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Class	10th	Chapter	01
Subject	Computer Science	Board	Federal

CHAPTER 1: Computer Systems

Q1. Multiple Choice Questions (MCQs)

1. What is the binary representation of the decimal number -43 using 8-bit two's complement notation?

- **a) 10101011 b) 11010101 c) 11010101 d) 11101011**
- **Correct Answer: b) 11010101**

2. Which of the following binary numbers corresponds to the hexadecimal number 3FA7?

- **a) 0011 1111 1010 0111 b) 1100 0011 1101 1000 c) 1011 1100 0011 0111 d) 0111 1011 1011 1100**
- **Correct Answer: a) 0011 1111 1010 0111**

3. How does the ASCII code for the character 'Z' (90 in decimal) look in binary?

- **a) 01011010 b) 01001110 c) 01011000 d) 01101001**
- **Correct Answer: a) 01011010**

4. In an 8-bit signed integer representation, what is the range of values that can be represented?

- **a) -127 to 128 b) -128 to 127 c) 0 to 255 d) -256 to 255**
- **Correct Answer: b) -128 to 127**

5. How many different values can be represented with a 10-bit binary number?

- **a) 256 b) 1024 c) 512 d) 2048**
- **Correct Answer: b) 1024**

6. Which of the following is NOT a task performed by an operating system?

- **a) Process Management b) Memory Management c) Email Management d) Device Management**
- **Correct Answer: c) Email Management**

7. Which type of operating system allows multiple tasks to be performed at the same time?

- **a) Multiprogramming b) Batch Processing c) Real-time d) Single-tasking**
- **Correct Answer: a) Multiprogramming**

8. Which state of a process represents that it is ready for execution but waiting for CPU time?

- **a) Start State b) Running State c) Ready State d) Blocked State**
- **Correct Answer: c) Ready State**

9. What is the main purpose of a process scheduler?

- **a) To manage file operations b) To manage CPU utilization c) To manage memory allocation d) To manage network resources**
- **Correct Answer: b) To manage CPU utilization**

10. Which memory management approach involves dividing memory into fixed-sized blocks?

- **a) Paging b) Segmentation c) Virtual Memory d) Contiguous Allocation**
- **Correct Answer: a) Paging** *(Note: Paging divides physical memory into fixed-size blocks called frames)*

11. What is the main purpose of interrupts in an operating system?

- **a) To speed up CPU processing b) To slow down CPU processing c) To handle immediate events d) To manage network connections**
- **Correct Answer: c) To handle immediate events**

12. Which scheduling algorithm assigns CPU time in fixed time slices to each process in a cyclic order?

- **a) First-Come First-Served (FCFS) b) Shortest Job Next (SJN) c) Priority Scheduling d) Round Robin (RR)**
- **Correct Answer: d) Round Robin (RR)**

13. Which memory management technique divides memory into fixed-sized blocks?

- **a) Segmentation b) Paging c) Fixed Partitioning d) Dynamic Partitioning**
- **Correct Answer: c) Fixed Partitioning**

14. Which type of hosting involves installing and running software on servers located within an organization's physical premises?

- **a) Shared Hosting b) Dedicated Hosting c) On-Premises Hosting d) Cloud Hosting**
- **Correct Answer: c) On-Premises Hosting**

15. Which component of programming software translates code written in a high-level programming language into machine code?

- **a) Text Editor b) Compiler c) Debugger d) IDE**
- **Correct Answer: b) Compiler**

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Q2. Short Response Questions

1. What is the significance of the Most Significant Bit (MSB) in signed binary numbers?

- The MSB acts as the sign bit in signed binary numbers. If the MSB is 0, the number is positive; if the MSB is 1, the number is negative.

2. What is a binary digit, and why is it fundamental in computer systems?

- A binary digit (bit) is the smallest unit of data in computing, representing either a 0 or a 1. It is fundamental because digital computers are built using electronic switches (transistors) that operate in two distinct states: ON (1) and OFF (0).

3. Why are binary numbers more efficient for computer calculations than decimal numbers?

- Binary systems simplify circuit design, manufacturing, and reliability. Electronic components only need to distinguish between two reliable voltage levels (high/low) rather than ten distinct levels required by decimal numbers, minimizing errors and maximizing processing speed.

4. How do ASCII and Unicode differ in character representation?

- **ASCII** is a 7-bit (or 8-bit) character encoding scheme capable of representing 128 (or 256) characters, primarily covering English alphabets, numbers, and basic symbols. **Unicode** is a universal character encoding standard using 16 to 32 bits, supporting over a million characters from virtually all global languages and scripts.

