Binary Code converter circuit.

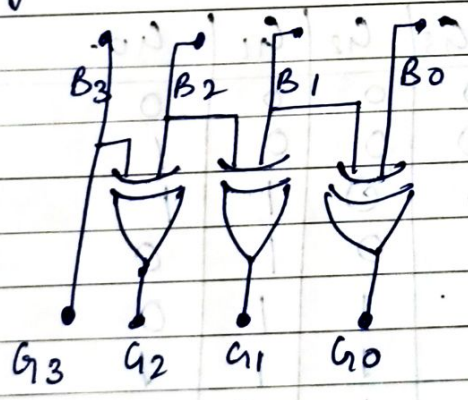
Code converts circuits are designed to translate data representation from one format to another.

Binary - to - Gray code converter takes binary i/p & translates it to the corresponding output.

Gray code is an ordering of the binary numeral system such that two successive values differs in only one bit.

BINARY to GRAY

- The most significant bit of Binary & Gray are always equal.
- Other bits of the output gray code can be Ex OR'd with the adjacent bit.



Binary to Gray code converter circuit.

Gray to Binary Conversion.

- The MSB of Binary is always equal to Gray code.
- If G_3 is MSB → G_3 G_2 G_1 G_0

the output variables → $B_3 = G_3$

$B_2 = G_2 \oplus G_3$

$B_1 = G_1 \oplus G_2 \oplus G_3$

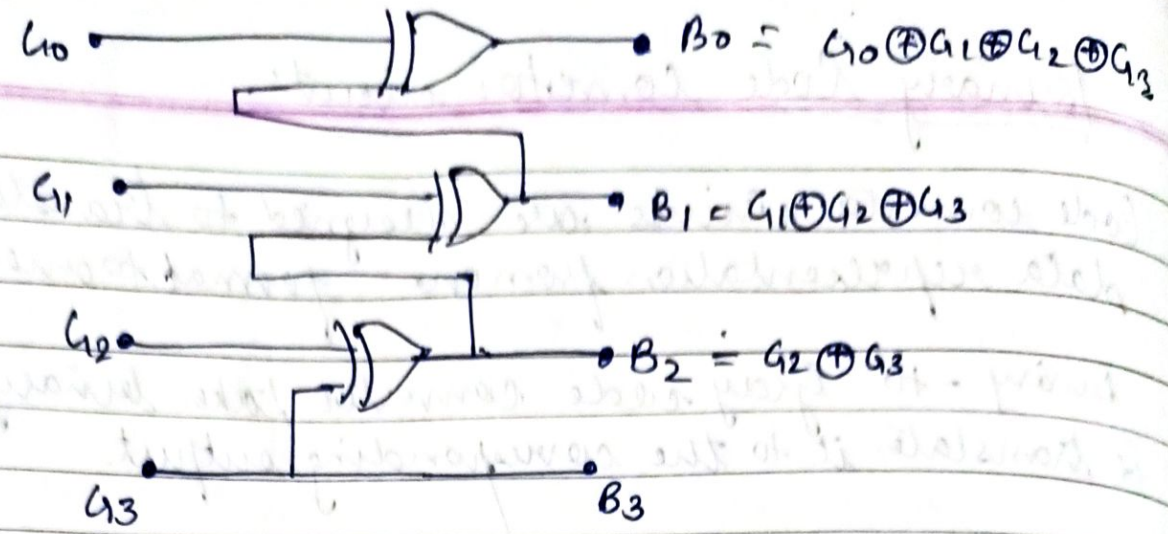
$B_0 = G_0 \oplus G_1 \oplus G_2 \oplus G_2$

G_3 G_2 G_1 G_0

B_3 B_2 B_1 B

$= G_2 \oplus G_3$ $= G_2 \oplus G_3 \oplus G_1$

$B = G_0 \oplus G_1 \oplus G_2 \oplus G_3$



Eg. → Binary 1 1 0 0 1 1

↓ gray ↓

gray → 1 0 1 0 1 0

Binary

1 1 0 0 1 1

4 Bit Binary to gray code Truth Table

B_3	B_2	B_1	B_0	G_3	G_2	G_1	G_0
0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1
0	0	1	0	0	0	1	1
0	0	1	1	0	0	1	0
0	1	0	0	0	1	1	0
0	1	0	1	0	1	1	1
0	1	1	0	0	1	0	1
0	1	1	1	0	1	0	0
1	0	0	0	1	1	0	0
1	0	0	1	1	1	0	1
1	0	1	0	1	1	1	1
1	0	1	1	1	1	1	0
1	1	0	0	1	0	1	0
1	1	0	1	1	0	1	1
1	1	1	0	1	0	0	1
1	1	1	1	1	0	0	0

BCD To Excess 3 Code Converters

- The process of converting BCD to excess 3 is quite simple from other conversion. It is done by calculated by adding 3 (0011) to each four bit BCD code.

