Parity Check

A parity check is a simple error detection mechanism used in digital communication and data storage to detect errors in transmitted or stored data. It ensures that the number of bits with a value of 1 in a binary sequence is either even or odd, depending on the type of parity used.

There are two types of parity:

1. **Even Parity**: Ensures that the total number of 1 bits in the data (including the parity bit) is even.
2. **Odd Parity**: Ensures that the total number of 1 bits in the data (including the parity bit) is odd.

How Parity Check Works

- A **parity bit** is added to the original binary data to enforce the selected parity (even or odd).
- After data is transmitted or stored, a parity check is performed by counting the 1 bits in the received data (including the parity bit).
    - For **even parity**, the number of 1s should be even.
    - For **odd parity**, the number of 1s should be odd.
- If the parity condition is violated, an error is detected, indicating that the data may have been corrupted during transmission or storage.

Example

Let’s assume we are transmitting the following 7-bit binary data: **1011001**.

1. **Count the number of 1 bits**: There are four **1s** in the data.
2. **Apply even parity**: Since there are an even number of **1s**, the parity bit is set to **0** to maintain even parity.
3. Data to transmit: **10110010** (the parity bit 0 is added at the end).

When the data is received, the system checks the number of 1s:

- If the number of **1s** is even, the data is considered correct.
- If the number of **1s** is odd, an error is detected.