

Chapter 1- Introduction to System

Short Questions from Exercise

1. Define a system. What are its basic components?

Ans: A system is a set of interrelated components working together towards a common goal. Think of it like a team: each member plays a specific role, but they all collaborate to achieve a shared object.

Basic components of a system are:

i. Input ii. Process iii. Output iv. Feedback v. control

5. What are the main components of the Von Neumann architecture?

Ans: i. Memory ii. Central Processing Unit (CPU)
iii. Input Devices iv. Output Devices

6. What is Von Neumann computer architecture? List its key components.

Ans: The Von Neumann architecture is a computer paradigm that delineates a system in which the hardware of the computer has four primary components: the memory, the central Processing Unit (CPU), input mechanisms, and output mechanisms. This model is called the John Von Neumann model.

i. Memory ii. CPU (Central Processing Unit)
iii. Input Devices iv. Output Devices

7. What are the four main steps in the Von Neumann architecture's instruction cycle?

Ans: Working: The Von Neumann architecture encompasses four essential for a CPU to carry out instructions, namely retrieval, Interpretation and storage. To demonstrate this procedure, we will use the example two-digit addition with a basic calculator application.

i. Fetching ii. Decoding iii. Execution iv. Storing

8. What is the Von Neumann bottleneck?

Ans: The Von Neumann bottleneck occurs when a single memory area limits the CPU's ability to retrieve instructions and data quickly.

9. What is the key advantage of the Von Neumann architecture?

Ans: Advantages:

i. **Simplified Design:** By combining instructions and data into a single memory area, architecture is simplified.
ii. **Flexibility:** Programs can be easily changed by changing memory contents.

Additional Short Questions

1: What is a system?

Ans: A system is a set of interrelated components working together to achieve a common goal. It processes inputs to produce outputs, often with feedback mechanisms to enhance performance.

2: What are the basic components of a system?

Ans: The basic components include:

Input: Data or resources entered into the system.

Process: Operations performed on the input.

Output: Results produced by the system.

Feedback: Information used to adjust and improve the system.

3: What is an operating system?

Ans: An operating system (OS) is system software that manages hardware and software resources, providing services for computer programs.

4: What is the role of the Central Processing Unit (CPU)?

Ans: The CPU executes instructions from programs, performs calculations, and manages data flow within the system.

5: What is memory in a computer system?

Ans: Memory stores data and instructions temporarily or permanently, allowing the CPU to access them quickly during processing.

6: What is the Von Neumann architecture?

Ans: The Von Neumann architecture is a computer design model where a single memory space stores both data and instructions.

7: What are the components of the Von Neumann architecture?

Ans: Key components include:

Memory Unit: Stores data and instructions.

Control Unit: Directs operations of the processor.

Arithmetic Logic Unit (ALU): Performs calculations and logical operations.

Input/output Devices: Facilitate user interaction.

System Bus: Transfers data between components.

8: What is the Von Neumann bottleneck?

Ans: The Von Neumann bottleneck refers to the limitation caused by the single data path for both instructions and data, potentially slowing down processing speed.

9: What is feedback in a system?

Ans: Feedback is the process of using outputs to influence the operation of the system, aiming to improve performance or correct errors.

10: What is a user interface?

Ans: A user interface is the point of interaction between the user and the computer system, encompassing input and output methods.

11: What is data processing?

Ans: Data processing involves converting raw data into meaningful information through various operations like sorting, filtering, and calculations.

12: What is data storage?

Ans: Data storage refers to saving data in a manner that allows for retrieval and manipulation, using devices like hard drives or cloud storage.

13: What is a database?

Ans: A database is an organized collection of data, typically stored electronically, that can be accessed, managed, and updated.

14: What is a software application?

Ans: A software application is a program or set of programs designed to perform specific tasks for the user, such as word processing or web browsing.

15: What is system security?

Ans: System security involves protecting a computer system from unauthorized access, attacks, or damage to ensure confidentiality, integrity, and availability of data.

Unit No.2: Number System

Short Questions from Exercise

1. What is the Primary purpose of the ASCII encoding scheme?

Ans: ASCII is an acronym that stands for American Standard Code for Information Interchange. It is a character encoding standard adopted for representing in devices such as computers and similar systems that use text. Each alphabet, number or symbol is given a code number between 0 and 27. ASCII enables different computer and devices to exchange text information reliably.

2. Explain the difference between ASCII and Unicode.

Ans: **ASCII:** ASCII is an acronym that stands for American Standard Code for Information Interchange. It is a character encoding standard adopted for representing in devices such as computers and similar systems that use text. Each alphabet, number or symbol is given a code number between 0 and 27. ASCII enables different computer and devices to exchange text information reliably.

Unicode: Unicode is an attempt at mapping all graphic character used in any of the world's writing system. Unlike ASCII which is limited to 7 bits and can represent only 128 characters, Unicode can represent over a million characters through different forms of encodings such as, **UTF-8, UTF-16, UTF-32.**

3. How does Unicode handle characters from different language?

Ans: **Unicode:** Unicode is an attempt at mapping all graphic character used in any of the world's writing system. Unlike ASCII which is limited to 7 bits and can represent only 128 characters, Unicode can represent over a million characters through different forms of encodings such as, **UTF-8, UTF-16, UTF-32.** **UTF** is an acronym that stands for Unicode Transformation format.

Example: The letter A is Unicode, represent as **U+0041**, is **0100001** is the binary format and occupies 8 bits or 1 byte.

4. What is a range of values for an unsigned 2-byte integer?

Ans: 2-Bytes Integer (16 bits): Minimum value = -2 = -32768

5. Explain how a negative integer is represented in binary.

Ans: To store negative value computers use a method called two's complement.

- i. Invert all the bits (change 0s to 1s and 1s to 0s).
- ii. Add to the least significant bits (LSB).

Examples: Let us convert the decimal number -5 to an 8 bits' binary number.

- i. Start with the binary representation of 5: **00000101**
- ii. Invert all the bits **11111010**
- iii. Add 1: **11111010 + 1 = 11111011**

So -5 in 8-bits two's complement is 11111011

6. What is the benefit of using unsigned integers? OR

How does the number of bits affect the range of integer values?