For eg. BCD for 8 → 1000
excess 3 → 1000 + 0011

$$\begin{array}{r} 1000 \\ +\ 0011 \\ \hline 1011 \end{array}$$

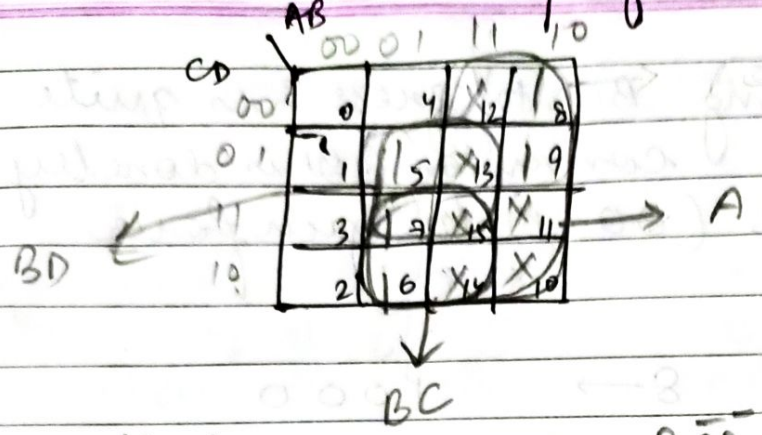
Truth Table for BCD to Excess-3.

Decimal	A B C D BCD Code	W X Y Z Excess-3.
0	0 0 0 0	0 0 1 1
1	0 0 0 1	0 1 0 0
2	0 0 1 0	0 1 0 1
3	0 0 1 1	0 1 1 0
4	0 1 0 0	0 1 1 1
5	0 1 0 1	1 0 0 0
6	0 1 1 0	1 0 0 1
7	0 1 1 1	1 0 1 0
8	1 0 0 0	1 0 1 1
9	1 0 0 1	1 1 0 0
BCD is Diff 10	1 0 1 0	X X X X
11	1 0 1 1	X X X X
12	1 1 0 0	X X X X
13	1 1 0 1	X X X X
14	1 1 1 0	X X X X
15	1 1 1 1	

Decimal

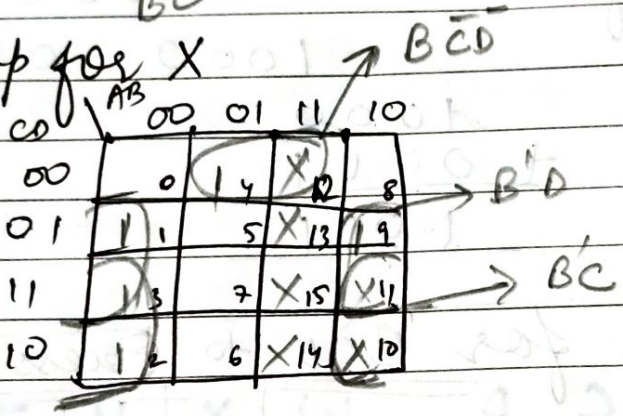
We Make K Map to draw circuit.

