AL HUDA SCIENCE ACADEMY

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Most Important Short Questions of Computer

SHORT QUESTIONS – SET 1

(Systems, Von Neumann Architecture, Number Systems, Encoding, Digital Logic & Boolean Algebra)

Q1. Define a system. What are its basic components? A system is a collection of parts that work together to achieve a common goal. A system is described by its objectives, components, communication among components, and the environment in which it works. These elements interact to ensure the system functions correctly.

Q2. Write a short note on systems theory. Systems Theory is a branch of science dealing with complicated structures in living organisms, relating humans with society and science. It provides a way to interpret the world by analyzing how different systems and sub-systems operate, integrate, grow, and change over time.

Q3. What is the objective of a system? Every system has a purpose or goal that it wishes to fulfill, known as its objective. Analyzing a system's operation requires understanding this aim to improve efficiency. Common objectives include processing information, supporting other systems, or achieving specific goals like temperature regulation.

Q4. What is the role of DNA in the human system? DNA acts as a blueprint for life, containing all instructions for an organism to grow, develop, and reproduce. Each cell in the body reads this blueprint to know what to do. It is a biological system passed down from generation to generation.

Q5. What are key properties of system environment? The environment includes external factors affecting the system. Its properties include being Static (unchanged unless the system provides output) or Dynamic (changing independently). It can also be Deterministic (certain impact) or Non-deterministic (uncertain or random impact).

Q6. What is the relationship between knowledge and science? Knowledge is our understanding of various systems in the universe around and within us. Science is the systematic way to validate this understanding. Science utilizes methods from both natural science and design science to study systems.

Q7. What is the use of design science? Design Science focuses on designing and creating artifacts (tools, systems, methods) to achieve specific goals or solve problems. Its nature is prescriptive, meaning it aims to prescribe and create artificial systems by following a regulative cycle.

Q8. What is computer science? Computer science is the study of how computers work, looking at what they can do and their limitations. It uses methods of both natural science (to find algorithms/rules) and design science (to create and improve systems) to understand computing.

Q9. What are the main components of the Von Neumann architecture? The Von Neumann architecture delineates a system with four primary hardware components: Memory, the Central Processing Unit (CPU), Input mechanisms, and Output mechanisms. It also includes a system bus to facilitate data movement between these parts.

Q10. What is the Von Neumann computer architecture? List its key components. This architecture is a computer paradigm developed by John von Neumann. It describes a system where hardware consists of

Memory, a CPU (containing an ALU and Control Unit), Input devices, and Output devices. A key feature is the stored program concept.

Q11. What are the four main steps in the Von Neumann architecture's instruction cycle? The four essential stages for a CPU to carry out instructions are Fetching (getting instruction from memory), Decoding (interpreting the instruction), Execution (processing the instruction via ALU or CU), and Storing (saving the result).

Q12. What is Von Neumann bottleneck? The Von Neumann bottleneck is a disadvantage of this architecture. It occurs when the single memory area used for both data and instructions limits the CPU's ability to retrieve information quickly, which can slow down processing.

Q13. What is the key advantage of the Von Neumann architecture? A key advantage is its simplified design, achieved by combining instructions and data into a single memory area. It also offers flexibility, as programs can be easily changed by modifying the memory contents.

Q14. Name three types of system buses and describe their purpose. The three types are the Data Bus, Address Bus, and Control Bus. The Data Bus transports data; the Address Bus maintains information about data destinations; and the Control Bus transports control electrical signals between components.

Q15. What are the two main parts of CPU? The CPU consists of two main components: the Arithmetic Logic Unit (ALU) and the Control Unit (CU). The ALU performs calculations and logic operations, while the CU governs activities and instructs other components.

Q16. What is the first stage of instruction processing in Von Neumann architecture? The first stage is Fetching. The CPU retrieves an instruction from memory. The Program Counter (PC) stores the address of the next instruction, which is then moved to the Instruction Register (IR).

Q17. What happens in the decoding stage of Von Neumann architecture? The Control Unit (CU) decodes the instruction located in the Instruction Register, interpreting the opcode (operation code) to determine the required procedures and data needed for execution.

Q18. What is the role of the Instruction Register (IR) in instruction processing? The IR is a component within the CPU. During fetching, once the instruction is retrieved from the memory location indicated by the Program Counter, it is placed into the Instruction Register so it can be decoded.

Q19. What is meant by a single memory store in Von Neumann architecture? It means both program instructions and data are stored in the same memory space. For example, in a computer game, both the game's code and the player's score data reside in the same RAM.