Ans: Integers extend the concept of whole numbers to include negative numbers. In computer programming, we call them signed integers. The set of integers is represented as:

$Z = \{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$

The store both positive and negative values, one bit is reserved as the sign bit. If the sign bit is ON (1), the value is negative; otherwise it is positive. Using this system, the maximum positive value that can be stored in a 1 byte signed integer is (01111111) which is 127.

Additional Short Questions

1: What is a Number System?

Ans: A number system is a writing system for expressing numbers. It uses a consistent set of symbols or digits. Common systems include binary, decimal, octal, and hexadecimal.

2: What is the Decimal Number System?

Ans: The decimal system is base-10. It uses digits from 0 to 9. Each position represents a power of 10.

3: What is the Binary Number System?

Ans: The binary system is base-2. It uses two digits: 0 and 1. Each position represents a power of 2.

4: What is the Octal Number System?

Ans: The octal system is base-8. It uses digits from 0 to 7. Each position represents a power of 8.

5: What is the Hexadecimal Number System?

Ans: The hexadecimal system is base-16. It uses digits 0–9 and letters A–F. Each position represents a power of 16.

It's commonly used in computing for a more human-friendly representation of binary.

6: What is the Base or Radix of a Number System?

Ans: The base or radix is the number of unique digits, including zero, used to represent numbers. For example, binary has base 2, decimal has base 10.

It determines the value of each digit's position.

7: What is a Bit?

Ans: A bit is the smallest unit of data in computing. It can have a value of 0 or 1. It's short for "binary digit."

8: What is a Byte?

Ans: A byte consists of 8 bits. It's a standard unit of data storage. One byte can represent a single character.

9: What is Binary Coded Decimal (BCD)?

Ans: BCD is a class of binary encodings of decimal numbers. Each decimal digit is represented by its own binary sequence. It simplifies the conversion between binary and decimal systems. It's used in digital systems where decimal accuracy is needed.

10: How do you Convert Decimal to Binary?

Ans: Divide the decimal number by 2. Record the remainder. Repeat the division with the quotient until it's 0. The binary equivalent is the remainders read in reverse order.

11: How do you Convert Binary to Decimal?

Ans: Write down the binary number. Multiply each bit by 2 raised to the power of its position. Sum all the results.

12: How do you Convert Decimal to Hexadecimal?

Ans: Divide the decimal number by 16. Record the remainder. Repeat the division with the quotient until it's 0.

13: How do you Convert Hexadecimal to Decimal?

Ans: Write down the hexadecimal number. Multiply each digit by 16 raised to the power of its position. Sum all the results.

14: What is the Purpose of Number Systems in Computing?

Ans: Number systems are used to represent data in computers. They facilitate data storage, processing, and transmission. Different systems are used for efficiency and compatibility.

15: What is the Relationship Between Binary and Other Number Systems?

Ans: Binary is the base for other systems like octal and hexadecimal. Each octal digit corresponds to three binary digits. Each hexadecimal digit corresponds to four binary digits. These relationships simplify conversions and data representation.

Unit 3: Digital Systems and Logic Design

Short Questions from Exercise

1. Define a Boolean function and give an example.

Ans: A Boolean function is a function which has a one or more binary inputs and produces a single binary output. The inputs and outputs can only have two values. False represented by 0 and true represented by 1. The construction of Boolean functions is done by employing the basic logical operations such as AND, OR and Not which connect the inputs to generate the correct output.

Example: (see Textbook Page # 52)

2. What is the significance of the truth table in digital logic?

Ans: A truth table is useful for better understanding of how the operation is organized and what the result of the OR's application is for all variants of the input variables.

3. Explain the difference between analog and digital signals.

Ans: Analog Signal:

- i. Continuous
- ii. Infinite possible values
- iii. Example Sound Waves

Digital Signal:

- i. Discrete
- ii. Finite (0 or 1)
- iii. Example Binary data in Computers

4. Describe the function of a NOT gate with its truth table.

Ans: NOT Gate: implements the NOT function. It outputs the opposite of the input.

Truth Table: The following table will illustrate the working of NOT operation for all possible inputs of the variable. Below is the truth table for NOT operation.

Explanation: When the input A is 0 the output P is 1. When A is 1 the output value P is 0. A NOT operation performs the negative of the input variable. It gives the opposite value. This operation is important in digital logic design to generate more complex logic functions and verify the functionality of digital circuits.

Additional Short Questions

What is a digital system?

Ans: A digital system processes data in binary form (0s and 1s). It uses discrete signals for operations. Examples include computers and calculators.

Digital systems are precise and reliable.

2: What is an analog system?

Ans: An analog system uses continuous signals. It represents data in varying voltage levels. Examples include microphones and thermometers. Analog systems are sensitive to noise.

3: What is a logic gate?

Ans: Logic gates perform logical operations on inputs.

They process binary signals (0 or 1). Basic gates include AND, OR, NOT. They form the building blocks of circuits.

4: Describe the AND gate.

Ans: AND gate outputs 1 only if all inputs are 1. If any input is 0, output is 0. Used in decision-making circuits. Symbol looks like a D shape.

5: Describe the OR gate.

Ans: OR gate outputs 1 if any input is 1. Output is 0 only when all inputs are 0. Used to check multiple conditions. Symbol looks like a curved shield.

6: What does a NOT gate do?

Ans: NOT gate inverts the input signal. Input 1 gives output 0; input 0 gives output 1. It has only one input. Called an inverter.

7: Define NAND gate.

Ans: NAND is AND gate followed by NOT gate. Output is 0 only if all inputs are 1. Otherwise, output is 1.

Important in building digital logic.

8: Define NOR gate.

Ans: NOR is OR gate followed by NOT gate. Output is 1 only when all inputs are 0. Otherwise, output is 0. Used in control systems.

9: What is XOR gate?

Ans: XOR outputs 1 if inputs are different. If inputs are the same, output is 0. Used in error detection and parity checks. Symbol looks like OR gate with extra curve.

