Number System

$(149)_{10} \rightarrow (\ )_2 , (\ )_8 , (\ )_{16}$

1, 2, 4, 8, 16, 32, 64, 128, 256, 512
$2^0, 2^1, 2^2, 2^3, 2^4, 2^5, 2^6, 2^7, 2^8, 2^9, 2^{10}$

149	
-128	-2^8
21	
-16	-2^4
5	
-4	-2^2
1	-2^0
-1	
0	

$2^0, 2^2, 2^4, 2^8$ $(1 + 4 + 16 + 128)$

$(149)_{10}$

1 0 , 1 0 1 0 0 1

$(149)_{10} \rightarrow (10101001)_2$

Padding 0

$(10101001)_2 \rightarrow (\underline{010}\ \underline{101}\ \underline{001})_2$

$(2\ \ 5\ \ 1)_8$

$(10101001)_2 \rightarrow (\qquad)_2$

$(\ A\ 9\ \ )_{16}$

(A10)
(8 6)

$(10169)_{10} \rightarrow (\ )_2, (\ )_8, (\ )_{16}$

$2^0, 2^1, 2^2, 2^3, 2^4, 2^5, 2^6, 2^7, 2^8, 2^9, 2^{10}, 2^{11}$
$1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024$

$2^{12} = 4096$
$2^{13} = 8192$
$2^{14} = 16384$

10169
- 8192 2^{13}
1977
- 1024 2^{10}
953 2^9
- 510
443
- 256 2^8
187
- 128 2^7
59
- 32 2^5
27
- 16 2^4
11
- 8 2^3
3
- 2 2^1
1 2^0
- 1

$2^0, 2^1, 2^3, 2^4, 2^5, 2^7, 2^8, 2^9, 2^{10}, 2^{13}$

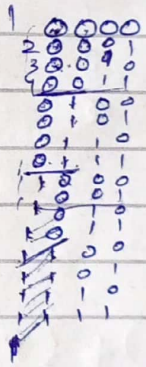
$(110111011111001)_2$

Convert into octal.

$(011\ 011\ 101\ 111\ 001)_2 \rightarrow (\quad)_8$

$(3\ 3\ 5\ 7\ 1)_8$

$2^2 = 4/2 = 2/2 = 1$
$2^3 = 8/2 = 4/2 = 2/1$
$2^4 = 16/2 = 8/2 = 4/2 = 2/1$



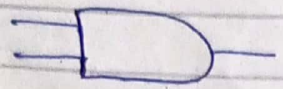
$(0011\ 0111\ 0111\ 1001)_2$
$(4\ 8\ 8\ 10)_{16}$

$$
\begin{array}{r}
\overset{1}{} \quad \overset{1}{} \\
1011 \\
+\ 0110 \\
\hline
10001
\end{array}
$$

A	B	A · B
0	0	0
0	1	0
1	0	0
1	1	1

$\bar{A}$	$\bar{B}$	$\bar{A} + \bar{B}$
1	1	1
1	0	1
0	1	1
0	0	0

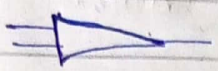
AND



$A \cdot B$

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

OR



$A + B$

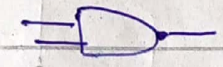
A	B	C
0	0	0
0	1	1
1	0	1
1	1	1

NOT

$(\bar{C}) = \bar{C}$

A	C
0	1
1	0

NAND



$\overline{(A \cdot B)} = \bar{A} + \bar{B}$

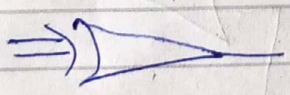
A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

