Parity Generator & checker

Parity Generator

Let's take 3-bit data

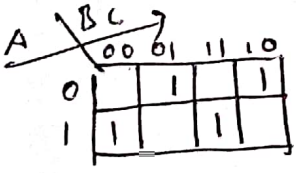
Logic → Even parity bit EP_b → no. of 1's in data bit even
$(EP)_b = 0$ (Remain it even)
→ no. of 1's in data bit odd
$(EP)_b = 1$ (Make it even)

→ odd parity bit OP_b → no. of 1's in data bit even
$(OP)_b = 1$ (Make it odd)
→ no. of 1's in data bit odd
$(OP)_b = 0$ (Remain it odd)

A	B	C	Even parity
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

A	B	C	odd parity
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	0

Even parity



$\Rightarrow \bar{A}\bar{B}C + \bar{A}B\bar{C} + A\bar{B}\bar{C} + ABC$

$\Rightarrow \bar{A}(B \oplus C) + A(B \odot C)$

Even parity $\Rightarrow A \oplus B \oplus C$

Odd parity = $\overline{(\text{Even parity})}$

Odd parity = $\overline{(A \oplus B \oplus C)}$

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Parity checker

Error checker

Even parity Error = 1 (Data + Parity bit odd 1's)
Vice-Versa

Odd parity Error = 1 (Data + parity bit even 1's)
Vice versa

Data bit A B C	Parity-in	Even parity Error	odd parity Error
0 0 0	0	0	1
0 0 0	1	1	0
0 0 1	0	1	0
0 0 1	1	0	1
0 1 0	0	1	0
0 1 0	1	0	1
0 1 1	0	0	1
0 1 1	1	1	0
1 0 0	0	1	0
1 0 0	1	0	1
1 0 1	0	0	1
1 0 1	1	1	0
1 1 0	0	1	0
1 1 0	1	0	1
1 1 1	0	0	1
1 1 1	1	1	0

Even parity Error = $(A \oplus B \oplus C \oplus P\text{-in})$

odd parity Error = $\sim(A \oplus B \oplus C \oplus P\text{-in})$

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