Q20. What does sequential execution mean? Sequential execution means instructions are processed one after another in a sequence. A computer follows the steps one by one in the order they are written, rather than simultaneously.

Q21. What is a number system? Numbering systems are methods used to represent, store, and process data. They form the basis for computers to perform tasks like calculations and data transfer. Common systems include decimal, binary, and hexadecimal.

Q22. List three types of number systems. Decimal System (base-10, used in daily life), Binary System (base-2, used by computers), and Hexadecimal System (base-16, used for compact representation). The Octal system (base-8) is also used.

Q23. What is the binary number system? The binary system is a base-2 number system consisting of only two digits: 0 and 1. Computers use this system because digital circuits have two states (ON and OFF). Place values are powers of 2.

Q24. What is the hexadecimal number system? Hexadecimal is a base-16 number system using digits 0–9 and letters A–F (where A=10 to F=15). Each digit represents a power of 16. One hexadecimal digit corresponds exactly to four binary bits.

Q25. What is the difference between decimal and binary number systems? The decimal system is base-10, uses digits 0–9, with place values as powers of 10. The binary system is base-2, uses digits 0 and 1, with place values as powers of 2. Computers operate in binary; humans typically use decimal.

Q26. Convert $(65)_{10}$ into a binary number. Divide 65 by 2 repeatedly: 65/2=32 r1; 32/2=16 r0; 16/2=8 r0; 8/2=4 r0; 4/2=2 r0; 2/2=1 r0; 1/2=0 r1. Reading remainders bottom to top: **$(1000001)_2$**

Q27. Convert $(786)_{10}$ to hexadecimal. 786/16 = 49 remainder 2; 49/16 = 3 remainder 1; 3/16 = 0 remainder 3. Reading from bottom to top: **$(312)_{16}$**

Q28. Convert $(AB)_{16}$ into binary. A (Hex) = 10 (Dec) = 1010 (Bin); B (Hex) = 11 (Dec) = 1011 (Bin). Combined: **$(10101011)_2$**

Q29. Convert $(11011)_2$ into decimal. $1\times2^4 + 1\times2^3 + 0\times2^2 + 1\times2^1 + 1\times2^0 = 16+8+0+2+1 =$ **$(27)_{10}$**

Q30. Convert $(137)_{10}$ into hexadecimal. 137/16 = 8 remainder 9; 8/16 = 0 remainder 8. Reading bottom to top: **$(89)_{16}$**

Q31. What is the range of values for an unsigned 2-byte integer? A 2-byte integer has 16 bits. Maximum value = $2^n - 1 = 2^{16} - 1 = 65,535$. So the range is 0 to 65,535.

Q32. Explain how a negative integer is represented in binary. Negative integers are represented using the Two's Complement method: invert all bits of the positive number (0s to 1s and 1s to 0s), then add 1 to the result.

Q33. What is the benefit of using unsigned integers? Unsigned integers represent quantities that cannot be negative (counts, ages). By not reserving a bit for the sign, they can represent a larger maximum positive value than signed integers of the same size.

Q34. How does the number of bits affect the range of integer values? The number of bits determines the maximum value a memory space can hold. If 'n' is the number of bits, the maximum value is $2^n - 1$. As bits increase (e.g., 8 to 16), the range increases exponentially.

Q35. What are whole numbers? Whole numbers are a set of non-negative integers {0,1,2,3,...}. They represent quantities that cannot be negative, such as a person's age or number of students.

Q36. What are integers? Integers extend whole numbers to include negative numbers {...,−2,−1,0,1,2,...}. In computing, they are called signed integers, where one bit (usually the most significant bit) indicates positive or negative.

Q37. What is the primary purpose of the ASCII encoding scheme? ASCII (American Standard Code for Information Interchange) is a character encoding standard. It represents text in computers by assigning unique numeric codes (0–127) to alphabets, numbers, and symbols.

Q38. Explain the difference between ASCII and Unicode. ASCII is an older standard limited to 7 bits, representing only 128 characters (English-based). Unicode is a modern standard that maps all graphic characters from world writing systems, representing over a million characters using variable bytes.

Q39. How does Unicode handle characters from different languages? Unicode provides character codes for all world writing systems. It uses encoding forms like UTF-8, UTF-16, and UTF-32 to represent characters from various languages using more bytes per character than ASCII.

Q40. What are text encoding schemes? Standards used to represent characters from languages and symbols in a format computers can process as binary data. Common examples: ASCII and Unicode.

Q41. What is ASCII? ASCII stands for American Standard Code for Information Interchange. Each alphabet, digit, or symbol is given a unique code number ranging from 0 to 127.