10: What is XNOR gate?

Ans: XNOR outputs 1 if inputs are the same. It is the complement of XOR. Used in equality detection. Symbol is XOR with a NOT bubble.

11: What is a truth table?

Ans: A truth table lists all possible inputs and outputs. It helps understand gate behavior clearly. Used for designing circuits. Includes all input combinations.

12: Convert binary 1010 to decimal.

$$(1 \times 2)^3 + (0 \times 2)^2 + (1 \times 2)^1 + (0 \times 2)^0$$

Ans: $1010 = 1 \times 8 + 0 \times 4 + 1 \times 2 + 0 \times 1$
 $= 8 + 0 + 2 + 0 = 10$ decimal.

Shows binary to decimal conversion.

13: What is a flip-flop?

Ans: Flip-flop stores one bit of data. It is a memory element in digital circuits. Used in registers and counters. Can remember state until changed.

14: What is a combinational circuit?

Ans: A combinational circuit's output depends only on current inputs. No memory or storage involved.

Examples: adders, multiplexers. Simple logic operations.

15: What is a sequential circuit?

Ans: Sequential circuits depend on current input and past output. They have memory elements like flip-flops. Used in clocks and counters. Enable complex operations.

16: What is the hexadecimal number system?

Ans: Hexadecimal uses 16 digits: 0–9 and A–F. It simplifies binary by grouping 4 bits. Used in programming and memory addresses. Easier for humans to read.

17: Convert decimal 15 to hexadecimal.

Ans: Decimal 15 corresponds to F in hexadecimal. Hex digits run from 0 to F (15). Used to shorten binary representation. Common in computers.

18: Why are digital systems preferred over analog?

Ans: Digital systems provide accurate and noise-free signals. Data can be easily stored and transmitted. They are more reliable and programmable. Ideal for modern electron.

Unit 4: System Troubleshooting

Short Questions from Exercise

1. What is the first step in the systematic process of troubleshooting, and why is it important?

Ans: **Identify Problem:** The first step in troubleshooting is to identify the problem. This means recognizing that something is not working as it should.

For Example: If you press power button and your laptop does not turn on, the problem is clear that it would not start.

2. After identifying a problem, what is the next step in troubleshooting, and how does it help in resolving the issue?

Ans: Once you have identified the problem the next step is to come up with a theory about what might be causing it. This involves thinking about what could have gone wrong.

For Example: If your laptop does not turn on possible causes might be a dead battery, a faulty power cord, or an internal hardware issue.

3. Describe the importance of testing a theory during the troubleshooting process. Provide an example.

Ans: After establishing a theory you need to test it to see if it is correct. This involves checking if the suspected cause is actually the reason for the problem.

For Example: If you think the laptop's battery is dead, you can test this theory by plugging in the power cord and seeing if the computer turns on.

4. Explain what the "Implement the Solution" step entails in a troubleshooting Implement the Solution.

Ans: Once you have a plan you need to put it into action. This means doing whatever necessary to fix the problem.

For Example: If your plan is to replace the battery you would buy a new battery and install it in your laptop.

5. Why is it necessary to verify full system functionality after implementing solution?

Ans: After implementing the solution you need to check to make sure that the problem is fully resolved and the system is working properly again.

For Example: Once you replace the battery, you should check to see if the laptop turns on and operates as expected without plugging in the power cord.

Additional Short Questions

1: What is system troubleshooting?

Ans: System troubleshooting is the process of identifying, diagnosing, and fixing problems in a computer system. It helps ensure the system runs smoothly and efficiently.

2: What are common symptoms of computer problems?

Ans: Slow performance, system crashes, unexpected shutdowns, and error messages are common symptoms. Hardware or software faults usually cause these issues.

3: Name three basic types of computer problems.

1. Hardware Problems 2. Software Problems 3. Network Problems

4: What is hardware troubleshooting?

Ans: It involves checking physical components like RAM, hard drive, cables, and power supply for faults. Tools like multimeters and diagnostic cards can be used.

5: What is software troubleshooting?

Ans: Software troubleshooting fixes problems like system errors, slow applications, or virus infections. It may involve reinstalling programs or updating drivers.

6: What should you do if your computer doesn't turn on?

Check the power cable, plug, and power supply. Also ensure the monitor is working and plugged in correctly.

7: Why does a computer restart again and again?

Ans: It could be due to hardware faults, overheating, or corrupted system files. Check RAM, CPU fan, and power supply.

8: What should you do if a program is not responding?

Ans: Use Task Manager to end the task. You may also restart the computer or reinstall the program.

9: What is a system restore?

Ans: System Restore returns your computer to a previous working state. It helps fix software problems without affecting personal files.

10: What are drivers?

Ans: Drivers are software programs that help the operating system communicate with hardware devices. Examples include printer and graphics card drivers.

11: What is disk cleanup?

Ans: Disk Cleanup is a utility that removes unnecessary files from the computer. It helps free up space and improves performance.

12: What is a booting problem?

Ans: A booting problem occurs when the computer fails to start properly. It may be caused by BIOS settings, hardware faults, or missing system files.

13: What is BIOS?

Ans: BIOS (Basic Input/output System) is firmware that starts hardware during boot. It also loads the operating system.

Unit 5: Software System

Short Questions from Exercise

1. Define system software and provide two examples.

Ans: System Software: A system software is designed to manage the system resources and provide a platform for application software to run. It acts as a bridge between the hardware and the user applications.

Examples.

Operating system. These include Microsoft Windows, macros, and Linux.

Device Drivers. These include printer drivers, graphics card driver, and sound card driver.

5. Differentiate between system software and application software with Examples.

Ans: **System Software:** See Q. No 1

Application Software: Application software is designed to help users perform specific tasks.

These programs are built to fulfill user needs and are typically more varied than system software.

Examples: **Word Processors,** Such as Microsoft Word and Google Docs.

Web Browsers. Such as Google Chrome, Mozilla Firefox, and Safari,

Games: Such as Minecraft, Fornite, and Among us.

Media Players: Such as VLC Media Player and Windows Media

Additional Short Questions

1: What is system software?

