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CLASS	9TH	CHAPTER	01
SUBJECT	COMPUTER	BOARD	FEDERAL

CHAPTER 1: COMPUTER SYSTEMS

Multiple Choice Questions (MCQs)

i. Which technology replaced vacuum tubes in second-generation computers?

a) Transistors b) Integrated Circuits (ICs) c) Microprocessors d) Magnetic tapes

- **Correct Answer:** a) Transistors

ii. What is the primary goal of fifth-generation computers?

a) Fast speed b) Thinking power c) Enhanced memory d) Faster microprocessors

- **Correct Answer:** b) Thinking power

iii. Which computer generation introduced the use of Integrated Circuits (ICs)?

a) First Generation b) Second Generation c) Third Generation d) Fourth Generation

- **Correct Answer:** c) Third Generation

iv. In which generation of computers was the microprocessor developed?

a) First Generation b) Second Generation c) Third Generation d) Fourth Generation

- **Correct Answer:** d) Fourth Generation

v. What is the function of the motherboard in a computer system?

a) To store and retrieve data permanently b) To connect and integrate all hardware components c) To perform mathematical calculations d) To display output on a monitor

- **Correct Answer:** b) To connect and integrate all hardware components

vi. Which component of the microprocessor controls the decision-making processes?

a) Arithmetic Logic Unit (ALU) b) Control Unit (CU) c) Memory unit d) Registers

- **Correct Answer:** b) Control Unit (CU)

vii. Which type of memory retains data even when the computer is turned off?

a) RAM b) ROM c) Cache d) Register

- **Correct Answer:** b) ROM

viii. What is the main purpose of Cache memory?

a) Store program instructions b) Provide high-speed storage c) Control input/output devices d) Perform arithmetic operations

- **Correct Answer:** b) Provide high-speed storage

ix. What is the smallest unit of memory in a digital computer?

a) Kilobyte b) Bit c) Byte d) Megabyte

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- **Correct Answer:** b) Bit

x. Which memory type uses laser beams to read and write data?

a) RAM b) Optical memory c) Cache memory d) ROM

- **Correct Answer:** b) Optical memory

xi. What is the primary function of the buses in a computer's memory system?

a) Control memory operations b) Display graphics c) Transmit data between components d) Perform arithmetic operations

- **Correct Answer:** c) Transmit data between components

xii. Which component of data communication converts the electrical signal into a suitable form for transmission?

a) Message b) Medium c) Protocol d) Sender

- **Correct Answer:** d) Sender

xiii. What is the primary function of the Presentation Layer in the OSI model?

a) Establishing connections between computers b) Converting data into a standard format c) Deciding the physical path of data d) Sending data in both directions simultaneously

- **Correct Answer:** b) Converting data into a standard format

xiv. In which network topology is data transmission unidirectional, like radio or television broadcasts?

a) Star Topology b) Bus Topology c) Mesh Topology d) Ring Topology

- **Correct Answer:** d) Ring Topology

xv. Which network architecture requires each computer to act as either a server or a client but not both simultaneously?

a) Client/Server Network b) Peer-to-Peer Network c) Metropolitan Area Network (MAN) d) Wide Area Network (WAN)

- **Correct Answer:** a) Client/Server Network

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Short Response Questions (SRQs)

i. What is the primary goal of fifth-generation computers?

The primary goal of fifth-generation computers is to develop systems based on Artificial Intelligence (AI) capable of learning, reasoning, and making decisions. They aim to process natural human language and exhibit true thinking power to solve complex problems autonomously.

ii. Differentiate between volatile and non-volatile memory.

Volatile memory (like RAM) temporarily stores data and loses all its contents when the power supply is turned off. In contrast, non-volatile memory (like ROM and Flash) permanently retains stored data even when the device is powered down.

iii. Show memory hierarchy with the help of diagram.

(Hierarchy from fastest/smallest to slowest/largest capacity):
Registers → Cache Memory → Main Memory (RAM/ROM) → Magnetic/Optical Secondary Storage → Tertiary Storage (Cloud/Tape).
(Note: Registers sit directly inside the CPU at the top with maximum speed and minimum storage).

iv. Why is the word size of a processor important, and how does it affect the computer's performance?

Word size determines the amount of data a CPU can process at one time, typically measured in bits (e.g., 32-bit or 64-bit). A larger word size allows the processor to handle more data per clock cycle, directly increasing execution speed and overall system performance.

v. Imagine you are building a custom computer for a friend. Give three considerations you would take into account this computer.

First, determine the intended primary use (e.g., gaming, video editing, or basic office work) to select the right CPU and GPU. Second, ensure adequate RAM capacity and storage speed (SSD vs HDD) to guarantee smooth multitasking. Third, verify hardware compatibility, including motherboard socket type, power supply wattage, and cooling requirements.

vi. You are a computer technician tasked with upgrading an older computer with a slow CPU. How might you improve its performance without replacing the entire CPU?

