Video: All about electronics

Parity generator and Checker

A parity checker is used to detect error during transmission of binary data. Parity bit is used to check the data

Parity Generator :- The digital circuit that generates a parity bit in the transmitter is known as parity generator

Parity Checker :- The digital circuit that checks the parity bit at the receiver is parity checker.

PARITY GENERATOR :

Lets take a Example of 7 bits

~~odd~~ Even Parity

0	0	1	0	0	0	1

Data Bits (1 Ones)

Parity bit → it will be 1

1	1	0	1	0	0	0	0

← Parity bit

(4 Ones)

The no of 1's in the code is even after adding the parity bit

odd parity

1	0	1	1	0	0	1	1

Data Bits (4 Ones)

Parity Bits (1)

The no of 1's in the code is odd after adding the parity bit

1	0	1	0	1	0	0	0

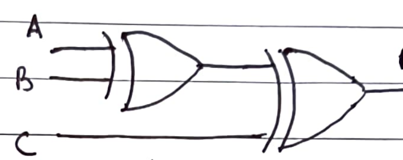
Data Bits (3 Ones)

Parity Bit

Truth table for 3 bit even parity generator

Input			Output
A	B	C	P_{even}
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

$$P = \bar{A}\bar{B}C + \bar{A}B\bar{C} + A\bar{B}\bar{C} + ABC$$
$$= \bar{A}(\bar{B}C + B\bar{C}) + A(\bar{B}\bar{C} + BC)$$
$$= \bar{A}(B \oplus C) + A(\overline{B \oplus C})$$
$$= A \oplus B \oplus C$$



Truth Table of 3 bit ~~odd~~ Odd parity Generator

A	B	C	P_o
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	1
1	1	0	0
1	0	1	1
1	1	0	1
1	1	1	0

This truth table is complement of even parity generator. So we need to add a not gate at the end of the even parity generator

Parity Checker

- The parity checker circuit is at the receiver end.
- The output of the parity checker circuit is denoted by PEO Parity Error Output

PEO = 1 when the error is present ie if the received four bit word has even parity

PEO = 0 When there is no error present ie if the received four bit word has an odd parity

Even Parity Checker.

A	B	C	P	Parity Check
0	0	0	0	0
0	0	0	1	1
0	0	1	0	1
0	0	1	1	0
0	1	0	0	1
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	1
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	ϕ	0

$= \bar A\bar B\bar C P_o + \bar A\bar B C\bar P_o$
$\bar A B\bar C\bar P_o + \bar A B C P_o$
$A\bar B\bar C\bar P_o + A\bar B C P_o$
$A B\bar C P_o + A B C\bar P_o$

$= \bar A\bar B(\bar C P_o + C\bar P_o)$
$+ \bar A B(\bar C\bar P_o + C P_o)$
$+ A\bar B(\bar C\bar P_o + C P_o)$
$+ A B(\bar C P_o + C\bar P_o)$

$= \bar A\bar B(\bar C P_o + C\bar P_o) + AB(\bar C P_o + C\bar P_o)$
$+ \bar A B(\bar C\bar P_o + C P_o) + A\bar B(\bar C\bar P_o + C P_o)$

$= \cancel{\bar A\bar B \odot (\bar C P_o + C\bar P_o)}$

$= + A \oplus B \oplus C \oplus P$

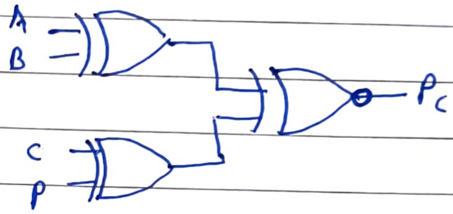
This can be developed using kmap

This is the complement of the even parity checker

Odd parity Checker.

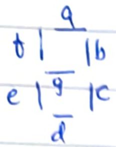
A	B	C	P	$P_{odd\ checker}$
0	0	0	0	1
0	0		1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	0
1	0	0	0	0
1	0	0	1	1
1	0	1	0	1
1	0	1	1	0
1	1	0	0	1
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

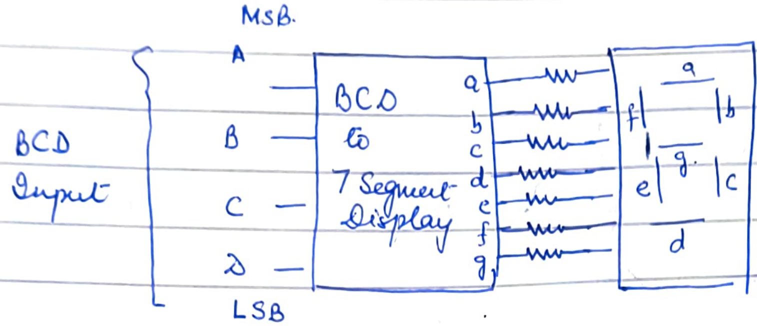
$$P_c = \overline{A \oplus B \oplus C + P}$$



IC: 74180 can be used as parity generator and parity checker

BCD TO 7 SEGMENT DECODER.





Decimal Eq.	Decimal Eq B A	B	C	D	a	b	c	d	e	f	g.
0	0	0	0	0	1	1	1	1	1	1	0
1	0	0	0	1	0	1	1	0	0	0	0
2	0	0	1	0	1	1	0	ϕ	ϕ	0	1
3	0	0	1	1	1	1	1	1	0	0	1
4	0	1	0	0	0	1	1	0	0	1	1
5	0	1	0	1	1	0	1	1	0	1	1
6	0	1	1	0	1	0	1	ϕ	1	1	1
7	0	1	1	1	1	1	1	0	0	0	0
8	1	0	0	0	1	1	1	1	1	1	1
9	1	0	0	1	1	1	1	0	0	ϕ	1

9
10
15 Dont Care.

Make k-map for a

CD

AB \ CD	00	01	11	10
00	1	0	1	1
01	0	1	ϕ	0
11	X	X	X	X
10	1	1	X	X

$A \cancel{A} B \cancel{B} \cancel{C} \bar{C} \cancel{D} \cancel{D} \rightarrow \bar{A}\bar{B}C$

$\cancel{A} \cancel{A} B \bar{B} \cancel{C} \cancel{C} D \bar{D} \rightarrow BD$

$\cancel{A} \bar{A} \cancel{B} \cancel{B} \cancel{C} \cancel{C} \cancel{D} \cancel{D} \rightarrow A$

$\cancel{A} \cancel{\bar{A}} B \cancel{B} C \cancel{C} D \cancel{D} \rightarrow \bar{B}CD$

$A + BD + \bar{A}\bar{B}C + \bar{B}CD + \bar{A}\bar{B}C$

$a = A + CD + \bar{B}\bar{D} + BD$

b

AB \ CD	00	01	11	10
00	1	1	1	1
01	1	0	1	0
11	1	1	1	1
10	1	1	1	1

$\bar{A}$