Ans: System software is a collection of programs designed to manage and control computer hardware. It provides a platform for running application software. Examples include operating systems, device drivers, and utility programs. It serves as an interface between hardware and user applications.

Unit 6: Introduction to Computer Networks

Short Questions from Exercise

1. Define data communication and list its key components.

Ans: Data communication refers to the transfer of data between devices through a transmission medium.

Key component:

i. **Sender:** The device that sends the data.

ii. **Receiver:** The device that receives the data.

iii. **Message:** The data being transmitted.

iv. **Transmission Medium:** The channel used to transmit data.

v. **Protocol:** A set of rules governing data transfer.

2. Explain the role of routers in a computer network.

Ans: Routers are networking devices that connect multiple networks and direct data packets between them. They determine the best path for data to travel and ensure efficient communication between devices.

3. What are the main functions of the Network Layer in the OSI model?

Ans: i. **Routing:** Determines the best path for data.

ii. **Addressing:** Assigns logical addresses to devices

iii. **Packet forwarding:** Sends data packets to their destination.

iv. **Error handling:** Ensures data integrity during transfer.

4: What is the purpose of the Dynamic Host configuration protocol?

Ans: **DHCP:** is used to automatically assign IP addresses to devices on a network. It ensures devices can connect to the network without manual configuration.

5. Differentiate between TCP and UDP in terms of data transfer reliability.

Ans: **TCP (Transmission Control Protocol):** Provides reliable data transfer with error checking and acknowledgment.

UDP: (user Datagram Protocol): offers faster, connectionless communication without error checking or acknowledgment, making it less reliable.

Additional Short Questions

1. What is a computer network?

Ans: A computer network is a group of two or more interconnected computers that can share data, hardware devices (like printers), software, and internet connections. Networks can be wired or wireless.

2: What are the main objectives of networking?

Ans: The main goals of networking are resource sharing, communication, reliability, and cost effectiveness. It allows users to work collaboratively and access data or devices remotely.

3: What is meant by resource sharing?

Ans: Resource sharing means using network connected resources like printers, scanners, or internet connections among multiple users, reducing the need for separate devices.

4: Define data communication.

Ans: Data communication is the exchange of data between two devices through a transmission medium. It involves a sender, receiver, message, and communication channel.

5: What are the main components of a data communication system?

Ans: The components include:

1. Message – the data to be communicated
2. Sender and receiver – the devices
3. Medium – path for data transfer
4. Protocol – rules for communication

6: What is meant by transmission medium?

Ans: A transmission medium is the physical path used to transmit data from one place to another.

Examples include copper wires, fiber optics, and radio waves.

7: What is network topology?

Ans: Network topology is the physical or logical arrangement of computers in a network. It shows how devices are connected and communicate with each other.

8: Name common types of network topologies.

Ans: Common network topologies include:

i Bus topology ii Star topology iii Ring topology iv Mesh topology v Tree topology

9: What is star topology?

Ans: In star topology, all computers are connected to a central hub or switch. If the central hub fails, the entire network goes down.

10: What is bus topology?

Ans: In bus topology, all devices are connected to a single communication line (the bus). If the bus line fails, the whole network stops functioning.

11: What is ring topology?

Ans: Ring topology connects computers in a circular fashion, where each computer is connected to two others. Data travels in one direction around the ring.

12: What is mesh topology?

Ans: In mesh topology, every device is connected to every other device in the network. It is reliable but expensive due to many cables.

13: What is a node?

Ans: A node is any device connected to a network. It can be a computer, printer, switch, or any other communication device.

14: What is a server?

Ans: A server is a powerful computer that provides data, services, or resources to other computers (clients) in a network.

15: What is a client?

Ans: A client is a computer or device that receives services or resources from a server in a network environment.

16: What is the difference between LAN and WAN?

Ans: LAN (Local Area Network) covers a small area like a home or school. WAN (Wide Area Network) covers large distances, such as cities or countries, like the Internet.

17: Define PAN and MAN.

Ans: PAN (Personal Area Network) connects devices around a person, like Bluetooth.

MAN (Metropolitan Area Network) spans a city or campus using high-speed connections.

18: What is the Internet?

Ans: The Internet is a global network of millions of computers that are interconnected to share information, communicate, and access web services.

19: What is the role of a modem in networking?

Ans: A modem (modulator demodulator) converts digital signals into analog and vice versa, allowing computers to connect to the internet via telephone lines.

20: What is a protocol in networking?

Ans: A protocol is a set of rules that computers follow to communicate in a network. Common protocols include TCP/IP and HTTP.

21: What is IP address?

Ans: An IP (Internet Protocol) address is a unique number assigned to every device on a network. It helps in identifying and locating devices.

22: What is a switch?

Ans: A switch is a network device that connects devices in a LAN and uses MAC addresses to forward data to the correct destination.

23: What is a router?

Ans: A router connects multiple networks together and directs data from one network to another, often used to connect a LAN to the internet.

24: What is peertopeer network?

Ans: In a peertopeer network, each computer acts as both a server and client. All devices share resources equally without a central server.

25: What is client-server network?

Ans: In a client-server network, one or more servers provide services or resources, and other devices (clients) request and use them.

Unit 7: Computational Thinking

Short Questions from Exercise

1. Define computational thinking.

Ans: Computational thinking is a problem-solving approach that involves breaking down complex problems into smaller parts, recognizing patterns, abstracting details, and developing step-by-step solutions that a computer can execute.

2. What is the decomposition in computational thinking?

Ans: Decomposition is the process of breaking a complex problem into smaller, manageable parts to make it easier to understand and solve efficiently.

3. Explain pattern recognition with an example.

Ans: Pattern recognition involves identifying similarities and trends in problems to develop efficient solutions.

Example: In mathematics recognizing the pattern in multiplication tables helps solve problems quickly.

4. Describe abstraction and its importance in problem-solving.

Ans: Abstraction is the process of filtering out unnecessary details to focus on the main concept of a problem. It helps in simplifying complex problems and making solution more efficient.

5. What is an algorithm?

Ans: An algorithm is a step-by-step sequence of instructions designed to perform a specific task or solve a problem systematically.