You can significantly boost performance by upgrading the system RAM to handle heavier multitasking workloads. Replacing an old mechanical hard drive with a high-speed Solid State Drive (SSD) drastically reduces boot and application load times. Additionally, cleaning background startup applications and applying fresh thermal paste to the CPU cooler can restore optimal operating speeds.

vii. Your school is planning to purchase new printers for the computer lab. Give two advantages and disadvantages of impact and non-impact printers to help them make a decision.

Impact printers are cost-effective for multi-part forms and carbon copies, but they are noisy and produce lower print quality. Non-impact printers (like laser/inkjet) offer silent operation and

exceptionally high-resolution output, but they generally have higher initial equipment and replacement consumable costs.

viii. What does OOP stand for, and which programming languages commonly use this paradigm?

OOP stands for Object-Oriented Programming, a paradigm centered around organizing software design around data, or objects, rather than functions and logic. Popular programming languages that commonly implement OOP include Java, C++, Python, and C#.

ix. Define "protocol" in the context of data communication.

A protocol is a standardized set of rules and conventions that govern how data is formatted, transmitted, and received across a network. It ensures that different connected hardware devices and software programs can communicate seamlessly and understand each other.

x. Define simplex, half-duplex, and full-duplex modes of communication with one example each.

Simplex communication is unidirectional (e.g., a keyboard sending data to a computer). Half-duplex allows bidirectional communication, but only one direction at a time (e.g., walkie-talkies). Full-duplex permits simultaneous two-way transmission in both directions (e.g., telephone calls).

xi. What are start and stop bits, and where are they used in data transmission?

Start and stop bits are control framing bits added to data bytes in asynchronous serial communication. The start bit alerts the receiver that a data packet is arriving, while the stop bit signals the completion of the character transmission.

xii. How does a switch differ from a hub in a network?

A hub broadcasts incoming data packets to all connected ports indiscriminately, creating network congestion and security risks. A switch intelligently inspects destination MAC addresses and forwards data packets exclusively to the specific target device, improving bandwidth efficiency and security.

xiii. How does asynchronous transmission differ from synchronous transmission?

Asynchronous transmission sends data characters one by one at irregular intervals using start and stop bits for synchronization. Synchronous transmission transfers large blocks of data continuously at a steady, synchronized clock rate without needing individual start/stop bits.

xiv. Give three limitations of peer-to-peer network compared to a client/server network.

Peer-to-peer networks lack centralized administration, making security management and user access control difficult. They suffer from poor scalability and performance degradation as more computers join the network. Additionally, data backup must be performed individually on each machine rather than centrally.

xv. What is the role of the Application Layer in the OSI model?

The Application Layer serves as the direct interface between software applications (like web browsers or email clients) and the network services. It provides network services tailored to user applications, such as file transfers, electronic mail, and remote database access.

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Extended Response Questions (ERQs)

Q1. Describe the evolution of computer generations from the first generation to the fifth generation, highlighting the key technological developments and their impact on computing.

- **First Generation (1940–1956) - Vacuum Tubes:** Computers like ENIAC and UNIVAC relied on thousands of fragile vacuum tubes for circuitry and magnetic drums for memory. They were massive in physical size, generated extreme heat, consumed enormous amounts of electricity, and broke down frequently.
- **Second Generation (1956–1963) - Transistors:** The invention of the transistor replaced vacuum tubes, making computers significantly smaller, faster, cheaper, more energy-efficient, and more reliable. High-level programming languages like FORTRAN and COBOL also emerged during this era.
- **Third Generation (1964–1971) - Integrated Circuits (ICs):** Transistors were miniaturized and placed onto silicon chips called semiconductors (ICs). This breakthrough drastically reduced costs and size while increasing processing speeds, making computers accessible to a wider commercial market.
- **Fourth Generation (1971–Present) - Microprocessors:** Large-scale and very-large-scale integration (LSI and VLSI) placed entire CPUs onto a single microchip. This era gave birth to personal computers (PCs), laptops, and the internet revolution, transforming modern society.
- **Fifth Generation (Present and Beyond) - Artificial Intelligence (AI):** Based on ultra-large-scale integration (ULSI) and parallel processing, fifth-generation systems focus on AI, natural language processing, neural networks, and machine learning, striving to give machines human-like reasoning capabilities.

Q2. Discuss the importance of both natural and artificial systems by providing examples of each type.

- **Natural Systems:**

Natural systems are biological, ecological, or physical entities created by nature without human intervention. Examples include the human nervous system, ecosystems, weather patterns, and the solar system. They are critically important because they sustain life on Earth, maintain ecological balance, regulate natural resources, and serve as biological blueprints that inspire technological inventions (such as artificial neural networks modeled after the human brain).