5. What is the importance of positional value in number systems? Give two examples.

- Positional value determines the weight of a digit based on its relative position in a number, allowing a compact set of symbols to represent infinitely large or small values.
    - *Example 1:* In decimal, the digit 5 in 52 means 5×10, whereas in 25, it means 5×1.
    - *Example 2:* In binary, 1 in position 2^0 equals 1, but in position 2^3 equals 8.

6. What is the process to convert a binary number to its hexadecimal equivalent?

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    1. Group the binary digits into sets of four, starting from the rightmost bit (adding leading zeros if necessary).
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    2. Replace each 4-bit binary group with its corresponding hexadecimal equivalent (0–9 and A–F).

7. What is the purpose of machine code in computer operations?

- Machine code consists of binary instructions (1s and 0s) that the computer's Central Processing Unit (CPU) can execute directly without any further translation, controlling hardware operations and calculations.

8. Why coding scheme is used in computer? Give three reasons.

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1. To standardize text data so different computer systems can exchange information accurately.

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2. To allow text characters (letters, numbers, punctuation) to be stored as numerical binary data.

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3. To support multi-language localization (via Unicode) across international platforms.

9. State five differences between a process and a thread.

- *Process:* Heavyweight entity; has its own separate memory space and resources; inter-process communication is complex and slow; creation and termination take more time; failure of one process does not directly affect others.
- *Thread:* Lightweight entity (subprocess); shares memory space and resources with other threads of the same process; communication between threads is fast; creation and switching overhead is low; failure of a thread can crash the entire process.

10. What is memory management and how does it work in an operating system?

- Memory management is the OS function that tracks every byte of primary memory (RAM) and coordinates the allocation and deallocation of memory blocks to active processes. It ensures processes do not overlap or corrupt each other's data using techniques like paging, segmentation, and virtual memory.

11. What is a real-time operating system and where is it commonly used?

- A real-time operating system (RTOS) is a specialized OS designed to process data and respond to inputs with strict, predictable time constraints (microseconds/milliseconds). It is commonly used in aerospace controls, medical monitoring equipment, industrial automation, and anti-lock braking systems (ABS).

12. Differentiate between multiprogramming and multitasking operating systems.

- **Multiprogramming** aims to maximize CPU utilization by keeping multiple programs in main memory simultaneously; when one program waits for I/O, the CPU switches to another. **Multitasking** (time-sharing) is an extension of multiprogramming where the CPU switches rapidly between tasks giving the illusion to the user that multiple programs are running concurrently.

13. List two pros and two cons of on-premises hosting.

- **Pros:** Complete control over hardware/software security; high customization and data privacy.
- **Cons:** High upfront capital expenditure for hardware; requires dedicated in-house IT staff for maintenance.

14. What is an application patch? Give key functions of it.

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- An application patch is a small piece of software designed to update, fix, or improve a computer program. Key functions include fixing software bugs, patching security vulnerabilities, and enhancing overall system stability or performance.

15. Differentiate between offline and online applications. Give one example of each.

- **Offline applications** run locally on a device without requiring an active internet connection (e.g., Microsoft Word).
- **Online applications** require internet access and run via cloud servers or web browsers (e.g., Google Docs).

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Q3. Extended Response Questions

1. Explain decimal, binary, octal and hexadecimal number systems with examples.

- **Decimal System:** Base-10 system using digits 0–9. Positional values are powers of 10. *Example:* $345_{10} = (3 \times 10^2) + (4 \times 10^1) + (5 \times 10^0)$.
- **Binary System:** Base-2 system using digits 0 and 1. Positional values are powers of 2. *Example:* $101_2 = (1 \times 2^2) + (0 \times 2^1) + (1 \times 2^0) = 5_{10}$.
- **Octal System:** Base-8 system using digits 0–7. Positional values are powers of 8. *Example:* $17_8 = (1 \times 8^1) + (7 \times 8^0) = 15_{10}$.
- **Hexadecimal System:** Base-16 system using digits 0–9 and letters A–F (where A=10, F=15). Positional values are powers of 16. *Example:* $2F_{16} = (2 \times 16^1) + (15 \times 16^0) = 47_{10}$.