6. How does problem understand help in computational thinking?

Ans: Understanding a problem helps in identifying key components selecting appropriate techniques. And creating an effective solution in computational thinking.

7. What are flowcharts and how are they used?

Ans: A flowchart is a diagram that represents an algorithm using symbols and arrows. It is used to visually outline the steps of a process to ensure clarity and correctness.

8. Explain the purpose of pseudocode.

Ans: Pseudocode is a simplified way of writing algorithms using structured statements that resemble programming language syntax, making it easier to understand and implement in actual coding.

9. How do you differentiate between flowcharts and pseudocode?

Ans: Flowcharts use symbols and diagrams to represent processes. Pseudocode uses structured text and statement to describe an algorithm.

10. What is a dry run and why is it important?

Ans: A dry run is the process of manually tracing an algorithm step by step to check its correctness before execution. It helps in detecting logical errors early.

11. Describe LARP and its significance in learning algorithms.

Ans: LARP (Learn Algorithm Representation Process) is a method used to teach algorithm through visual representation. Making it easier to understand logical flow and debugging.

12. List and explain two debugging techniques.

Ans: Trace the steps: Reviewing each step of an algorithm to find errors. Check Condition: Ensuring all conditions in decision-making steps are correct.

Additional Short Questions

1. What is computational thinking?

Ans: Computational thinking is a problem-solving process that involves understanding a problem and designing solutions in a way that a computer can carry out. It uses logic, patterns, and step-by-step instructions.

2: What are the four key components of computational thinking?

Ans: The four components are:

1. Decomposition
2. Pattern Recognition
3. Abstraction
4. Algorithm Design

These help in solving complex problems in a structured way.

3: What is decomposition in computational thinking?

Ans: Decomposition is breaking a large or complex problem into smaller, more manageable parts. Each part can then be solved individually, making the overall problem easier to understand.

4: Give an example of decomposition.

Ans: For example, writing an essay can be broken into steps: choosing a topic, researching, writing an introduction, body, and conclusion. Each step is simpler to handle on its own.

5: What is pattern recognition?

Ans: Pattern recognition is identifying similarities, trends, or repeated elements in problems or data. Recognizing patterns helps in predicting future behavior and solving problems faster.

6: Give an example of pattern recognition.

Ans: In mathematics, when we notice that the sum of two even numbers is always even, we're using pattern recognition. It helps to apply previous knowledge to new problems.

7: What is abstraction?

Ans: Abstraction means focusing only on the important details and ignoring irrelevant information. It helps simplify problems and remove unnecessary complexity.

8: Give an example of abstraction.

Ans: When using Google Maps, we see only the roads and locations needed for navigation, not every tree or building. That's abstraction—it shows only relevant information.

9: What is algorithm design?

Ans: Algorithm design is creating a step-by-step procedure to solve a specific problem. It helps programmers tell computers exactly what to do, in a logical order.

10: Why is decomposition important?

Ans: Decomposition makes it easier to understand and solve problems. It helps in assigning different parts to different people or processes, improving efficiency and clarity.

11: What is the role of pattern recognition in programming?

Ans: Pattern recognition helps in reusing code and solutions. If a programmer sees a similar structure in different problems, they can apply the same logic or functions.

12: How does abstraction improve problem-solving?

Ans: Abstraction removes unnecessary details, letting you focus on the core problem. It prevents distraction and keeps the solution simple and efficient.

13: How do algorithms help in daily life?

Ans: We follow algorithms daily—like making tea, tying shoelaces, or solving a math problem. These tasks involve clear steps that are followed in order.

14: What are characteristics of a good algorithm?

Ans: A good algorithm should be: Clear and unambiguous

Finite (it must end) Effective and efficient

Easy to understand and implement

15: How is computational thinking related to computer science?

Ans: Computational thinking is the foundation of computer science. It trains the mind to think logically and systematically to create programs and solve digital problems.

16: Can computational thinking be used outside computer science?

Ans: Yes, it can be used in any field—science, business, or daily life. For example, organizing a party, planning a trip, or solving math problems all involve computational thinking.

17: What is meant by step-by-step instructions in algorithms?

Ans: Step-by-step instructions mean each action is written in a clear order. Computers follow instructions exactly, so missing or wrong steps can cause incorrect results.

18: Why is it important to recognize patterns?

Ans: Recognizing patterns helps predict outcomes and avoid repeating mistakes. It also makes coding and problem-solving more efficient through reuse of known solutions.

19: What is meant by generalization in pattern recognition?

Ans: Generalization is applying a solution or pattern seen in one problem to other similar problems. It helps in developing flexible and reusable solutions.

20: How does computational thinking make problems easier to solve?

Ans: It breaks big problems into smaller ones, highlights important parts, and creates a logical plan to solve them. This makes even difficult problems manageable.

21: Can we use computational thinking without a computer?

Ans: Yes, computational thinking is a way of thinking, not coding. We use it when planning a schedule, solving a puzzle, or organizing tasks logically.

22: What is the difference between algorithm and program?

Ans: An algorithm is a set of steps to solve a problem. A program is the actual code written in a programming language based on that algorithm.

23: Why is testing algorithms important?

Ans: Testing ensures the algorithm works correctly for all inputs. It helps catch errors early and ensures the solution is reliable and accurate before implementation's.

Unit 8: Web Development with HTML, CSS and JavaScript

Short Questions from Exercise

1. What is the purpose of the <head> tag in HTML?

Ans: The <head> tag contains meta-information about the HTML document, such as the title, character set, stylesheets and scripts.

2. Explain the difference between an ordered list and an unordered list in HTML.

Ans: An ordered list displays items in a numbered sequence using tags while an unordered list displays items with markers, typically bullets using tag.

3. How do you add a comment in CSS?

Ans: you add a comment in CSS by using /* to begin the comment and */ to end it.

4. What are the different ways to apply CSS to an HTML document?

Ans: There are three main ways to apply CSS to an HTML document.

Inline CSS: Apply styles directly to an HTML element using the style attribute.