Q42. Write ASCII codes for any three characters.

1. Uppercase 'P' = 80
2. Lowercase 'a' = 97
3. Lowercase 'n' = 110

Q43. What is Unicode? Unicode is a comprehensive character encoding standard designed to map all graphic characters used in world writing systems. It supports multiple languages using encoding forms like UTF-8.

Q44. What is UTF-32? UTF-32 is a Unicode encoding method using a fixed block size — every character is represented using exactly 4 bytes (32 bits), regardless of the character.

Q45. Explain the difference between analog and digital signals. Analog signals are continuous and change smoothly over time, taking any value within a range (e.g., sound waves). Digital signals are discrete, having only two specific values (0 and 1), used in computing systems.

Q46. What is a digital system? Digital systems manipulate information in the form of binary digits (0 and 1). Systems like computers and calculators process discrete data rather than continuous signals.

Q47. Describe analog signal with examples. Analog signals change smoothly and continuously over time, taking any value within a range. Examples: voice signals (sound waves), body temperature, radio-wave signals.

Q48. Describe digital signal with examples. Digital signals are discrete, having only two values, typically '0' and '1' (OFF and ON). Used in digital electronics and computing systems to process and transmit binary data.

Q49. What is meant by ADC? ADC (Analog to Digital Conversion) is the process of converting continuous analog signals (e.g., sound from a microphone) into discrete digital signals for processing by digital devices.

Q50. What do you mean by DAC? DAC (Digital to Analog Conversion) converts digital signals back into analog signals — e.g., converting digital music files into sound waves heard through speakers.

Q51. What is digital logic? Digital logic is the basis of digital systems. It uses binary numbers (0 and 1) to represent information. Digital circuits use logic levels (voltage levels representing 0 or 1) to process information.

Q52. Define a Boolean function and give an example. A Boolean function is an algebraic statement describing the relationship between binary variables and logical operations, accepting binary inputs and producing a single binary output. Example: F(A,B) = A·B (AND operation).

Q53. What is the significance of the truth table in digital logic? A truth table demonstrates the functionality of a logic operation by listing all possible combinations of input variables and their corresponding outputs, helping verify the logic of gates like AND, OR, NOT.

Q54. Describe the function of a NOT gate with its truth table. A NOT gate negates the input. If input A is 0, output is 1. If input A is 1, output is 0. It reverses the logic state of the signal.

Q55. What is Boolean algebra? Boolean algebra is a branch of mathematics dealing with logic and symbolic computation using two values: True (1) and False (0). Essential for designing digital circuits, involving AND, OR, and NOT.

Q56. How does the AND operation work? Takes two binary inputs and produces one output. Output is "1" only when both inputs are "1". Written as A·B.

Q57. How does the OR operation work? Takes two binary inputs and produces one output. Output is "1" when at least one input is "1"; output is "0" only when both inputs are "0". Written as A+B.

Q58. How does the NOT operation work? Takes a single binary variable and negates its value. If input is 1, output is 0; if input is 0, output is 1. Represented as $\bar{A}$ or ¬A.

Q59. What is a truth table? A chart used in Boolean algebra listing all possible combinations of input variables (0s and 1s) and the resulting output for a specific logical operation.

Q60. What are the applications of Boolean functions in computers? Used in ALUs for arithmetic operations, in data processing to manage memory, and in control logic to coordinate system components. Present in devices like cell phones and calculators.

Q61. What is an AND gate? How does it work? A physical logic gate implementing the Boolean AND function. Outputs True (1) only when all inputs are True. Example: two switches in series must both be ON for the light to turn on.

Q62. What is an OR gate? How does it work? A logic gate implementing the Boolean OR function. Outputs True (1) if at least one input is True; outputs False (0) only if all inputs are False.

Q63. What is a NAND gate? How does it work? Combines an AND gate with a NOT gate. Outputs True (1) when at least one input is False; outputs False (0) only when all inputs are True. It is the inverse of the AND gate.

Q64. What is an XOR gate? How does it work? The Exclusive OR gate outputs True (1) only when exactly one input is True. If both inputs are the same, output is False (0). Often used in adder circuits.

Q65. What is the identity law? Identity Laws: A + 0 = A and A · 1 = A. Combining a variable with 0 (OR) or 1 (AND) leaves the variable unchanged.

Q66. What is the idempotent law? A + A = A and A · A = A. Combining a variable with itself using AND or OR results in the original variable.

Q67. What is the distributive law?

1. A · (B + C) = (A·B) + (A·C)
2. A + (B · C) = (A+B) · (A+C)

Q68. What are the absorption laws?