NOR

$\overline{(A + B)} = \bar{A} \cdot \bar{B}$

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

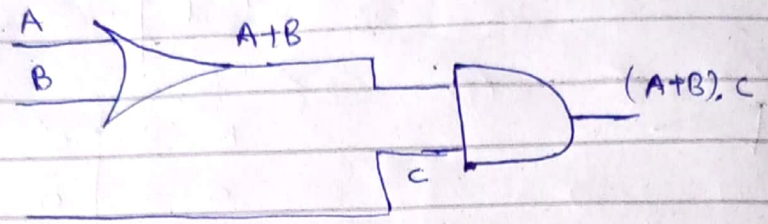
~~XOR~~ XOR



$A \oplus B = \bar{A}B + \bar{B}A$

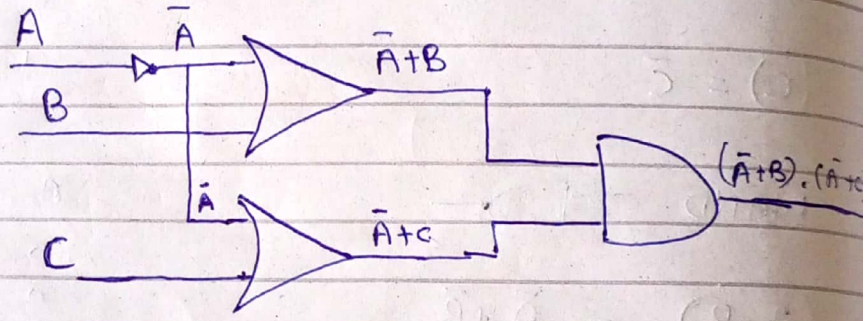
A	B	
0	0	0
0	1	1
1	0	1
1	1	0

$(A + B).C$

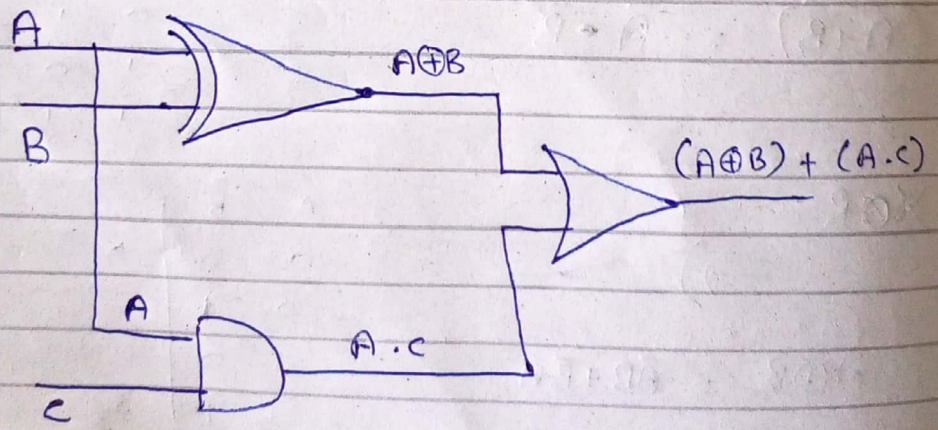


$X = (\bar{A}+B) . (\bar{A}+C)$

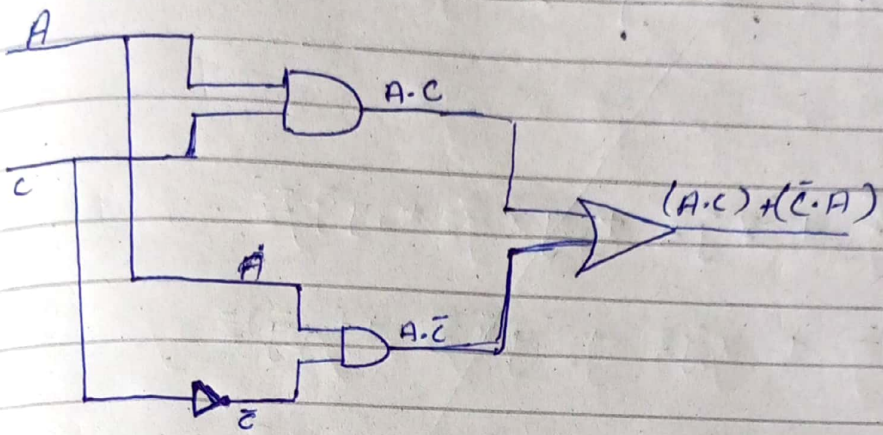
$= \bar{\bar{A}}$



$(A \oplus B) + (A \cdot C)$



$(A \cdot C) + (\bar{C} \cdot A)$



$x + x = x$

$(x + x) \cdot 1$

$(x + x) \cdot (x + \bar{x})$

$x + x\bar{x}$

$x + 0$

$\boxed{x + x = x}$

x	$\bar{x}$	$x \cdot \bar{x}$
0	1	0
0	1	0
1	0	0
1	0	0

$x \cdot x = x$

$x \cdot x + 0$

$x \cdot x + (x \cdot \bar{x})$

$x(x + \bar{x})$

$x(1)$

x

Standard form

$xy + z$

$xy.(z+\bar{z}) + (z(\bar{x}+x))$

$xyz + xy\bar{z} + (z\bar{x} + zx)$

$xyz + xy\bar{z} + ((z\bar{x} + zx).(y+\bar{y}))$

$xyz + xy\bar{z} + z\bar{x}y + z\bar{x}\bar{y} + zxy + zx\bar{y}$

$xyz + xy\bar{z} + xy\bar{z} + \bar{x}\bar{y}z + xyz + x\bar{y}z$

$xyz + xy\bar{z} + \bar{x}\bar{y}z + x\bar{y}z$

i) $x=1, y=1, z=1$; $x=1, y=1, z=0$; $x=0, y=1, z=0$; $x=0, y=1, z=0$