Internal CSS: Embed CSS within the < style> tags in the <head> section of the HTML document.

External CSS: Create a separate CSS file and link it to the HTML document using the <link> tag in the <head> section.

5. How can you include JavaScript in an HTML file?

Ans: you can include JavaScript in an HTML file using the <script> tag. Which can be placed either in the <head> or the <body> section.

6. Describe the syntax for creating a hyperlink in HTML.

Ans: The basic syntax for creating a hyperlink in HTML is: link text.

7. What is the function of the <div> tag in HTML?

Ans: The <div> tag is a generic container element that divides the HTML document into logical sections. It allows you to group and style content.

8. How do you link an external CSS file to an HTML document?

Ans: You link an external CSS file using the <link> tag in the <head> section of your HTML document. The href attribute specifies the path to the CSS file.

9. What is the use of the <table> tag in HTML?

Ans: The <table> tag defines a table structure in HTML. It is used to display data in rows and columns.

10. Explain the box model in CSS.

Ans: The CSS box model represents every HTML element as a rectangular box with the box model defining the space around its content.

Additional Short Questions

1: **What is HTML?**

Ans: HTML (Hypertext Markup Language) is the standard language used to create and structure content on the web. It defines elements like headings, paragraphs, links, images, and lists.

2: **What is the purpose of HTML in web development?**

Ans: HTML provides the structure of a web page. It organizes content such as text, images, and links using tags so browsers can display it correctly.

3: **What is a tag in HTML?**

Ans: A tag is a keyword enclosed in angle brackets like `<p>` or ``. Tags define elements on a webpage and often come in pairs, such as `` and ``.

4: **What is a web browser?**

Ans: A web browser is a software application used to access and view websites. Examples include Google Chrome, Mozilla Firefox, Microsoft Edge, and Safari.

5: **Name any three basic HTML tags.**

Ans: Three basic HTML tags are:

1. `<html>` – Defines the entire HTML document
2. `<head>` – Contains metadata like the title
3. `<body>` – Contains the content shown on the webpage

6: **What is the use of the `<title>` tag?**

Ans: The `<title>` tag defines the title of the web page, which appears in the browser's title bar or tab. It also helps in SEO (Search Engine Optimization).

7: **What is CSS?**

Ans: CSS (Cascading Style Sheets) is used to control the layout and style of HTML elements. It defines colors, fonts, sizes, spacing, and positioning on web pages.

8: **What are the types of CSS?**

Ans: There are three types of CSS:

1. Inline CSS (inside HTML tags)
2. Internal CSS (in `<style>` tag in `<head>`)
3. External CSS (linked using a separate .css file)

9: **Why is CSS used with HTML?**

Ans: HTML structures the content, but CSS improves the visual appearance. It separates content from design, making web pages more attractive and easier to maintain.

10: **What is an element in HTML?**

Ans: An element includes a start tag, content, and end tag. For example, `<p>`This is a paragraph. `</p>` is an HTML element.

11: **What is a script tag?**

Ans: The `<script>` tag is used to include JavaScript code in an HTML document. It can be placed in the `<head>` or `<body>` section.

12: **What are comments in HTML and JavaScript?**

Ans: Comments are notes added to the code to explain it. In HTML, use `<!-- comment -->`, and in JavaScript, use `//` for single line or `/* ... */` for multiline.

13: **What is the use of the `<a>` tag?**

Ans: The `<a>` tag is used to create hyperlinks to other pages or websites. The `href` attribute specifies the destination URL.

14: **What is the difference between internal and external CSS?**

Ans: Internal CSS is written within the `<style>` tag in the `<head>` section of an HTML file. External CSS is written in a separate .css file and linked using `<link>`.

15: **What is the `<style>` tag used for?**

Ans: The `<style>` tag is used to define internal CSS styles. It is placed in the `<head>` section of the HTML document.

16: **What is the purpose of `<div>` tag in HTML?**

Ans: The `<div>` tag is a container used to group HTML elements together. It's useful for applying styles or scripts to a section of content.

17: **What is the use of `<head>` tag in HTML?**

Ans: The <head> tag contains metadata about the webpage, such as the title, links to CSS files, scripts, and character encoding.

18: What is the difference between and tags?

Ans: creates an unordered list with bullet points, while creates an ordered list with numbered items.

Unit 9: Data Science and Data Gathering

Short Questions from Exercise

1. What type of data is the number of students in your class?

Ans: The number of students is discrete quantitative data because it consists of whole numbers and cannot be broken into fractions.

2. Why is it important to organize data into tables or charts before analyzing it?

Ans: It helps in better visualization, comparison, and interpretation of the data making it easier to identify trends and patterns.

3. Explain why data visualization is important. How does it help in understanding complex information?

Ans: It simplifies complex data making it easier to interpret identify patterns, and make decisions using charts graphs and infographics.

4. Describe what a line graph is used for and provide an example of data that could be displayed using a line graph.

Ans: A line graph is used to show trends over time.

Example: Tracking a student's grades in different subjects over a school year.

Additional Short Questions

1. What is data science?

Ans: Data science is the study of extracting meaningful information and insights from large amounts of data. It combines mathematics, statistics, computer science, and domain knowledge to analyze data and make decisions.

2: Why is data science important?

Ans: Data science helps businesses, governments, and researchers make informed decisions. It turns raw data into useful knowledge and predicts future trends to improve performance and services.

3: What are the key components of data science?

Ans: The main components include:

Data collection

Data cleaning

Data analysis

Data visualization

Machine learning

These help transform data into actionable insights.

4: What is structured data?

Ans: Structured data is organized and stored in a fixed format like rows and columns in a table. It is easy to search, filter, and analyze using tools like Excel or SQL.

5: What is unstructured data?

Ans: Unstructured data has no specific format and includes things like images, videos, emails, and social media posts. It is harder to analyze and requires special tools.

6: What is semi structured data?

Ans: Semi structured data is a mix of structured and unstructured data. It may have some organizational properties, like tags in XML or JSON, but does not follow a fixed table format.

7: What is data analysis?