1. A + (A·B) = A
2. A · (A+B) = A

Q69. What is the double negation law? Negating a variable twice returns it to its original value: $\overline{\overline{A}} = A$. Useful for simplifying circuits with double inverters.

Q70. What is the use of a logic diagram? Logic diagrams depict the working of a digital circuit using symbols for individual logic gates, helping visualize connections between inputs, gates, and outputs.

SHORT QUESTIONS – SET 2

(System Software, Computer Networks)

Q1. Define system software and provide two examples. System software manages system resources and provides a platform for application software to run, acting as a bridge between hardware and user applications. Examples: Operating Systems (Windows, macOS) and Device Drivers.

Q2. Differentiate between system software and application software with examples. System software manages and operates computer hardware (Operating Systems, Device Drivers) and is usually pre-installed. Application software helps users perform specific tasks (Word Processors, Games) and is installed by the user as needed.

Q3. What was the message displayed by the "Creeper" virus? The "Creeper" virus (1971), an experimental self-replicating program, displayed: "I'm the creeper, catch me if you can!"

Q4. What is the role of application software in a computer system? Application software helps users perform specific tasks, utilizing the operating system and hardware to fulfill user needs — from productivity and creativity to entertainment and education.

Q5. What is the primary function of a media player application? A media player plays multimedia files. Examples: VLC Media Player, Windows Media Player.

Q6. What type of software is Fortnite categorized as? Application Software, under the Games sub-category (like Minecraft and Among Us).

Q7. Name a software tool used for editing text documents. Microsoft Word. Others: Google Docs, Apple Pages, LibreOffice Writer.

Q8. What is a computer network? A system of linked devices and computers that exchange data and operate together, ranging from small LANs to large WANs, including the Internet.

Q9. What are the primary components of a computer network? Nodes (computers, printers), Links (wired/wireless connections), Switches (connect nodes within a network), and Routers (connect different networks).

Q10. How do computer networks help in communication? They facilitate data transfer via emails, instant messaging, and video conferencing, allowing employees in different locations to collaborate and share information.

Q11. What is video conferencing? A method of digital face-to-face communication over networks using tools like Zoom or Microsoft Teams.

Q12. What is Google Drive? A cloud-based service allowing teams to work on shared documents in real time, improving productivity and flexibility.

Q13. What is a MAC address? Media Access Control address — a hardware address used by switches at the Data Link layer to forward data to the correct device within a network.

Q14. Define data communication and list its key components. Data communication is the exchange of data between a sender and receiver through a communication medium. Its five key components: Sender, Receiver, Message, Protocol, Medium.

Q15. Explain the role of routers in a computer network. A router interconnects networks and directs data packets between them, acting like a traffic director to ensure data reaches its destination efficiently.

Q16. What are networking devices? Hardware components responsible for managing and directing network traffic, ensuring devices can connect and communicate effectively.

Q17. Name four networking devices. Hubs, Switches, Routers, and Access Points (APs).

Q18. What is the role of a switch in a network? Connects multiple devices within a network and manages data traffic using MAC addresses, forwarding data only to the specific device that needs it.

Q19. What is the difference between hub and switch? A switch sends data only to the intended destination using MAC addresses (efficient). A hub broadcasts data to all connected devices.

Q20. How does a router work? Connects different networks and directs data packets using a routing table to decide the best path to each destination (IP address).

Q21. What is bus topology? All devices share a single communication line (the bus). Easy to set up, but if the main cable fails, the whole network goes down.

Q22. What is star topology? Each node communicates with others via a central switch or hub, which acts as the central point for data flow.

Q23. What is the major disadvantage of star topology? If the central device (hub or switch) fails, the entire network communication is disrupted.

Q24. What is ring topology? Each device is connected to two others, forming a circular data path. Data travels in one direction. If one connection fails, the whole network is affected.

Q25. What is mesh topology? Each device is connected to every other device, providing high redundancy and reliability — if one link fails, data can be rerouted through others.

Q26. Define data transmission mode and list its types. Describes how data is transmitted between devices. Three types: Simplex, Half-Duplex, and Full-Duplex.

Q27. Differentiate between half-duplex and full-duplex transmission modes. Half-Duplex: data flows both ways but not simultaneously (e.g., walkie-talkie). Full-Duplex: data flows both ways simultaneously (e.g., telephone call).

Q28. What are the main functions of the network layer in the OSI model? The Network Layer (Layer 3) handles data transfer between different networks, using IP addresses to determine the best path from source to destination.