K Map for W



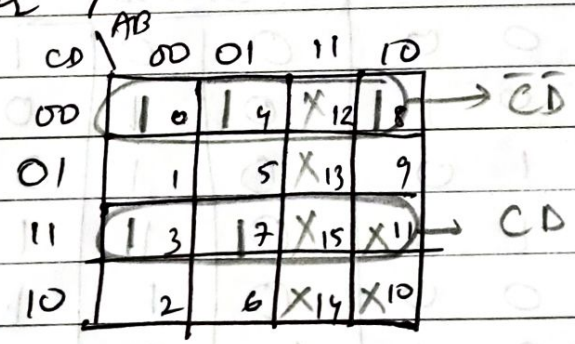
$W = A + BC + BD$

K Map for X



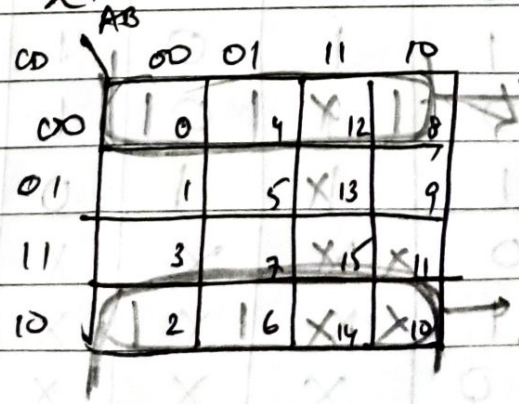
$X = B'C + B'D + BC'D'$

K Map for Y

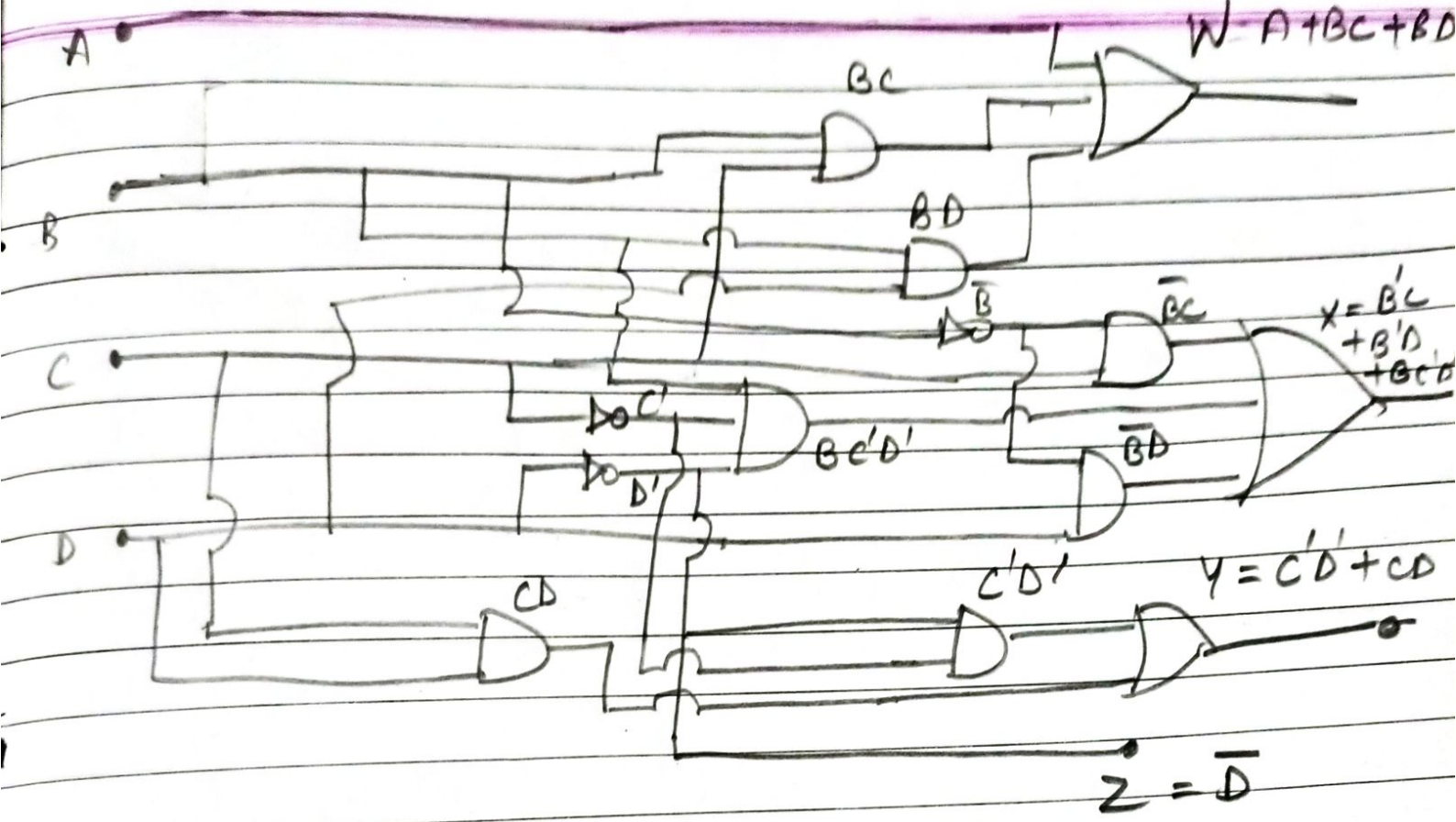


$Y = C'D' + CD$

K Map for Z.



$Z = \overline{D}$



Eg :- $(10000101101001)_{BCD} \rightarrow (\quad)_{excess\ 3}$

Step I → Make a group of 4-Bit

1000 0101 1001

Step II
→ Add 0011 to each 4Bit group

1000	0101	1001
0011	0011	0011
1011	1000	1100

Ans → $(1011100011100)_{excess\ 3}$