- **Artificial Systems:**

Artificial systems are man-made constructs designed to achieve specific goals or perform predefined tasks. Examples include digital computers, transportation networks, software operating systems, and automated industrial assembly lines. They are vital for modern civilization because they automate repetitive calculations, increase industrial productivity, expand global communication, and solve complex computational problems beyond human capacity.

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Q3. Explain the fundamental components of network communication, and how they work together to facilitate data transfer?

Successful data communication relies on five fundamental hardware and software components working in harmony:

1. **Message:** The actual information, data, text, audio, or video being transmitted from the sender to the receiver.
2. **Sender:** The device (such as a computer, phone, or sensor) that creates and transmits the data message across the network.
3. **Receiver:** The target device intended to accept and process the incoming message sent across the network.
4. **Transmission Medium:** The physical or wireless path (such as twisted-pair copper cables, fiber optic cables, or radio waves) through which data travels from sender to receiver.
5. **Protocol:** A formalized set of rules governing how data is packaged, addressed, transmitted, routed, and received across network nodes.

- **How They Work Together:** The sender encodes the message into signals, formats it according to established protocols, and transmits it across the physical communication medium. The medium carries the signals to the destination receiver, where the protocol rules are decoded to reconstruct the original message accurately.

Q4. Describe the roles of common communication devices like hubs, switches, routers, and gateways in data communication. How do they contribute to the functionality of a network?

- **Hubs:** Basic networking devices that connect multiple computers in a LAN. When data arrives at one port, the hub broadcasts it blindly to all other ports, creating high network traffic and lower security.
- **Switches:** Intelligent versions of hubs that maintain a table of connected MAC addresses. Instead of broadcasting data everywhere, a switch filters and forwards data packets directly to the intended destination port, maximizing bandwidth efficiency.
- **Routers:** Advanced devices operating at the network layer that connect different networks together (such as connecting a home network to the Internet). They determine the optimal physical path for data packets using IP addresses.
- **Gateways:** Specialized nodes acting as protocol translators between completely different network architectures or systems, allowing incompatible networks to exchange data successfully.

Q5. Discuss the advantages and limitations of different network topologies, including bus, star, and ring. When should each topology be used in a network design?

- **Bus Topology:**
    - *Advantages:* Simple to set up, requires minimal cable length, and is cost-effective for small networks.

- *Limitations:* If the main cable (backbone) breaks, the entire network goes down; troubleshooting is difficult.
- *Best Used For:* Small, temporary, or low-cost networks where cabling costs must be minimized.

- **Star Topology:**
  - *Advantages:* Highly reliable—if one cable fails, only that device is disconnected; easy to add/remove nodes and troubleshoot centrally.
  - *Limitations:* Requires more cabling, and if the central hub/switch fails, the entire network fails.
  - *Best Used For:* Modern local area networks (LANs) in offices, schools, and homes due to high performance and easy management.
- **Ring Topology:**
  - *Advantages:* Equal access for all computers; no data collisions because tokens circulate in one direction.
  - *Limitations:* A break in the single ring cable disrupts the entire network; adding or removing devices can be disruptive.
  - *Best Used For:* Specialized industrial or campus token-ring networks requiring deterministic data delivery.

Q6. What is the OSI model, and how does it help in understanding the process of data communication? Give the purpose of each OSI layer.

The Open Systems Interconnection (OSI) model is a conceptual 7-layer framework developed by ISO to standardize how different communication systems interact and exchange data regardless of their underlying hardware architecture.

The Seven Layers and Their Purposes:

1. **Physical Layer:** Manages transmission of raw bit streams over physical communication media.
2. **Data Link Layer:** Handles node-to-node data transfer, framing, and physical addressing (MAC addresses).
3. **Network Layer:** Responsible for logical addressing (IP addresses) and routing packets across multiple networks.
4. **Transport Layer:** Ensures reliable, error-free end-to-end data delivery, flow control, and sequencing.
5. **Session Layer:** Establishes, manages, and terminates communication sessions between applications.
6. **Presentation Layer:** Handles data translation, formatting, encryption, and compression.
7. **Application Layer:** Provides direct network services and protocols (HTTP, FTP, SMTP) to end-user software applications.

Q7. Discuss any three common applications of the Internet and their impact on society, including communication, education, business, entertainment, and research.

1. **Communication (Email, VoIP, Social Media):**

The internet revolutionized global communication by eliminating geographical barriers. Email, instant messaging, and video conferencing allow families, corporations, and governments to exchange information instantly in real time, fostering global connectivity.

2. **Education (E-Learning & Online Research):**

Digital learning platforms, online universities, virtual classrooms, and open-access research libraries have democratized education. Students worldwide can access world-class lectures, textbooks, and collaborative tools from anywhere, transforming traditional classroom dynamics.

3. **E-Commerce and Business:**

The internet opened up borderless digital marketplaces through e-commerce platforms, cloud computing, and online banking. Businesses can operate 24/7, reach global customer bases, reduce operational costs, and streamline supply chain management efficiently

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