Q29. Name the seven layers of the OSI model.

1. Physical Layer, 2. Data Link Layer, 3. Network Layer, 4. Transport Layer, 5. Session Layer, 6. Presentation Layer, 7. Application Layer.

Q30. What is the role of the data link layer in the OSI model? Handles error detection/correction and node-to-node data transport, ensuring error-free transmission from the Physical Layer.

Q31. What is the role of the session layer in the OSI model? Manages sessions between applications — establishes, maintains, and terminates connections between devices, similar to a phone call.

Q32. What is the role of the application layer in the OSI model? Closest to the end user; provides network services directly to applications, such as email, web browsing, and file transfer.

Q33. What is the use of IP? Internet Protocol handles addressing and routing of data packets, assigning unique identifiers (IP addresses) to devices for correct delivery.

Q34. Differentiate between IPv4 and IPv6. IPv4 uses a 32-bit address scheme (~4.3 billion addresses). IPv6 uses a 128-bit scheme, offering an almost limitless number of addresses.

Q35. What is the purpose of DHCP? Dynamic Host Configuration Protocol automatically assigns IP addresses to devices, removing the need for manual configuration.

Q36. Differentiate between TCP and UDP in terms of reliability. TCP ensures reliable data transfer. UDP provides faster but less reliable data transfer.

Q37. Name four protocols used in networks. TCP, IP, HTTP, and FTP.

Q38. What is HTTP? HyperText Transfer Protocol — the standard protocol for transferring web pages and related data over the internet.

Q39. Give an example of DNS and IP address. DNS example: typing "www.example.com" in a browser. IPv4 example: 192.168.1.1. IPv6 example: 2001:0000:130F:0000:0000:0900:876A:130B.

Q40. What is network security and why is it important? Measures to protect data and prevent unauthorized access to networks. Important for data protection, preventing attacks, maintaining privacy, and ensuring resource availability.

Q41. Briefly differentiate between LAN and WAN. LAN connects computers within a limited area (home/school). WAN covers a large geographical area, connecting multiple LANs and MANs (e.g., the Internet).

Q42. What is a Virtual Private Network (VPN)? Used to securely connect to a WAN, protecting data on public networks by creating a secure connection.

Q43. Write some real-world applications of computer networks. Business (intranets for resource sharing), Education (LMS like Blackboard), Healthcare (patient info sharing via EHR).

Q44. How are networks used in healthcare? Facilitate sharing of patient information, telemedicine, and access to medical databases. Hospitals use Electronic Health Records (EHR) systems.

Q45. What are protocols? A set of rules governing data communication — how data is transmitted and received over a network. Examples: TCP/IP, HTTP, SMTP.

Q46. What do you know about TCP/IP? The fundamental suite of protocols for internet communication. TCP ensures reliable transfer; IP handles addressing and routing.

SHORT QUESTIONS – SET 3

(Computational Thinking, Algorithms, Flowcharts, Data, AI, IoT, Cybersecurity, Entrepreneurship)

Q1. Define computational thinking. Computational Thinking (CT) is a problem-solving process using skills and techniques to solve complex problems in a way a computer can execute. Used in computer science, biology, mathematics, and daily life.

Q2. What is decomposition in computational thinking? Breaking down a complicated problem into smaller, more manageable components or tasks, making it easier to solve one part at a time.

Q3. Explain pattern recognition with an example. Looking for similarities or patterns among/within problems — e.g., noticing you always forget homework on Mondays, so you set a reminder for Sundays.

Q4. Describe abstraction and its importance in problem-solving. Simplifying complex problems by focusing only on essential details while ignoring unnecessary ones — reduces complexity and helps design solutions more efficiently.

Q5. What is an algorithm? A precise sequence of instructions or step-by-step directions to solve a problem or complete a task, similar to a recipe.

Q6. List key components of computational thinking. Decomposition, Pattern Recognition, Abstraction, Algorithms.

Q7. Describe the importance of decomposition. It transforms a tough task into smaller, manageable parts (e.g., building a birdhouse into designing, gathering materials, cutting wood), making the overall task achievable.

Q8. What is the role of algorithm in computational thinking? Provides a step-by-step plan/solution design to achieve a specific goal, allowing the problem to be solved logically and efficiently.

Q9. How does problem understanding help in computational thinking? Gains clarity on what needs to be solved, defines clear goals, enables efficient solutions, and helps avoid mistakes from misunderstanding the core issue.

Q10. What are flowcharts and how are they used? Visual representations of steps in a process, using symbols connected by arrows. Used to model processes, design systems, and communicate workflows clearly.