Ans: Data analysis involves inspecting, cleaning, and modeling data to discover useful information. It helps identify patterns, draw conclusions, and support decision-making.

8: What are the tools used in data science? Common tools include:

Excel and Google Sheets

Python and R programming languages

SQL for databases

Tableau and Power BI for data visualization

9: What is machine learning in data science?

Ans: Machine learning is a branch of artificial intelligence (AI) that allows computers to learn from data and make predictions or decisions without being programmed explicitly.

10: What is data cleaning?

Ans: Data cleaning is the process of fixing or removing incorrect, incomplete, or duplicate data. It ensures the accuracy and quality of data before analysis.

11: What is the role of a data scientist?

Ans: A data scientist collects, analyzes, and interprets data. They build models, make predictions, and help organizations make data driven decisions.

12: What is data privacy?

Ans: Data privacy is the protection of personal and sensitive information from unauthorized access. It ensures that data is collected and used in a legal and ethical way.

13: What is the difference between data and information?

Ans: Data is raw and unorganized facts. Information is processed, organized, and meaningful data used for decision-making or understanding something.

14: What are open data sources?

Ans: Open data sources are freely available to the public and can be used without restrictions.

Examples include government websites and global research databases.

15: How can we gather data through surveys?

Ans: Surveys use questionnaires to collect responses from people. They can be conducted online, on paper, or by phone to gather opinions, preferences, or feedback.

16: How is social media a source of data?

Ans: Social media platforms generate huge amounts of unstructured data like comments, likes, and posts.

This data can be analyzed for trends, public opinion, and behavior.

17: What is the purpose of using charts and graphs in data science?

Ans: Charts and graphs help present data in a visual format, making it easier to understand patterns, trends, and comparisons. They improve communication of insights.

Unit 10: Emerging Technologies in Computer Science

Short Questions from Exercise

1. Define Artificial Intelligence (AI).

Ans: Artificial Intelligence (AI) refers to the simulation of human intelligence machines that are designed to think and act like humans. It includes tasks such as learning, reasoning, problemsolving and decision-making.

3. Provide two examples of AI applications in healthcare.

Ans: **Medical Imaging:** AI is used to analyze X-rays, MRIs and CT scans to detect abnormalities like tumors.
Personalized Medicine: AI helps predict the best treatments for individual patients by analyzing genetic and medical data.

4. Explain the role of AI techniques in advancing machine learning models.

Ans: AI techniques like neural networks, deep learning, decision trees, and reinforcement learning enable machines to learn from data, improve over time, and solve complex problems with greater accuracy.

5. Define the Internet of Things (IoT).

Ans: IoT refers to a network of interconnected devices that communicate and share data via the internet. These devices include smart home appliances, wearable technologies and industrial sensors.

6. Describe the significance of IoT in connecting devices and systems.

Ans: IoT enables seamless communication between devices, improving efficiency, automation, and data-driven decision-making in various fields like healthcare agriculture, and smart cities.

Additional Short Questions

1. What are emerging technologies?

Ans: Emerging technologies are newly developing or rapidly evolving technologies that can significantly impact society, industry, and the economy. They often bring innovation and improvements to existing systems and create new possibilities.

2: Why are emerging technologies important?

Ans: Emerging technologies solve real-world problems, improve productivity, and open up new job opportunities. They also transform industries like healthcare, education, business, and communication.

3: What is Artificial Intelligence (AI)?

Ans: Artificial Intelligence is the ability of machines or software to mimic human intelligence. AI enables computers to learn, reason, solve problems, and make decisions without direct human input.

4: What are some common uses of Artificial Intelligence?

Ans: AI is used in voice assistants (like Siri), self-driving cars, face recognition, chatbots, medical diagnosis, and recommendation systems in platforms like YouTube or Netflix.

5: What is the Internet of Things (IoT)?

Ans: IoT refers to a network of physical devices connected to the internet that collect and exchange data. These devices include smart home appliances, wearables, and industrial sensors.

6: How does IoT impact daily life?

Ans: IoT allows remote control and monitoring of devices. For example, smart thermostats adjust room temperature automatically, and fitness bands track your health in real time.

7: What is cloud computing?

Ans: Cloud computing is the delivery of computing services like storage, software, and databases over the internet. It allows users to access data and applications from anywhere without owning physical servers.

8: What is the use of Virtual Reality in education?

Ans: VR helps students explore historical places, the human body, or science labs virtually. It enhances learning through realistic simulations and engaging environments.

9: What is Augmented Reality (AR)?

Ans: Augmented Reality overlays digital content, such as images or sounds, on the real world using devices like smartphones or AR glasses. It enhances the user's real-world experience.

10: Give an example of Augmented Reality in use.

Ans: AR is used in games like Pokémon GO, where digital characters appear in the real environment. It is also used in education, shopping apps, and interior design tools.

11: What is Robotics?

Ans: Robotics is the branch of technology that deals with designing, building, and operating robots. Robots are machines that can perform tasks automatically or with minimal human help.

12: Where are robots used today?

Ans: Robots are used in manufacturing, space exploration, medicine, military, and home cleaning (like robotic vacuum cleaners). They perform tasks that are dangerous, repetitive, or require high.

Unit 11: Ethical, Social, and Legal Concerns in Computer Usage

Short Questions from Exercise

1. What is the importance of using computers safely and responsibly?

Ans: Using computers safely and responsibly prevents data loss, protects privacy, avoids cyber threats, and ensures ethical use of technology.

6. Why should you create strong unique passwords for your accounts?

Ans: Strong, unique passwords reduce the risk of hacking and unauthorized access to personal information.

7. What is the purpose of regular software updates?

Ans: Regular updates fix bugs, enhance security, and add new features to improve software functionality.

8. How can you protect yourself from harmful links and downloads?

Ans: Avoid clicking on suspicious links, download files only from trusted sources, and use security tools.

9. What is two factor Authentication (2FA) and why is it useful?

Ans: 2FA adds an extra security layer by requiring a second verification step, such as a code, making unauthorized access difficult.

10. Why is it a good idea to avoid using public Wi-Fi for sensitive transactions?

Ans: Public Wi-Fi is insecure, and hackers can intercept data during sensitive transactions.

