printer.

- **Example – Calculating Total Marks:**

Suppose a student enters marks for five subjects. The keyboard sends the data to RAM. The CU fetches the instruction "Add Marks" and transfers the numbers to ALU. The ALU performs the addition operation step by step. Once the total is calculated, the CU transfers the result to the output unit, which displays it on the monitor.

**Conclusion:**

Thus, the internal data flow ensures that instructions are fetched, decoded, and executed in a logical sequence. This cycle repeats continuously, enabling the computer to solve a wide variety of real-world problems.

## Q1 (c)

**Evaluate the impact of memory hierarchy (cache, RAM, secondary storage) on the performance of commonly used applications such as video editing or gaming.**

**Answer:**

**Introduction:**

Computer performance largely depends on its memory hierarchy, which balances speed, cost, and storage. The hierarchy includes **cache, RAM, and secondary storage (HDD/SSD)**. Each level contributes differently to how applications like gaming, video editing, and everyday tasks perform.

**Body:**

- **Cache Memory:**

Cache is the fastest memory placed near the CPU. It stores frequently used data and instructions, reducing delays. In gaming, cache minimizes frame drops, while in video editing it speeds up repeated operations like rendering.

- **Random Access Memory (RAM):**

RAM provides the main workspace for active programs. Higher RAM allows smooth multitasking and handling of large files. For example, more RAM in

editing software ensures smooth playback of HD or 4K videos.

- **Secondary Storage (HDD/SSD):**

Used for permanent storage. SSDs are much faster than HDDs, reducing loading times in games and improving file handling in video editing.

**Application-Wise Impact:**

1. **Gaming:** Requires fast rendering and real-time responses. Cache and RAM ensure smooth performance, while SSDs cut down loading screens.
2. **Video Editing:** Needs large RAM for smooth editing of high-resolution files. Cache speeds up filter application, and SSDs reduce file load times.
3. **Everyday Applications:** Browsing and office work require less memory, but cache and RAM still ensure responsiveness and prevent freezing.

**Conclusion:**

In short, cache provides speed, RAM offers workspace, and SSD/HDD ensures storage. Optimizing all three improves performance in demanding tasks like gaming and editing while keeping everyday applications responsive.

## Q1 (d)

**Imagine you are designing a kiosk for railway ticket booking. Justify your selection of input and output devices based on user interaction, reliability, and efficiency.**

**Answer:**

**Introduction:**

A railway ticket booking kiosk is a self-service machine used by passengers. It should be easy to use for all age groups, reliable enough to handle heavy usage, and efficient to reduce waiting times.

**Body:**

- **Input Devices:**

1. **Touchscreen Display:** A touchscreen is user-friendly, eliminates the need for keyboard or mouse, and can display multiple languages.
  2. **Smart Card Reader/QR Scanner:** This allows passengers to scan payment cards, UPI QR codes, or railway passes directly.
  3. **On-screen Keyboard:** For entering details like passenger name, PNR, and mobile number.
- **Output Devices:**
    1. **Thermal Printer:** Used to print tickets quickly and at a low cost. These printers are durable and widely used in kiosks.
    2. **Monitor/Display Panel:** Displays booking details, available trains, and payment confirmations.
    3. **Audio Output (Optional):** Provides voice instructions for visually impaired passengers, increasing accessibility.

### **Conclusion:**

By combining a touchscreen interface, printer, and display screen, the kiosk becomes efficient, reliable, and easy for passengers to use. This setup reduces dependency on staff and ensures quick booking even during rush hours.

## **Q1 (e)**

**You have ₹35,000 to assemble a personal computer for online learning and basic office work. List the hardware components you would choose and justify your selection based on performance and cost.**

**Answer:**

### **Introduction:**

For online learning and office work, the computer does not need very high-end gaming hardware but should still be powerful enough for multitasking, video calls, and document handling. A balanced system within ₹35,000 is practical.

### **Body:**

- **Processor (CPU):** AMD Ryzen 5 5600G with integrated graphics – a cost-effective processor with good performance and no need for a separate

graphics card.

