Topic Wise Additional Questions for Short Answers

1.1 Theory of Systems:

A: General Systems Theory

1: What is a system?

Ans: A system is an organized set of components that work together to achieve a specific objective. A system is described by its objectives components, communication among components and environment in which it works.

2: What is Systems Theory?

Ans: A branch of a science that deals with complicated structures in living organisms, that relate the human with society and the science is known as Systems Theory. It gives a way of gives interpreting the existing world with different varied perspectives, how the different systems perate, how they grow and how they change with time.

3: Name two examples of systems in nature.

Ans: The human body and the DNA system.

4: What is the role of components in a system? Give an example from daily life?

Ans: System is simply an organized set of components that are coordinated to perform a designated function. All the components of the system are in some way related to each other and the functioning of the other components enhances the operation of the system.

Let us consider a simple example, such as a car, it is made up of an engine, wheels, brakes, and other related items. Every part plays a unique task, but collectively they are responsible for making the car move.

5: What is a principal goal of computer system?

Ans: A computer system's principal goal is to process data and provide useful information to users.

B: Components and Objectives

6: What are components in a system?

Ans: Components are the building blocks of a system that work together to achieve its objective. Each component plays a specific role and contributes to the overall functionality of the system. Understanding the role of each component of the system is essential to understand how the entire system works.

7: Give an example of a system with a specific objective.
Ans: A thermostat system aims to maintain a set temperature.

C: Tit Bits

8: What does DNA do in the human body?
Ans: DNA acts as a blueprint, containing instructions for growth, development, and reproduction.
9: How fast does information travel in the human brain?
Ans: About 268 miles per hour.
10: How many neurons are there in the human brain?
Ans: Approximately 86 billion neurons.

D: Environment

11: What is the environment of a system?
Ans: The environment includes everything external to a system that interacts with it. It consists of all external factors that affect the system's operation.
12: What is difference between static and dynamic environment?
Ans: Static: The environment remains unchanged unless the system provides an output. There are no changes occurring in the environment while the system is working internally.
Dynamic: The environment can change independently of the system's output. The system must account for changes that occur over time in the environment.
13: What is the difference between deterministic and non-deterministic environments?
Ans: Deterministic: A deterministic system is characterized by its fully known and certain impact of its output on the environment.
Non-deterministic: The impact of the system's output on the environment is characterized by inherent uncertainty, randomness, or probability.

E: Communication

14: Why is communication important in a system?
Ans: It ensures that components work together in an organized way to achieve the system's objectives.
15: Give an example of a system interacting with its environment.
Ans: A weather monitoring system receives data from sensors and provides forecasts to users.
16. How do systems interact with their environment?
Ans: Systems interact through inputs (data, resources) and outputs (results, actions). It means the system exchanges inputs (like data or resources) and outputs (like actions or results) with its surroundings.
17. How do computing systems interact with peripheral devices?
Ans: Computing systems communicate with peripherals like printers and scanners to perform tasks like printing documents or scanning images.

18. What is an example of interaction in biological systems?

Ans: Animals interact with plants and other animals, forming a food chain.

19. What is the role of sensors in system-environment interaction?

Ans: Sensors collect data from the environment to provide inputs for the system.

1.2: Types of Systems

20. What are the two main types of systems?

Ans: Systems can be divided into two types, natural system and artificial systems. Natural systems are naturally built and occur in nature without human intervention. While artificial systems are created by humans to fulfill specific needs or purposes.

21. What defines a natural system? Give an example.

Ans: Natural systems are those that exist in nature and operate independently of human involvement. They are governed by natural laws and processes. Natural systems are of various forms and sizes, from very tiny objects like atoms and cells in our body to very huge like forests, oceans and the cosmos.

22. What are artificial systems? Give an example.

Ans: Artificial systems are created and developed by people so that they may fulfill certain functions or address certain issues. These systems can be as small as a wheel or as large as the United Nations. Each system is designed to improve the efficiency of the processes and provide solutions to various issues.

23 What are physical systems? Give an example.

Ans: Physical systems are composed of physical components and governed by the laws of physics. They include things ranging from atoms to planets, stars, galaxies, and cosmos. For example hydrogen gas is formed when an electron, proton and neutron combine, following the rules of physics.

24. What are chemical systems? Give an example.

Ans: Chemical systems involve substances and their interactions, transformations, and reactions. They are governed by the laws of chemistry. Chemical systems form when atoms and molecules interact forming new substances. For example, water is formed when hydrogen atoms bond with oxygen atoms, following chemical rules and reactions.

25. What are biological systems? Give an example.

Ans: Biological systems consist of living organisms and their interactions. They are governed by biological processes such as growth, reproduction, and metabolism Biological systems emerge from chemical systems when molecules interact in complex ways to form living cells which then organize into tissues, organs, and organisms.

