## LDA SCHOOL SYSTEM (BOYS) ALLAMA IQBAL TOWN LAHORE

*UNIT # 1 (INTRODUCTION TO SYSTEMS)*

***SHORT QUESTIONS:***

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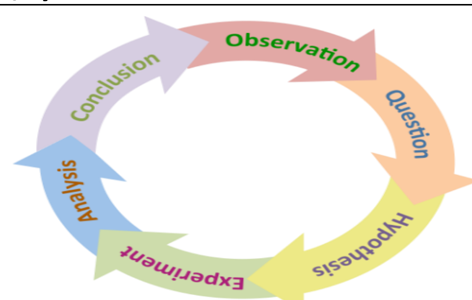
| **Q1:** | **Define Information System?** |
| **ANS:** | An information system is simply an organized set of components that are coordinated to perform a designated function. All the components of the system are in some way related to each other and the functioning of the other components enhances the operation of the system. |
| **Q2:** | **What is Systems Theory?** |
| **ANS:** | A branch of science that deals with complicated structures in living organisms, that relate the human with society and the science is known as systems theory. |
| **Q3:** | **Define a system. What are its basic components?** |
| **ANS:** | A system is a collection of parts that work together to achieve a common goal. A system is described by its objective, components, communication among components and environment in which it works.<br>Components are the building blocks of any system. Each component plays a specific role and contributes to the overall functionality of the system. |
| **Q4:** | **Differentiate between natural and artificial systems.** |
| **ANS:** | **Natural System:**<br>In this system, scientists study existing natural systems to understand the workings.<br>**Artificial System:**<br>In this system, scientists create new systems to solve problems or achieve specific goals. |
| **Q5:** | **Define natural science/system?** |
| **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. |
| **Q6:** | **What is the empirical cycle of natural science/system?** |
| **ANS:** | 1. Observation<br>2. Questions<br>3. Hypothesis<br>4. Experiment<br>5. Analysis<br>6. Conclusion<br> |
| **Q7:** | **Define design/artificial science/system?** |
| **ANS:** | Design or artificial science or system focused on designing and creating artifacts (tools, systems, methods) to achieve specific goals. The nature of design (artificial) science/system is prescriptive, meaning that is aims to prescribe and create artificial systems. |

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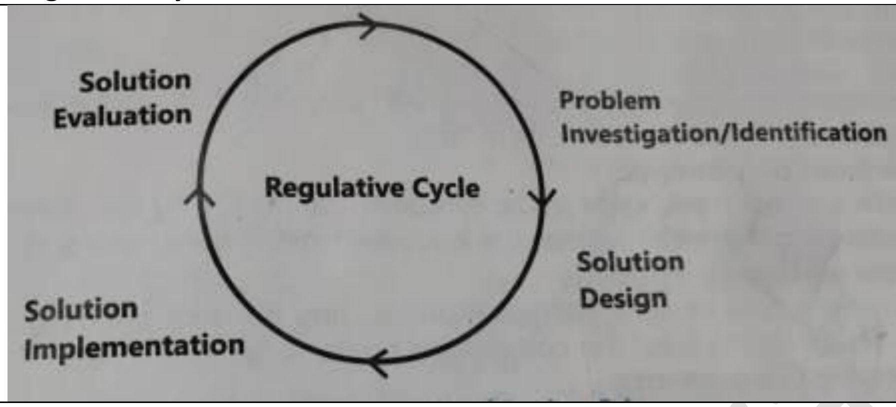
| **Q8:** | **Draw the regulative cycle.** |
| **ANS:** | |

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| **Q9:** | **Give one example of natural and design (artificial) systems.** |
| **ANS:** | **Natural System:**<br>Studying the ecosystem of a forest to understand how different species interact (descriptive).<br>**Artificial/Design System:**<br>Developing a new software system to manage forest data and improve conservation efforts (prescriptive). |
| **Q10:** | **Define 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. |
| **Q11:** | **What is meant by natural science of computer science?** |
| **ANS:** | Natural science of computer science focuses on finding the basic rules that control how computer systems work. This involve the study of various algorithms and their characteristics. |
| **Q12:** | **Define study of algorithms?** |
| **ANS:** | Researchers analyze existing algorithms to understand their efficiency and limitations. For example, studyng different sorting algorithms and their characteristics which arrange given data in an order, like QuickSort or MergeSort. To understand their speed and how they perform with different kind of data. |
| **Q13:** | **What are the main components of the Von Neumann architecture?** |
| **ANS:** | 1. Memory<br>2. Central Processing Unit<br>3. Input Devices<br>4. Output Devices |
| **Q14:** | **What is meant by system bus?** |
| **ANS:** | A system bus is a communication mechanism that facilitates the movement of data between components inside a computational system. It comprises of Data Bus, Address Bus and Control Bus. |
| **Q15:** | **What is Von Neumann computer architecture? List its key components.** |
| **ANS:** | The Von Neumann architecture involves several key steps for a CPU to execute instructions, including fetching, decoding, executing and storing. |