- **Motherboard:** A compatible B550 motherboard offering future upgrade options.
- **RAM:** 16 GB DDR4 RAM – ensures smooth performance for multiple browser tabs, online classes, and productivity software like MS Office.
- **Storage:** 500 GB SSD – fast boot times, quick file access, and efficient storage for assignments and lecture recordings.
- **Monitor:** 21-inch Full HD monitor – comfortable for reading, typing, and attending online classes.
- **Input Devices:** Basic USB keyboard and mouse set.
- **Cabinet & Power Supply:** Mid-tower cabinet with 450W reliable PSU.
- **Audio/Video Accessories:** A good quality webcam, microphone, and headset for online meetings and classes.

**Estimated Cost:** The total cost comes around ₹33,000–₹35,000, making it affordable within the given budget.

### **Conclusion:**

This configuration provides a balanced solution for students and office workers. It offers reliability, smooth performance, and upgradability while staying within budget. It can handle online learning platforms, office software, and day-to-day tasks efficiently.

## **Q2 (a) Compare proprietary and open-source software models by analyzing two software products (e.g., Microsoft Office vs. LibreOffice) in terms of cost, accessibility, updates, and support.**

### **Introduction:**

Software products can be divided into two main categories: proprietary software and open-source software. Proprietary software is developed and owned by a company that controls its distribution and usage rights, while open-source

software is made available freely with access to its source code. To understand this better, we can compare Microsoft Office (proprietary) with LibreOffice (open-source) in terms of cost, accessibility, updates, and support.

### **Body:**

- **Cost:** Microsoft Office requires users to purchase a license or subscription, which can be expensive for students and small organizations. In contrast, LibreOffice is free of cost and can be downloaded without any license restrictions.
- **Accessibility:** Microsoft Office is widely used across the world in organizations, educational institutions, and government offices. This makes its file formats more commonly accepted. LibreOffice is accessible to anyone since it does not require payment, but sometimes compatibility issues arise when opening files created in Microsoft Office.
- **Updates:** Microsoft provides periodic updates that improve security and features, but users are dependent on the company's release cycle. LibreOffice, on the other hand, is updated by a global community of developers, leading to more frequent and open improvements.
- **Support:** Microsoft offers official support through help centers, chat, and email, but this comes with the product's cost. LibreOffice provides community-based support through forums, online documentation, and volunteer contributors.

### **Example:**

For instance, a small business may choose Microsoft Office to ensure professional support and file compatibility, while a student may prefer LibreOffice due to its zero cost and basic functionality.

### **Conclusion:**

Both models have unique advantages. Proprietary software such as Microsoft Office is reliable for business and enterprise use, while open-source software like LibreOffice provides a cost-effective and flexible solution for individuals and educational purposes.

---



## **Q2 (b) Assume your system has both Linux and Windows installed. Discuss three scenarios where Linux offers more control or flexibility compared to Windows, and explain why.**

### **Introduction:**

Operating systems play a major role in determining how users interact with a computer. Windows is the most widely used commercial operating system, while Linux is known for its open-source flexibility and customization options. There are several cases where Linux provides more control compared to Windows.

### **Body:**

1. **Server Management:** Linux is the preferred choice for web and database servers because it offers better stability, reliability, and security. Unlike Windows, it can run for months or even years without requiring a reboot, making it ideal for hosting.
2. **Customization and Control:** Linux allows users to modify its kernel, change the desktop environment, and automate processes using shell scripts. Windows does not allow such deep system modifications.
3. **Programming and Development:** Linux supports a wide range of programming languages such as Python, C, and Java. It also comes with built-in compilers and package managers, which provide flexibility for developers to install and manage software.

### **Example:**

Suppose a student is learning web development. They can use Linux to install Apache, MySQL, and PHP quickly using package managers. At the same time, they can customize the system to create a personal development environment, which is not as flexible in Windows.

### **Conclusion:**

Linux offers greater control in terms of customization, programming, and server management. Windows is useful for general users due to its user-friendly interface, but Linux is more suitable for developers, system administrators, and advanced users who need flexibility.

## **Q2 (c) Reflect on how compilers and interpreters differ in handling programming errors. Provide an example where using an interpreter would be more beneficial during development.**

### **Introduction:**

Programming languages cannot be directly understood by a computer, so they must be translated into machine-readable code. This translation is done using either compilers or interpreters. Both handle code execution differently and have distinct ways of dealing with errors.