26.How do psychological systems emerge?

Ans: Psychological systems involve the mind and behavior. They include thoughts, emotions, and mental processes, governed by the principles of Psychology. Psychological systems emerge from biological systems when the brain's physical and chemical processes give rise to thoughts, emotions, and behaviors.

27. What is a knowledge system?

Ans: A knowledge system is unique because it is developed to capture, process, facilitate, store, retrieve and manage information. Such systems facilitate in managing and utilizing the resources of knowledge effectively for the purpose of decision-making, learning and problem-solving.

28. What is the role of knowledge system in mathematics.

Ans: Mathematics is a field of knowledge, which is studied to focus problems connected to numbers, their amounts, forms, structures, and patterns.

29. What is logic?

Ans: Logic is a theoretical model consisting of concepts and strategies on identifying and assessing rationale. That is why it is a basis of all logical thinking processes and practice of critical analysis.

30. What is the purpose of a database system? Give examples.

Ans: A database system is used for managing data, particularly to enable easy retrieval, management, and updating of data. Some of the examples are relational database management system like MySQL while others are NoSQL database management system like MongoDB.

31. What are engineering systems?

Ans: Products developed by engineers are complex frameworks or devices that apply engineering concepts to perform certain tasks or solve technical challenges.

32. What are some examples of engineering systems?

Ans: Civil engineering systems (e.g., bridges), mechanical engineering systems (e.g., robotic arms), chemical engineering systems (e.g., water treatment plants), electrical engineering systems (e.g., home automation systems), and software engineering systems (e.g., online library management tools).

33.What do civil engineering systems focus on?

Ans: Construction and maintenance of structures like houses, roads, and bridges.

34. What is a mechanical engineering system?

Ans: Engage in planning and creating devices that make utilization of forces from outside to accomplish work. For instance, a robotic arm applied in assembly line for packaging of products in factories.

35. How do chemical engineering systems operate?

Ans: They convert raw materials into useful products through chemical processes, such as water treatment plants.

36. What do electrical engineering systems involve?

Ans: The study and application of electricity and electronics to create systems like home automation.

37. What is a software engineering system?

Ans: It is the process of designing, developing. and maintaining software to perform certain tasks eradicating errors. For instance, an online tool assisting a library in tracking books, users as well as stocks in their possession.

38. What is an example of an artificial engineering system?

Ans: The Metro Train System in Lahore.

39. What are the components of the Metro Train System?

Ans: Tracks, trains, stations, and control systems.

40. What is an example of an AI system that can recognize and respond to human speech?

Ans: Siri and Alexa.

41. What is Virtual Reality (VR)?

Ans: Immersive digital worlds that enable exploration and interaction as if you were physically present.

42. What are some applications of Virtual Reality (VR)?

Ans: Gaming, teaching, and astronaut training.

Social Systems:

43. What are social systems? Give examples.

Ans: Social systems refer to structured frameworks established by individuals to effectively handle social interactions, organizational governance, and communal endeavors. The basic goal of these systems is to maintain order, provide services, and facilitate social connections. Academic institutions, governments, and organizations are some examples of social systems.

44. What is the main goal of social systems?

Ans: To maintain order, provide services, and facilitate social connections.

1.3: System and Science

45. What is natural science? Give example.

Ans: Natural science is meant to uncover the objectivity and functionality of natural systems in the natural world. Its nature is descriptive, meaning that the scientists seek to understand and describe natural phenomena. For example: Studying the ecosystem of a forest to understand how different species interact (descriptive).

46. What is design science? Give example.

Ans: Design Science is focused on designing and creating artifacts (tools, systems; methods) to achieve specific goals. The nature of design science is prescriptive, meaning that it aims to prescribe and create artificial systems. For example: Developing a new software system to manage forest data and improve conservation efforts (prescriptive).

47. What is the difference between natural science and design science?

Ans: Natural science studies existing natural systems, while design science creates new systems to solve problems or achieve specific goals.

48. What is the nature of natural science?

Ans: Descriptive, seeking to understand and describe natural phenomena.

49. What is the nature of design science?

Ans: Prescriptive, aiming to prescribe and create artificial systems.

50. What is computer science?

Ans: Computer science is the study of how computers work, including at what they can do and their limitations. To understand computer science, we use methods of both design science and natural science.

51. Which two sciences are used to understand computer science?

Ans: Design science and natural science.

52. What is the focus of natural science in computer science?

Ans: Natural science of computer science focuses on finding the basic rules that control how computer systems work. This involves the study of various algorithms and their characteristics.

53. What is the focus of design science in computer science?

Ans: Creating and improving computer tools and systems.

54. What is an example of natural science in computer science?

Ans: Studying different sorting algorithms and their characteristics.