11. How can you verify if an email or message is a scam?

Ans: Check for suspicious sender addresses, grammatical errors, urgent language, and avoid clicking unknown links.

12. Why is it important to be careful about what you share on social media?

Ans: Sharing too much can lead to privacy issues, identity theft, or misuse of personal information.

13. What should you do if you receive an email from an unknown sender asking for personal information?

Ans: Avoid responding, do not click on links, and report the email as spam.

16. What is the difference between copyright, trademarks, and patents?

- Copyright protects original works like books and music.
- Trademarks protect brand names and logos.
- Patents protect inventions and innovations.

17. Why is it important to respect intellectual property rights?

Ans: Respecting intellectual property encourages innovation, supports creators, and avoids legal issues.

Additional Short Questions

1: What is meant by computer ethics?

Ans: Computer ethics refers to moral principles and guidelines that govern the use of computers. It helps users understand what is right or wrong when using technology, especially concerning privacy, honesty, and responsibility.

2: Why are computer ethics important?

Ans: They promote respectful and fair use of technology. Following ethics prevents harm, protects privacy, avoids illegal activities like hacking, and builds trust in digital systems.

3: What is cybercrime?

Ans: Cybercrime is any illegal activity carried out using a computer or the internet. Examples include hacking, identity theft, online fraud, and spreading viruses.

4: What is hacking?

Ans: Hacking is unauthorized access to or control over computer systems, often to steal data, damage files, or cause disruption. It is considered a criminal act under cyber laws.

5: What is a computer virus?

Ans: A computer virus is a malicious program designed to harm, steal, or damage data. It spreads from one system to another, often through infected files or emails.

6: What is data privacy?

Ans: Data privacy is the protection of personal or sensitive information from being accessed, shared, or stolen without permission. It ensures users' rights over their own data.

7: Why is data privacy important?

Ans: It protects individuals from identity theft, financial fraud, and misuse of personal data.

Organizations must handle users' data responsibly and lawfully.

8: What are intellectual property rights?

Ans: Intellectual property rights (IPR) protect creators' work like software, music, videos, and designs.

These rights prevent others from copying or using the work without permission.

10: What are social impacts of computer usage?

Ans: Computer usage can affect communication, education, employment, and relationships. While it offers many benefits, overuse or misuse may lead to social isolation or addiction.

11: What are the positive effects of computer usage on society?

Ans: Computers improve communication, provide access to education, support businesses, and increase productivity. They help in health care, research, and social networking.

12: What are the negative effects of computer usage on society?

Ans: Negative effects include cyberbullying, addiction, online scams, and loss of privacy. Misuse can harm mental health, reduce face-to-face interactions, and cause security issues.

Unit 12: Entrepreneurship in Digital Age

Short Questions from Exercise

1. What is the meaning of the word entrepreneur and its origin?

Ans: The word "entrepreneur" originates from a French word "entreprendre". Meaning "to undertake"

It refers to a person who starts and manages a business. Taking financial risks to earn a profit.

2. How do digital technologies help entrepreneurs reach a global audience?

Ans: Digital technologies such as e-commerce platforms, social media and online marketing tools help entrepreneurs reach a global audience by expanding their customer base enabling online transactions and providing cost-effective advertising methods.

4. What is an e-commerce platform, and why is it important for businesses?

Ans: An e-commerce platform, and why is it important for businesses to sell products or services over the internet. It is important because it helps businesses expand their reach operate 24/7 and reduce operational costs while improving customer convenience.

5. Why is it important to identify market needs when generating a business idea?

Ans: Identifying market needs ensures that the business idea is relevant, solves a real problem, and has a demand. This increases the chances of business success by meeting customer expectations effectively.

6. Explain the importance of market analysis in a business plan. Give an example.

Ans: Market analysis helps businesses understand customer preferences, competitors and market trends. For example, a Pakistani clothing brand can conduct market analysis to identify fashion trends, pricing strategies, and target customers to compete effectively.

7. What are revenue models, and why are they essential components of a business plan?

Ans: A revenue model outlines how a business will generate income. It is essential for sustainability, profitability, and financial planning helping businesses decide on pricing strategies and revenue streams.

8. How can businesses contribute to environmental sustainability according to the sustainable development Goals?

Ans: Businesses can contribute to environmental sustainability by reducing carbon footprints, using renewable energy, minimizing waste, and adopting eco-friendly practices, For Example companies investing in solar energy support SDG7.

Additional Short Questions

1. What is entrepreneurship?

Ans: Entrepreneurship is the process of starting and managing a new business. It involves taking risks to introduce new ideas, products, or services in the market.

2: Who is called an entrepreneur?

Ans: An entrepreneur is a person who identifies a business opportunity, takes risks, and starts a business to make a profit, often by offering something new or better.

3: What is digital entrepreneurship?

Ans: Digital entrepreneurship uses digital tools and the internet to start and run a business. It includes ecommerce, freelancing, mobile apps, and online services.

4: How has the digital age changed business?

Ans: The digital age allows businesses to reach more customers online, use digital marketing, and reduce startup costs. It also supports remote work and faster communication.

5: What is innovation in entrepreneurship?

Ans: Innovation means introducing new ideas, methods, or products. It helps entrepreneurs improve their business and compete in the market.

6: How can social media help entrepreneurs?

Ans: Social media helps entrepreneurs market their products, attract customers, and communicate with followers at a low cost, making it a powerful business tool.

7: What are some benefits of digital entrepreneurship?

Ans: Benefits include low setup cost, global reach, flexible work hours, fast communication, and access to online tools for marketing and management.

8: What challenges do digital entrepreneurs face?

Ans: They may face issues like internet access problems, lack of digital skills, online fraud, strong competition, and difficulties in gaining customer trust.

9: Why is entrepreneurship important for the economy?

Ans: Entrepreneurship creates jobs, brings innovation, increases national income, and helps in solving local and global problems through business solutions.

10: What is digital marketing?

Ans: Digital marketing is promoting products or services through online platforms like websites, social media, and email to reach and attract customers effectively.