### **Body:**

- **Compilers:** A compiler translates the entire program into machine code before execution. This means that the whole program must be free of syntax errors before it can run. Errors are detected all at once, and programmers must fix them before running the program again. Compilers are efficient for large applications because they produce optimized machine code.
- **Interpreters:** An interpreter, in contrast, reads and executes the code line by line. As soon as it encounters an error, it stops execution and reports the problem. This makes it easier for programmers to test small portions of code and debug interactively.
- **Error Handling:** While compilers are suitable for final deployment, interpreters are more beneficial during development and learning, since they provide immediate feedback.

### **Example:**

Python is an interpreted language. If a student is learning programming and makes a mistake in one line of code, the interpreter will immediately display the error. The student can fix the error and continue coding without re-compiling the entire program.

### **Conclusion:**

Compilers are better for creating efficient and large-scale applications, but interpreters are extremely useful during development and debugging because they provide instant error detection and correction.

## **Q2 (d) Create a scenario (e.g., preparing an event budget) where both a word processor and spreadsheet are required. Describe how you would use each to accomplish the task effectively.**

### **Introduction:**

Word processors and spreadsheets are two of the most commonly used office applications. A word processor is used for creating text-based documents, while a spreadsheet is used for calculations, tables, and data analysis. Together, they can be used effectively in project planning.

### **Body:**

Scenario: **Preparing the budget and plan for a college annual day.**

- **Word Processor (MS Word or LibreOffice Writer):** Used to prepare the formal proposal for the event, including objectives, event schedule, guest list, and responsibilities of the organizing team. It can also be used to create official letters for sponsors and permissions.
- **Spreadsheet (MS Excel or LibreOffice Calc):** Used to maintain detailed records of financial aspects such as estimated budget, actual expenditure, and income from sponsors. The spreadsheet allows automatic calculations using formulas, making it easier to track overall costs.

### **Example:**

The organizing committee creates a document in Word with all the event details. At the same time, they prepare an Excel sheet where they list expenses like stage setup, food, printing, and decorations, and use formulas to calculate the total budget.

### **Conclusion:**

By combining the strengths of word processors and spreadsheets, tasks such as event management become more organized and efficient. Word processors handle documentation, while spreadsheets ensure accuracy in budgeting and calculations.

---

## **Q2 (e) Design a simple database schema to store student attendance in a classroom. Mention tables, fields, and types. Also, mention one project management tool and how it can help in managing a classroom project.**

### **Introduction:**

A database is an organized collection of data that allows easy storage and retrieval. In a classroom, attendance management is an essential task, and a database schema can be designed to handle it effectively.

### **Body:**

#### **Database Schema:**

- **Table 1: Students**
  - Student\_ID (Integer, Primary Key)
  - Name (Text)
  - Roll\_No (Integer)
  - Class (Text)
- **Table 2: Attendance**
  - Attendance\_ID (Integer, Primary Key)
  - Student\_ID (Foreign Key)
  - Date (Date)
  - Status (Present/Absent)

This schema ensures that each student's attendance is linked to their ID, and records can be generated for daily, weekly, or monthly analysis.

#### **Project Management Tool:**

A project management tool like **Trello** or **Microsoft Project** can help in classroom project handling. These tools allow teachers and students to plan tasks, assign roles, set deadlines, and track progress visually.

### **Example:**

The teacher uses the Attendance table to record daily presence. At the same time, if students are given a group project, the teacher can use Trello to assign tasks such as research, presentation, and report writing, while monitoring their progress.

**Conclusion:**

A database schema simplifies attendance management and ensures accuracy, while project management tools enhance teamwork, organization, and productivity in classroom projects.

## Q3

**(a) You have to set up a small office network with internet connectivity. Describe the networking devices (router, switch, etc.) and topology you would choose and justify your decision.**

**Answer:**

**Introduction:**

In any modern office, networking is the backbone of communication and information sharing. Even a small office with a limited number of employees requires an efficient and secure network setup for smooth day-to-day operations. The network should support both wired and wireless connections, allow internet access, provide internal file sharing, and ensure data security. Choosing the right networking devices and topology is therefore a critical decision.

**Body:**

To set up a small office network, I would select the following essential devices:

**1. Router:**

- The router acts as the gateway between the local office network and the Internet Service Provider (ISP).
- It provides internet access to all devices, assigns IP addresses automatically through DHCP (Dynamic Host Configuration Protocol), and also includes features like firewall and security filters.
- A router with dual-band (2.4GHz and 5GHz) support would be ideal for handling multiple devices simultaneously.