2. What is 2's complement, and why it is used? Given examples.

- **Definition:** 2's complement is a mathematical operation on binary numbers used to represent signed numbers. It is calculated by finding the 1's complement of a binary number (flipping all bits) and adding 1 to the least significant bit.
- **Purpose:** It eliminates the problem of dual representations of zero (+0 and -0) present in 1's complement and simplifies hardware arithmetic circuitry (allowing subtraction to be performed using addition).
- **Example:** To find the 2's complement of 00000101 (+5):
    1. 1's complement (invert bits): 11111010
    2. Add 1: 11111010 + 1 = 11111011 (-5).

3. Define the terms Overflow and Underflow. Explain Overflow in number system with one example.

- **Overflow:** Occurs when the result of an arithmetic operation exceeds the maximum limit that can be stored in the allocated number of bits.
- **Underflow:** Occurs when a result is a tiny non-zero number smaller than the smallest representable value in the system.
- **Overflow Example (8-bit binary):** Adding two large positive numbers like 01111111 (+127) and 00000001 (+1) results in 10000000. In signed 8-bit representation, the MSB becomes 1, incorrectly interpreting the result as a negative number (-128), which is an overflow error.

4. What is the significance of ASCII and Unicode character coding schemes?

- **ASCII:** Standardized computer text interchange for English alphanumeric characters, ensuring data compatibility across different computers and printers.
- **Unicode:** Overcame the limitations of ASCII by providing a universal standard capable of encoding text from all global writing systems, emojis, and mathematical symbols, making modern multilingual software and internet communication possible.

5. What is an operating system? Explain any five tasks/functions of OS.

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- **Definition:** An operating system (OS) is system software that acts as an intermediary between computer hardware and the user/applications.
- **Five Key Functions:**

1. *Process Management:* Creation, scheduling, synchronization, and termination of processes.
2. *Memory Management:* Allocation and tracking of primary memory (RAM) usage.
3. *File Management:* Organization, storage, retrieval, and security of files on storage devices.
4. *Device/I/O Management:* Managing hardware devices using drivers and controlling input/output operations.
5. *Security and Protection:* Protecting system resources and user data through authentication, authorization, and access controls.

6. Explain any four types of operating systems.

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1. **Batch Operating System:** Collects jobs in batches with similar needs before processing them without user interaction (e.g., payroll systems).

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2. **Time-Sharing (Multitasking) Operating System:** Switches CPU rapidly among multiple users and programs, allowing concurrent interaction.

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3. **Distributed Operating System:** Manages a group of independent computers and makes them appear as a single high-performance system.

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4. **Real-Time Operating System (RTOS):** Guarantees strict, predictable processing deadlines for mission-critical hardware environments.

7. How operating system manages applications? Explain five states of a process with diagram.

- The OS manages applications by loading their code into memory, creating process control blocks (PCBs), allocating CPU time slots via schedulers, and managing their lifecycle through different execution states.
- **Five Process States:**

1. **New:** The process is currently being created.
2. **Ready:** The process has all necessary resources and is waiting in the queue to be assigned to the CPU.
3. **Running:** Instructions of the process are currently being executed by the CPU.
4. **Waiting (Blocked):** The process is waiting for an external event or I/O operation to complete before continuing.
5. **Terminated:** The process has finished execution and its resources are released.

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8. Explain the role of Integrated Development Environments (IDEs) in the software development process, including specific features that enhance programming efficiency.

- **Role:** An IDE provides a comprehensive, all-in-one software suite that consolidates all tools required to write, test, debug, and compile code.
- **Key Features:**
    - *Code Editor with Syntax Highlighting:* Automatically formats and color-codes keywords for readability.
    - *Auto-completion (IntelliSense):* Suggests functions and variables as you type, reducing typing errors.
    - *Integrated Debugger:* Allows step-by-step code execution, breakpoint setting, and variable inspection to find and fix bugs.
    - *Build Automation & Compiler:* Translates code directly into executable formats with single-click shortcuts.

9. What is software hosting? Explain On-premises and Cloud hosting. Also give two pros and cons of each.

- **Software Hosting:** Storing, maintaining, and running software applications and data on servers so users can access them.
- **On-Premises Hosting:** Software and servers are installed, maintained, and operated physically within the organization's own buildings.
    - *Pros:* Maximum data privacy and security control; full hardware customization.
    - *Cons:* High initial capital cost; requires dedicated internal IT infrastructure and personnel.
- **Cloud Hosting:** Applications and data are hosted on remote third-party data centers accessed via the internet (e.g., AWS, Microsoft Azure).
    - *Pros:* Scalability on demand; lower upfront infrastructure costs with pay-as-you-go pricing.
    - *Cons:* Requires a stable internet connection; ongoing subscription costs and potential dependency on third-party security

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