Q11. Explain the purpose of pseudocode. Describes algorithm steps using simple, informal language, letting programmers focus on logic without worrying about specific programming syntax.

Q12. How do you differentiate between flowcharts and pseudocode? Flowcharts use graphical symbols/arrows to show flow visually (like a movie). Pseudocode uses plain language/structured text (like a story).

Q13. What is pseudocode? A method of representing an algorithm using simple, human-readable language, combining programming structure with plain English.

Q14. Draw flowchart symbols for Processing and Input/Output.

- **Processing:** Rectangle symbol — depicts a process, task, or operation.
- **Input/Output:** Parallelogram symbol — depicts data input or output.

Q15. What do you mean by time complexity? Measures how fast or slow an algorithm performs — how running time changes as input size increases. Often expressed with Big O notation (e.g., O(n), $O(n^2)$).

Q16. What is meant by space complexity? Measures the amount of memory an algorithm uses relative to input size, including memory for input and any extra memory used during execution.

Q17. What is a dry run and why is it important? Manually walking through an algorithm/flowchart step-by-step with sample data (without a computer). Helps identify logical errors before coding.

Q18. What is simulation? Write its two uses. Uses computer programs to model a real-world process. Uses: testing algorithms with different data types, and exploring scenarios that are dangerous/expensive in real life (e.g., weather forecasting, traffic flow).

Q19. Describe LARP and its significance in learning algorithms. LARP = Logic of Algorithms for Resolution of Problems. An interactive tool to learn algorithms by running them and seeing results, helping students practice writing/improving algorithms.

Q20. List and explain two debugging techniques.

1. **Trace the Steps:** Go through each step of the algorithm to identify where it goes wrong.

2. **Use Comments:** Write notes explaining what each part does, to help spot mistakes.

Q21. What are bugs and their types? Bugs are errors that prevent code/algorithms from working correctly. Three types: Syntax Errors, Runtime Errors, Logical Errors.

Q22. Describe syntax errors. Occur when something is written incorrectly according to the rules of the language (e.g., missing a step, wrong symbol). Usually the easiest to find.

Q23. Describe runtime errors. Occur during execution when the program attempts an impossible operation (e.g., dividing by zero), causing a crash.

Q24. Describe logical errors. Mistakes in the logic causing incorrect behavior/results even though the program runs. Example: wrong condition in a decision step. Often the hardest to find.

Q25. What is debugging? The process of finding and fixing errors (bugs) in an algorithm, flowchart, or code using techniques like tracing steps and checking conditions.

Q26. What is data? Raw facts collected about things — numbers, words, measurements, observations, images, or sounds — processed to generate useful information.

Q27. What is the difference between qualitative and quantitative data? Qualitative data describes qualities/characteristics using categories/labels (non-numeric, e.g., color). Quantitative data measures quantity using numbers (countable/measurable, e.g., height).

Q28. Which type of data describes the qualities of something? Qualitative data — categories or labels describing qualities/characteristics rather than quantity.

Q29. What are the key characteristics of qualitative data? Non-Numeric (words/labels), Descriptive, Categorical (can be grouped into classes).

Q30. What is quantitative data? Numbers used to measure quantity/amount — answers "how much?" or "how long?" Used for mathematical/statistical analysis.

Q31. Write the key characteristics of quantitative data. Numerical, Measurable, Countable, Arithmetical.

Q32. Why is it important to organize data into tables/charts before analyzing it? Saves time, improves clarity, reduces errors, and allows patterns/trends to be quickly grasped — easier decision-making than messy lists.

Q33. What is meant by data collection? The process of gathering information to answer questions, make decisions, or understand something better, using various methods and tools.

Q34. Describe a direct method of data collection. Interviews — talking to individuals one-on-one for detailed information. Another: Observation — watching and noting what happens in a situation.

Q35. What is observation? A data collection method involving watching and noting what happens in a particular situation (e.g., observing student teamwork during a group project).

Q36. How does structured data differ from unstructured data? Structured data (spreadsheets) is organized into rows/columns, easy to search/analyze. Unstructured data (emails, videos) is free-form and harder to organize.

Q37. Explain why data visualization is important. Turns numbers into pictures (charts), making data easier to understand. Helps the brain process information faster, revealing patterns, trends, and relationships.

Q38. Describe a line graph's use with an example. Used to represent continuous data and show trends over time — e.g., temperature change over a week, or student growth over years.

Q39. What is data visualization? The process of turning numbers/information into visual representations (charts, graphs, maps) to make data easier to understand.

Q40. Give three benefits of data visualization.