55. What is an example of design science in computer science?

Ans: Developing a new programming language that makes it easier to write secure computer programs.

56. Give an example of algorithms studied in computer science.

Ans: Quicksort and MergeSort are examples of algorithms studied for their speed and performance with different data types.

57. What is the purpose of analysing sorting algorithms?

Ans: To understand their efficiency and how they perform with different kinds of data.

1.4: Computer as a System

58. What is the main objective of a computer?

Ans: To perform computations, process data, and execute different tasks efficiently.

59. What are the main components of a computer?
Ans: Interface components, processing components, and communication components.
60. What is the function of the CPU in a computer?
Ans: The processing components of a computer consist of the CPU, which acts as the Central Processing Unit responsible for computations and executing command.
61. What is the role of the operating system in a computer?
Ans: The operating system is responsible for receiving information from interface components and determining the appropriate actions to take.
62. How do the components of a computer interact with each other?
Ans: Through a series of steps, including user input, processing, and output.
63. What is the environment of a computer system?
Ans: Any external devices that interact with the computer, such as power supply, network, and peripherals.
64. What are interface components in a computer system?
Ans: Interface components refer to the fundamental parts of a computer system, including input devices such as the keyboard and mouse, which allow users to interact with the computer and computer output devices, such as monitors and printers are used to present or generate results from the computer's operations.
65. What is the role of RAM in a computer?
Ans: It is a transient storage that holds data and instructions for the CPU temporarily.
66. What are communication components?
Ans: Communication components in a computer refer to the physical elements that provide communication between different components of the computer. For example, mother board, bus etc.
67. What is the purpose of a motherboard?
Ans: It serves as the primary circuit board interconnecting all components using cables and circuits.
68. Name the three types of system buses in a computer.
Ans: Data bus, address bus, and control bus.
69. What does the computer system environment include?
Ans: The computer system environment includes any external devices that interact with the computer. For example:
- Power Supply: Provides electrical power to allow the computer to work.
- Network: Connects the computer to other systems and the Internet.
- Peripherals: Include printers, scanners, and external discs that expand the computer's capabilities.

70. How does a computer interact with its environment?
Ans: A computer interacts with its environment to perform its functions. For examples;
- User Input: A user types on the keyboard, and the computer processes the input to display text on the screen.

• Network Communication: The computer sends and receives data over the internet to browse websites or download files.
• Power Supply: The computer relies on a stable power supply to function correctly.

1.4: The Architecture of Von Neumann Computers

71. What is the Von Neumann architecture?
Ans:: A computer paradigm that delineates a system with four primary components: memory, CPU, input mechanisms, and output mechanisms.
72. Who developed the Von Neumann architecture?
Ans: Mathematician and physicist John von Neumann who contributed to its development during the 1940s.
73. What are the four primary components of the Von Neumann architecture?
Ans: Memory, Central Processing Unit (CPU), input mechanisms, and output mechanisms.
74. What is the function of the memory in the Von Neumann architecture?
Ans: Contains both input data and the instructions (program) required for CPU processing. For instance, consider the RAM of your Computer: when a program starts it is loaded into RAM to enable faster execution compared to when it runs from the hard disk.
75. What are the two main components of the Central Processing Unit (CPU)?
Ans: The Arithmetic Logic Unit (ALU) and the Control Unit (CU).
76. What are examples of input devices in the Von Neumann architecture?
Ans:: Keyboard, mouse, and microphone.
77. What are examples of output devices in the Von Neumann architecture?
Ans: Monitor and printer.
78. What does the Arithmetic Logic Unit (ALU) do?
Ans: It performs mathematical computations and logical operations.
79. What role does the Control Unit (CU) play?
Ans: A Control Unit (CU) is a peripheral that governs the activities of the CPU by instructing the ALU and memory to execute tasks according to the program instructions. It ensures the proper-and timely execution of duties by all the other components.
When doing the calculation 2 + 2 on a calculator application, the Arithmetic Logic Unit (ALU) handles the numerical values while the control Unit (CU) supervises the whole procedure.
80. What are input devices used for in this architecture? Give examples.
Ans: Enable users to input data and instructions into the computer system. Illustrative examples include keyboard, mouse, and microphone. Entering text on the keyboard transmits data to the CPU for subsequent processing.

