**COAL # 01**

**Introduction to Assembly Language**

***1. How the processor uses the address bus, the data bus, and the control bus to communicate with the system memory?***

**A:**

**1. Address Bus:**

**- Purpose:** The address bus is used to specify the memory location that the processor wants to access.

**- Operation:** When the processor needs to read from or write to memory, it places the address of the desired memory location onto the address bus. The address bus is unidirectional, meaning it only carries addresses from the processor to the memory or other components.

**2. Data Bus:**

**- Purpose:** The data bus is used to transfer data between the processor and memory (or other I/O devices).

**- Operation:** The data bus is bidirectional, meaning it can carry data in both directions. When the processor wants to write data to a memory location, it places the data on the data bus after specifying the address on the address bus. Conversely, when the processor wants to read data from memory, the address is placed on the address bus, and then the data bus carries the data from memory to the processor.

**3. Control Bus:**

**- Purpose:** The control bus carries control signals that manage and synchronize the operations of the processor and memory.

**- Operation:** Control signals include commands such as "read," "write," "memory access," and "interrupts." These signals direct the memory or other components on what operation to perform and when to perform it.

**Communication Flow Example:**

**1. Reading Data:**

**- Address Bus:** The processor places the address of the memory location it wants to read from onto the address bus.

**- Control Bus:** The processor sends a "read" signal via the control bus.

**- Data Bus:** The memory places the data from the specified location onto the data bus.

**- Data Transfer:** The processor reads the data from the data bus.

**2. Writing Data:**

**- Address Bus**: The processor places the address of the memory location it wants to write to onto the address bus.

**- Data Bus:** The processor places the data it wants to write onto the data bus.

**- Control Bus**: The processor sends a "write" signal via the control bus.

- Memory: The memory writes the data from the data bus into the specified location.

***Q2: Which of the following are unidirectional and which are bidirectional? a. Address Bus b. Data Bus c. Control Bus***

|  |  |
| --- | --- |
| **Bus Type** | **Directionality** |
| Address Bus | Unidirectional |
| Data Bus | Bidirectional |
| Control Bus | Unidirectional |

**Explanation:**

**- Address Bus:** Unidirectional, as it only carries address information from the processor to memory or other components.

**- Data Bus:** Bidirectional, as it carries data both to and from the processor and memory.

**- Control Bus:** Unidirectional, as it carries control signals from the processor to other components to manage and synchronize operations.