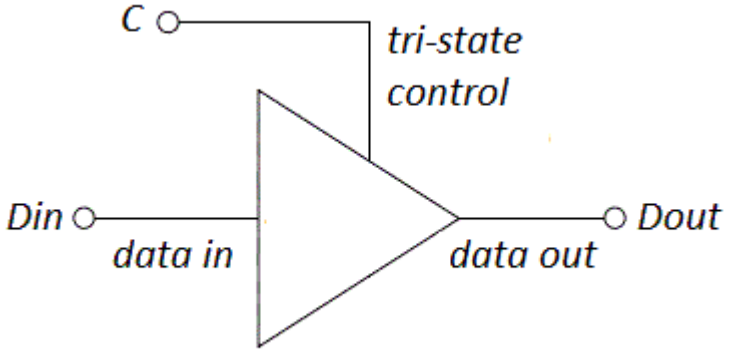
1. Explain the common components of a microprocessor.
   Arithmetic Logic Unit (ALU): The ALU is responsible for performing arithmetic operations (such as addition, subtraction, multiplication, and division) and logical operations (such as AND, OR, NOT) on binary data.
   Control Unit (CU): The CU directs the operation of the processor by interpreting and executing instructions. It manages the data flow between the ALU, registers, memory, and input/output devices.
   Registers: Registers are small, fast storage locations within the CPU used to hold data and instructions temporarily during processing.
   Cache Memory: Cache memory is a small, high-speed memory located close to the CPU core that stores frequently accessed data and instructions to speed up processing.
   Bus Interface Unit (BIU): The BIU manages the data and address buses, which are pathways used to transfer data and addresses between the CPU, memory, and peripheral devices.
2. Difference between a microprocessor and a microcontroller?
   Microprocessor: A CPU that performs computational tasks, requiring external components for memory and I/O functions.
   Microcontroller: A single-chip system with an integrated CPU, memory, and I/O peripherals, designed for specific control tasks.
   Key differences
   Integration: Microprocessors require external components (memory, I/O interfaces) to function, while microcontrollers integrate these components on a single chip.
   Functionality: Microprocessors are designed for complex, general-purpose computing tasks, whereas microcontrollers are designed for specific control tasks and are often used in embedded systems.
   Applications: Microprocessors are found in personal computers and servers, while microcontrollers are used in dedicated devices like household appliances and automotive systems.
3. What distinguishes a microcontroller's timer from its counter?
   Timer
   - Measures elapsed time by counting clock pulses.
   - Used for time-related operations, such as generating time delays or periodic interrupts.

   Counter
   - Counts external events or pulses.
   - Used for counting external events or measuring frequencies.
4. What is a program counter?
   The Program Counter (PC) is a special-purpose register in the CPU that keeps track of the address of the next instruction to be fetched from memory and executed.
5. Explain Tri-state logic.
   Tri-state logic is a digital circuit feature that allows a component to be in one of three states: high, low, or high impedance. This capability is essential for managing data lines shared by multiple devices, enabling effective and conflict-free communication.



6. What are the different types of interrupts in a microprocessor system?
   Hardware Interrupts: Generated by external devices or hardware components.
   Software Interrupts: Generated by software instructions or system calls.
   Timer Interrupts: Generated by internal timers to manage time-based operations.
7. What is the difference between interrupt service routine and subroutine?
   Key Differences:
   Invocation:
   - ISR: Automatically invoked by the processor in response to an interrupt.
   - Subroutine: Explicitly called by the program code.

   Purpose:

   - ISR: Handles interrupts and performs tasks related to specific hardware or software events.
   - Subroutine: Performs a general-purpose task or computation as part of the program flow.

   Execution Context:

   - ISR: Often runs in a special context with high priority, and the processor manages state saving and restoration automatically.
   - Subroutine: Runs as part of the normal program flow, with explicit state management by the calling program.