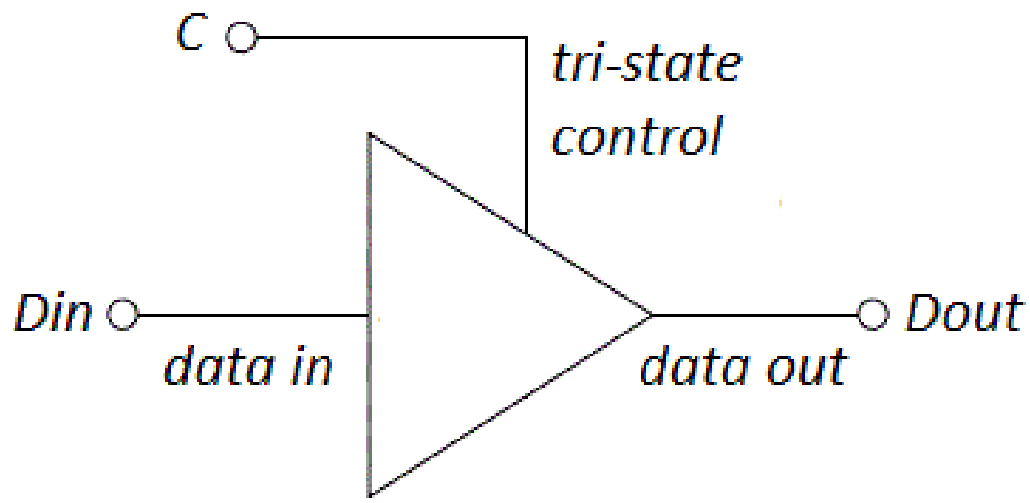
@Sree Vishnu Varthini

Day - 10

Embedded Systems Programming

TRISTATE LOGIC



Truth Table

Enable PIN	IN	OUT
0	0	Hi-Z
0	1	Hi-Z
1	0	0
1	1	1

TRISTATE LOGIC

Tri-state logic is a digital logic design that allows an output to have **three** possible states instead of the usual two (high or low).

In traditional binary logic, a signal can either be:

- **High (1)** – representing a logical “1”
- **Low (0)** – representing a logical “0”

However, tri-state logic introduces a third state:

- **High Impedance (Z)** – a **disconnected or "off"** state, meaning the output is not driving any signal at all.

Think of this third state as a way for a device to "remove" itself from the circuit temporarily, avoiding interference with other signals on a shared connection. This is especially useful in shared bus systems, like data buses in a microcontroller or computer.

WORKING OF TRISTATE LOGIC

In a tri-state system, control signals determine whether the output is active or in the high impedance state. This control signal is called the **Enable signal,** typically labeled as **EN**.

- **When EN = 1:** The output is enabled and can drive either a "high" or "low" signal.
- **When EN = 0:** The output is in the high impedance (Z) state and effectively disconnected from the circuit.

IMPORTANCE OF TRISTATE LOGIC

- **Prevents signal conflict:** Only one device drives the signal at a time.
- **Efficient use of data buses:** Multiple devices can share the same line.
- **Flexibility in circuit design:** Tri-state logic allows for more efficient and scalable digital designs.

Practical Example: Using a Tri-State Buffer

A **tri-state buffer** is the simplest example of a tri-state device. It controls whether an input signal is passed to the output or disconnected (high impedance).

Input (A): The signal to be transmitted.
Enable (EN): Controls whether the signal is transmitted or not.

EN	A (Input)	Output
1	1	1
1	0	0
0	X	Z (high impedance)

- If **EN = 1**, the output follows the input (either 0 or 1).
- If **EN = 0**, the output is disconnected (Z), meaning it doesn't interfere with the bus.

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P.S. You can access the **Embedded Systems Programming** course by contacting **Balajee Seshadri** Sir through the WhatsApp number provided on his linkedin profile.