## 2. **Switch:**

- A switch is used to connect multiple devices such as desktop computers, printers, and servers within the local area network (LAN).
- Unlike hubs, switches are intelligent devices that reduce unnecessary data collisions and ensure efficient data transfer.
- A Gigabit switch with 24 ports can easily support a small office of 15–20 employees with room for expansion.

## 3. **Access Points (APs):**

- Wireless access points are necessary for laptops, smartphones, and tablets.
- APs extend the network's reach, enabling employees to move freely while staying connected to the office Wi-Fi.

## 4. **Firewall / Security Device:**

- To safeguard against cyberattacks, malware, and unauthorized access, a firewall is required.
- Firewalls can be hardware-based (integrated into the router) or software-based (installed on servers).

## 5. **Other Devices:**

- **Cables (Ethernet Cat6):** For stable wired connections.
- **Network Printer/Server:** To allow shared access to files and printing resources.
- **UPS (Uninterrupted Power Supply):** To keep the network functional during power outages.

## **Topology Choice – Star Topology:**

Among various network topologies such as bus, ring, mesh, and hybrid, I would choose **Star Topology** for the small office network.

- **Justification:**

- In a star topology, all devices are connected to a central switch or router, which manages data transfer efficiently.

- It is easy to install, maintain, and expand when new devices need to be added.
- If one computer fails, it does not affect the rest of the network.
- Troubleshooting becomes easier because the failure of one link can be isolated quickly.

### **Example:**

Suppose a small office has 15 employees, each with a desktop computer. All desktops are connected to a central switch using Ethernet cables. The switch is then connected to the router, which provides internet access. Wireless devices like smartphones and laptops connect through access points. This ensures both wired reliability and wireless flexibility.

### **Conclusion:**

By using devices such as routers, switches, access points, and firewalls arranged in a star topology, a small office can achieve secure, scalable, and efficient networking. This setup not only supports internet connectivity but also allows file sharing, printing, and collaboration within the office, making it a reliable choice for small businesses.

**(b) Suppose you are tasked with designing a personal learning portal. Identify three internet services you would integrate (e.g., cloud storage, video conferencing, email notifications) and justify their use.**

### **Answer:**

#### **Introduction:**

E-learning has become an essential mode of education in the digital age. A personal learning portal is an online platform that allows students to access study material, interact with teachers, and track their academic progress. To make the portal more interactive and effective, it should integrate internet services that enhance accessibility, communication, and collaboration.

#### **Body:**

When designing a personal learning portal, I would integrate the following three internet services:

### **1. Cloud Storage Services:**

- Cloud storage provides a centralized space where learners can access digital resources such as e-books, lecture notes, assignments, and recorded videos.
- It ensures that students can study anytime and from anywhere without carrying physical materials.
- Teachers can also upload assignments, while students can submit their work online.
- Example: Google Drive, OneDrive, or Dropbox.

### **2. Video Conferencing Services:**

- Real-time interaction is crucial in learning. By integrating video conferencing, students can attend live classes, participate in discussions, and ask questions directly to the instructor.
- It creates a classroom-like experience even in a virtual environment.
- Features like screen sharing and recording sessions make it more effective for revising lessons.
- Example: Zoom, Microsoft Teams, or Google Meet.

### **3. Email Notification Services:**

- Email notifications keep learners updated with important announcements, exam schedules, assignment deadlines, and new course uploads.
- Automatic reminders ensure that students do not miss deadlines and stay engaged with the learning process.
- This also creates a professional channel of communication between the learner and the portal.

### **Example:**

A learner preparing for competitive exams may attend a live online lecture through video conferencing, download practice materials from cloud storage, and receive



an email notification reminding them about an upcoming mock test. This integration ensures seamless learning and improves efficiency.

**Conclusion:**

The integration of cloud storage, video conferencing, and email notifications makes a personal learning portal more interactive, reliable, and learner-centric. Cloud storage ensures easy access to study materials, video conferencing allows real-time interaction, and email notifications keep students updated. Together, these services provide a holistic online learning experience, bridging the gap between teachers and learners.