1. Makes complex data easier to understand.
2. Provides quick insight without reading details.
3. Aids faster/better decisions (e.g., seeing sales trends).

Q41. What is data preprocessing? The first and most important step in working with data — preparing it for analysis by cleaning and organizing it (like washing/chopping ingredients before cooking).

Q42. What are outliers? Unusual or extreme values in a dataset that don't fit the overall pattern (e.g., a score of 5 in a list of scores between 50–80).

Q43. What is data validation? Checking data completeness (nothing missing) and accuracy (correct, within valid ranges) — e.g., verifying test scores are between 0–100.

Q44. What is the difference between quantitative and qualitative analysis? Quantitative analysis deals with numbers using statistics (mean, median). Qualitative analysis deals with non-numeric data (text/images) using content or thematic analysis.

Q45. List some benefits of collaborative tools. Enhanced Productivity (working simultaneously) and Version Control (auto-saving changes, reverting to previous versions).

Q46. What is data science? A field involving gathering, analyzing, and interpreting large amounts of data to find patterns and useful information, combining computer science, math/statistics, and business knowledge.

Q47. Define Artificial Intelligence (AI). AI denotes the simulation of human thinking ability in computer systems, allowing machines to think, learn, and perform tasks requiring human intelligence.

Q48. Provide two examples of AI applications in healthcare.

1. Diagnosing diseases accurately.
2. Personalizing treatment plans.

Q49. Explain the role of AI techniques in advancing machine learning models. AI techniques, particularly Deep Learning (using neural networks), enable computers to learn from vast data, improving over time, making decisions, and recognizing patterns.

Q50. Elaborate on the importance of AI in daily life. Provides smart solutions like voice assistants (Siri, Alexa), personalized recommendations, and smart home devices — automating tasks and improving efficiency.

Q51. How can AI be used in education? Provides personalized learning experiences, automates administrative tasks, and offers insights into student performance.

Q52. How can AI be helpful in finance? Enables personalized investment recommendations, fraud detection, algorithmic trading, and risk assessment.

Q53. What is the use of AI in e-commerce? Powers personalized product recommendations, intelligent chatbots for customer support, and fraud detection.

Q54. How does deep learning work? Uses neural networks (inspired by the human brain) with layers that process data, helping computers learn from large datasets to recognize patterns and make decisions.

Q55. How does a neural network work? Complex structures inspired by the human brain that process data through layers, allowing systems to make decisions or recognize patterns with high accuracy.

Q56. What is robotics? Give examples. The science of building and programming robots (machines that perform tasks). Examples: robots for cleaning floors, building cars in factories, medical operations.

Q57. What do you know about explainable algorithms? Explainable (whitebox) algorithms have a transparent, understandable decision-making process. Examples: Decision Trees, Linear Regression.

Q58. What are unexplainable algorithms? Unexplainable (blackbox) algorithms have decision-making that's difficult to interpret due to complex computations. Example: Neural Networks.

Q59. Differentiate between whitebox and blackbox models. Whitebox: transparent process humans can understand (e.g., decision trees). Blackbox: complex interactions making the process hard to interpret (e.g., deep learning).

Q60. Define the Internet of Things (IoT). A network of physical objects equipped with sensors, software, and technologies to connect and exchange data with other devices/systems over the internet.

Q61. Define the significance of IoT in connecting devices and systems. IoT integrates the physical and digital worlds, allowing devices to collect/share data that can be analyzed to improve efficiency and create opportunities in healthcare, smart homes, etc.

Q62. What is the purpose of actuators in an IoT system? Actuators convert energy into motion, acting on collected data/decisions to generate a physical output or action.

Q63. Give two applications of IoT in transportation.

1. Smart traffic lights that adjust based on traffic flow.

2. Real-time vehicle tracking systems for optimized routes and safety.

Q64. How can IoT devices be protected from cyberattacks? Using strong, unique passwords; keeping software/firmware updated; encrypting transmitted data.

Q65. What is the importance of using computers safely and responsibly? Protects personal information, ensures wise hardware/software choices, and ensures respectful online behavior while avoiding risks.

Q66. What is cyber hygiene, and why update antivirus software regularly? Cyber hygiene refers to practices for maintaining system health. Updating antivirus is essential to protect against new, constantly emerging viruses and malware.

Q67. What is the purpose of regular software updates? To maintain device security — updates include fixes for newly discovered threats and vulnerabilities.

Q68. What is Two-Factor Authentication (2FA), and why is it useful? Adds an extra security layer requiring a second verification form (e.g., a code sent to a phone) besides the password, making it harder for hackers to access accounts.