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| | And its key components are Memory, CPU, Input Devices and Output Devices |
| **Q16:** | **What are the four main steps in the Von Neumann architecture's instruction cycle?** |
| **ANS:** | 1. Fetching<br>2. Decoding<br>3. Execution<br>4. Storing |
| **Q17:** | **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. |
| **Q18:** | **What is the key advantage of Von Neumann architecture?** |
| **ANS:** | Simplified Design:<br>By combining instructions and data into a single memory area, architecture is simplified.<br>Flexibility:<br>Programs can be easily changed by changing memory contents. |
| **Q19:** | **What kind of security risk occurs in Von Neumann's architecture?** |
| **ANS:** | 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 a security risk. |
| **Q20:** | **Why Von Neumann's architecture is so important?** |
| **ANS:** | The Von Neumann architecture is a key important aspect of the design and structure of many computers, serving as a central model on how they operate. It is like a recipe fed into the computer, which follows it exactly ensuring that both data and instructions are properly processed. However, this model has been essential in the evalution of computing technology, despite its limitations. |
| **Q21:** | **Write down the characteristics of Von Neumann computer architecture.** |
| **ANS:** | **1. Single Memory Storage:**<br>Both program instructions and data are stored in the same memory space.<br>**2. Sequential Execution:**<br>Instructions are processed one after another ina sequence.<br>**3. Stored Program Concept:**<br>Programs are stored in memory and can be changed by the computer. |

## *LONG QUESTIONS:*

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| **Q1:** | **Define and describe the concept of a system. Explain the fundamental components, objectives, environment and methods of communication within a system.** |
| **ANS:** | **Basic Concept of System:**<br>A system is described by its objectives, components, communication among components and environment in which it works. The components of a system communicate with each other to achieve the system's objective in an environment. Systems can be simple, like a thermostat, or complex, like the human body or a computer network. |

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| | **Objective:**<br>Every system has purpose or goal that it wishes to fulfill. Analyzing a system's operation requires understanding its aim. This insight improves the efficiency and efficacy of the present system. A transport system aims to transfer people and products securely and effectively between locations. A computer system's principal goal is to process data and provide useful information to users.<br>Components:<br>Components are the building blocks of any system. 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. This helps in identifying problems, improving performance, and refining system design. Smooth and proper working of these components together ensures the system meets its objectives.<br>**Environment:**<br>The environment of a system includes everything external to the system that interacts with it. It consists of all external factors that affect the system's operation. Understanding the environment of a system is important as it influences the system's performance and behavior by providing inputs and receiving outputs. Intelligent systems adjust to changes in their environment to continue their functionality. There are several properties of a system's environment that affect system design and its functionality. Two of these properties are static vs dynamic and deterministic vs non-deterministic.<br>**Communication:**<br>Communication and interaction among system components is key to the functioning of a system. It ensures that components work together in an organized and smooth manner to achieve the system's objectives. For example, in a computing system the CPU communicates with memory to fetch and store data and in a biological system brain sends signals to muscles to initiate movement. |
| **Q2:** | **Explain the Von Neumann architecture of a computer. Include a discussion on the main components, their functions, and the step-by-step process of how the architecture operates.** |
| **ANS:** | The Von Neumann architecture is a computer paradigm that defines a system in which the hardware of a computer has four primary components i.e. the memory, the central processing unit, input mechanisms and output mechanisms. Its design and structure serves as a central model for many computers. It is like a recipe fed into the computer, which follows it exactly ensuring the both data and instructions are properly processed.<br>**Components:**<br>There are four key components:<br>**Memory:**<br>Contains both input data and 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.<br>**Central Processing Unit (CPU):** |

It has two main components: the Arithmetic Logic Unit (ALU) and the Control Unit (CU). The ALU performs mathematical computations and logical operations whereas a CU 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 executions of duties by all the other components.

**Input Devices:**

Enable users to input data and instructions into the computer system. Keyboard, mouse and microphone are the most common examples which transmit data to the CPU for subsequent processing.

**Output Devices:**

Present (display) or communicate the outcomes of the tasks executed by the computer. Most common examples are monitor or printers which are used by CPU to transmit the outcome after processing the data for visual display or for printed output.

**Working:**

The Von Neumann architecture encompasses three essential stages for a CPU to carry out instructions namely retrieval, interpretation, execution and storage.

**1. Fetching:**

**Description:**

The CPU retrieves an instruction from the computer's memory. This instruction specifies the operation to be executed by the CPU.

**Components:**

Memory, CPU (Program Counter (PC)), Instruction Register (IR).

**Detail:**

The Program Counter (PC) stores the memory address of the subsequent instruction. Once the address is stored in memory, the instruction located at the location is retrieved and placed into the Instruction Register (IR).

**2. Decoding:**

**Description:**

In order to determine the necessary action, the CU decodes the instruction.

**Components:**

Control Unit (CU).

**Detail:**

The Control Unit decodes the opcode (operation code) of the instruction and determines the required procedures and data.

**3. Execution:**

**Description:**

The CPU processes the instruction, when the instruction involves a computation, it is executed by the ALU. Any task that requires transferring data between several locations is managed by the CU.

**Components:**

Arithmetic and Logic Unit (ALU) and Control Unit (CU).

**Detail:**

The ALU carries out mathematical and logical calculations, while the CU handles data transmission activities.

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| | **4. Storing:**<br>**Description:**<br>The outcome of the computation is either returned to memory or sent to an output device.<br>**Components:**<br>Memory and Output Devices.<br>**Details:**<br>The outcome is either stored in a designated memory location or sent to an output device, such as a display. |
| **Q3:** | **Provide a detailed explanation of how a computer interacts with its environment. Include examples of user input, network communication and power supply.** |
| **ANS:** | The computer system environment includes any external devices that interact with the computer. For example:<br>**Power Supply:** Provides electrical power to allow the computer to work.<br>**Network:** Connects the computer to other systems and the internet.<br>**Peripherals:** Include printers, scanners and external discs that expand the computer's capabilities.<br>**Interaction with the Environment:**<br>A computer interacts with its environment to perform its functions. For example:<br>**User input:** A user types on the keyboard and the computer processes the input to display text on the screen.<br>**Network Communication:** The computer sends and receives data over the internet to browse websites or download files.<br>**Power Supply:** The computer relies on a stable power supply to function correctly. |