81. What are output devices used for? Give examples.
Ans: To present or communicate the results of tasks executed by the computer. Examples are monitor and printer.
82. What is a system bus?
Ans: A communication mechanism that facilitates the movement of data between components inside a computational system.
83. What does the Data Bus do?
Ans: Transports data.
84. What is the function of the Address Bus?
Ans: Maintains data destination information.
85. What does the Control Bus transport?
Ans: Control electrical signals.
86. Discuss the role of CPU in the light of Von Neumann Architecture.
Ans: Central Processing Unit (CPU) performs addition and subtraction, and executes commands provided by the memory. The system has two main components: the Arithmetic Logic Unit (ALU) and the Control Unit (CU). The Arithmetic Logic Unit (ALU) performs mathematical computations and logical operations.
87. What are the four stages of the Von Neumann architecture?
Ans: Fetching, decoding, execution, and storing.
88. What is the role of the Program Counter (PC) in the fetching stage?
Ans: Stores the memory address of the subsequent instruction. . Once the address is stored in memory, the instruction located at that location is retrieved and placed into the Instruction Register (IR).
89. What is the role of the Control Unit (CU) in the decoding stage?
Ans: The control unit (CU) decodes the opcode (operation code) of the instruction and determines the required procedures and data.
90 What is the role of the Arithmetic Logic Unit (ALU) in the execution stage?
Ans: The Arithmetic and Logic Unit (ALU) carries out mathematical and logical calculations, while the Control Unit (CU) handles data transmission activities.
91. What is the key characteristic of the Von Neumann architecture regarding memory storage?
Ans: 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 data (like scores and player positions) are stored in the same RAM.
92. What is the Von Neumann bottleneck?
Ans: A limitation that occurs when a single memory area limits the CPU's ability to retrieve instructions and data quickly.
93. What are the advantages of the Von Neumann architecture?
Ans: Simplified Design: By combining instructions and data into a single memory area, architecture is simplified.
Flexibility: Programs can be easily changed by changing memory contents.

94. What are the disadvantages of the Von Neumann architecture?

Ans: The Von Neumann bottleneck occurs when a single memory area limits the CPU's ability to retrieve instructions and data quickly.
Security Risks: Having data and instructions stored in the same area poses a problem where one program can alter another's instructions in a manner that is security risk.

1.6: Computing Systems

95. What is a computer system?

Ans: A computer system is a structured set of hardware and software components specifically designed for data processing and the performance of various operations. These systems can range from simple technological tools, such as calculators used for performing mathematical calculations to complex network of linked computers.

96. What are the three basic requisites needed to run a computing system?

Ans:: Hardware, software, and electric power.

97. What is computer hardware?

Ans: Hardware of a computer System refers to the tangible components of the system. These include the Central Processing Unit (CPU), Random Access Memory (RAM), storage devices, and input and output devices.

98. What is computer software?

Ans: Software refers to a collection of instructions that dictate the requirements and actions that hardware must do.

99. What is the difference between system software and application software?

Ans: System Software encompasses the Operating System (OS) and utility applications responsible for managing the computer's resources, such as Windows, macOS, and Linux distributions.
Application software refers to software applications that are specifically developed to carry out certain functions for the user, such as word processors, web browsers, and games.

100. How does hardware can be enabled to work?

Ans: Electricity is the power source that enables the hardware components to function. Without electricity, the hardware components cannot function, and the computing system will not operate.

101. What is a computer network?

Ans: A computer network connects multiple computers and devices, enabling the efficient exchange of resources and information.

102. What are the objectives of a computer network?

Ans: Resource sharing, communication, and data management.

103. What are the components of a computer network?

Ans: Networking hardware (routers, switches, network cables) and network software (protocols, network operating systems).

104. What is the Internet?

Ans: A vast and complex system designed to connect multiple networks worldwide for communication and data exchange.

105. What are some common Internet protocols?

Ans: TCP/IP, UDP, FTP, POP.

106. What are the core protocols that govern data transmission over the Internet?

Ans: TCP/IP (Transmission Control Protocol/Internet Protocol).

107. What is the purpose of the File Transfer Protocol (FTP)?

Ans: FTP is used for transferring files between computers.

108. What is the role of the Post Office Protocol (POP)?

Ans: POP is used for retrieving emails from a server/network.

109. How does the Internet operate in its environment?

Ans: The Internet operates across diverse environments, connecting networks in homes, offices, data centres, and mobile networks, which influences its design, security, and performance.

110. What is one of the largest man-made systems ever created?

Ans: The Internet is one of the largest man-made systems, a vast network of interconnected computers that communicate to share information.

111. How fast does data travel on the Internet?

Ans: Data on the Internet travels at nearly the speed of light, allowing near-instantaneous global communication.

112. What is difference between Routers and switches?

Ans: • Routers: Routers are devices that transmit data packets between their networks.

• Switches: Switches connect devices in a network and facilitate communication.

113. What is difference between LAN and WAN?

Ans: • Local Area Network (LAN): Connects computers in a specific area, such as a single building or school. For example, an office network that connects everyone. Employee PCs and printers.

• Wide Area Network (WAN): connects computers across larger geographic regions, such as cities, nations, and even continents. For example, consider the Internet which links computers worldwide.