Q69. Why avoid using public Wi-Fi for sensitive transactions? Public Wi-Fi is often less secure, making it easier for hackers to intercept data, so avoid it for things like online banking.

Q70. How can you verify if an email/message is a scam? Be skeptical of unsolicited requests for personal info, check the sender's address carefully, and avoid clicking unknown links or downloading attachments from untrusted sources.

Q71. What should you do if you receive an email from an unknown sender asking for personal information? Be skeptical, verify the source before responding, and do not provide info, click links, or download attachments — likely a phishing attempt.

Q72. What does "safe operation" of digital platforms/devices mean, and why is it important? Using devices/platforms in a way that protects you from harm — important to protect personal information, prevent malware, and maintain a positive online environment.

Q73. What is meant by a password? A secret string of characters used to secure access to digital accounts/devices. Should be strong and unique.

Q74. What are the characteristics of a strong password? A mix of upper/lower-case letters, numbers, and special characters (e.g., @, #, $). Unique for each account, not easily guessable.

Q75. How can you protect yourself from harmful links and downloads? Avoid clicking unknown links or downloading from untrusted sources; verify the source; use updated antivirus software.

Q76. Why be careful about what you share on social media? To protect privacy and safety — oversharing personal details puts you at risk, and posts can have long-term reputational consequences.

Q77. What is the difference between copyright, trademarks, and patents? Copyright protects original works (music, books). Trademarks protect brand symbols/names (logos). Patents protect new inventions/processes, giving exclusive rights to the inventor.

Q78. Why is it important to respect intellectual property rights? Unauthorized use is unethical and illegal; respecting these rights ensures creators are compensated, encouraging further innovation and creativity.

Q79. What is a patent, and how does it protect new inventions? A legal right protecting new inventions/processes by giving the inventor exclusive rights to make, use, or sell it for a certain period, preventing unauthorized copying.

Q80. What is the meaning of the word "entrepreneur" and its origin? Comes from a French word meaning "to undertake." It refers to someone who undertakes starting and running a new business.

Q81. What is entrepreneurship? The process of designing, launching, and running a new business — identifying market need, taking risks, and innovating to create value, products, or services.

Q82. What are the key characteristics of entrepreneurs? Innovation, Risk-Taking, and being Problem Solvers.

Q83. How does entrepreneurship contribute to economic growth? By creating new jobs and providing new products/services, increasing production of goods/services and improving people's lives.

Q84. How does digital technology help entrepreneurs reach a global audience? E-commerce platforms and social media let entrepreneurs market/sell products worldwide efficiently, often at lower cost than traditional methods.

Q85. How does social media support entrepreneurship? Allows businesses to market products, engage directly with customers, and build a brand presence cost-effectively (Facebook, Instagram, Twitter).

Q86. What is big data analytics, and why is it useful? Analyzing large datasets to understand market trends and customer behavior, helping entrepreneurs make informed, data-driven decisions.

Q87. What is digital marketing and e-commerce? Digital Marketing: promoting products/services via digital channels (social media, email). E-commerce: buying/selling goods/services online (Amazon, Shopify).

Q88. What is Search Engine Optimization (SEO)? A digital marketing strategy optimizing website content to rank higher in search results, increasing visibility and traffic.

Q89. What is an e-commerce platform, and why is it important for business? A platform (Shopify, Amazon) enabling businesses to set up online stores, manage inventory, and process payments — providing infrastructure to reach a global audience.

Q90. Why is it important to identify market needs when generating a business idea? Understanding what people want/need helps create products/services that solve real problems, increasing chances of business success.

Q91. What is prototyping and iteration, and how have successful companies used them? Prototyping: creating a preliminary model to test an idea. Iteration: improving it based on feedback. Companies like Facebook and Airbnb started with simple versions and refined them based on user input.

Q92. Explain the importance of market analysis in a business plan. Helps understand customer needs and competitors — e.g., for an online bookstore in Pakistan, researching student reading habits and competitors to tailor inventory and pricing.

Q93. What are revenue models, and why are they essential in a business plan? A revenue model outlines how a business generates income, including pricing strategies and sales forecasts — demonstrating financial viability to stakeholders.

Q94. How can businesses contribute to environmental sustainability (SDGs)? By reducing carbon footprints, using renewable resources, and minimizing waste — e.g., a solar energy startup contributes to SDG 7 (Affordable and Clean Energy).

Q95. What is ethical entrepreneurship, and what are its key principles? Incorporating ethics into business operations. Key principles: Honesty, Integrity, Fairness, and Respect.