ii) $x=1, y=1, z=1$; $x=1, y=1, z=0$; $x=0, y=0, z=1$; $x=0, y=0, z=1$

	x	y	z	
0	0	0	0	0
1	0	0	1	$1 - \bar{x}\bar{y}z$
2	0	1	0	0
3	0	1	1	0
4	1	0	0	0
5	1	0	1	$1 - x\bar{y}z$
6	1	1	0	$1 - xy\bar{z}$
7	1	1	1	$1 - xyz$

$$F = y' + xy + x'yz'$$

$$= (x+\bar{x})\bar{y} + xy(z+\bar{z}) + \bar{x}y\bar{z}$$

$$= x\bar{y} + \bar{x}\bar{y} + xyz + xy\bar{z} + \bar{x}y\bar{z}$$

$$= x\bar{y} + \bar{x}\bar{y}(z+\bar{z}) + xyz + xy\bar{z} + \bar{x}y\bar{z}$$

$$x\bar{y}z + x\bar{y}\bar{z} + \bar{x}\bar{y}z + \bar{x}\bar{y}\bar{z} + xyz + xy\bar{z} + \bar{x}yz$$

if

$x=$	1	1	0	0	1	1	0
$y=$	0	0	0	0	1	1	1
$z=$	1	0	1	0	1	0	0

	x	y	z	
0	0	0	0	— 1
1	0	0	1	— 1
2	0	1	0	— 1
3	0	1	1	— 0
4	1	0	0	— 1
5	1	0	1	— 1
6	1	1	0	— 1
7	1	1	1	— 1

SOP

$x\bar{y}z + x\bar{y}\bar{z} + \bar{x}\bar{y}z + \bar{x}\bar{y}\bar{z} + xyz + xy\bar{z} + \bar{x}y\bar{z}$

$x=1, y=0, z=1$; $x=1, y=0, z=0$; $x=0, y=0, z=1$; $x=0, y=0, z=0$; $x=1, y=1, z=1$; $x=1, y=1, z=0$; $x=0, y=1, z=0$

SOP
$x=1$
$\bar{x}=0$

POS
$x=0$
$\bar{x}=1$

0	0	0	1	$\bar{x}\bar{y}\bar{z}$
0	0	1	1	$\bar{x}\bar{y}z$
0	1	0	1	$\bar{x}y\bar{z}$
0	1	1	0	—
1	0	0	1	$x\bar{y}\bar{z}$
1	0	1	1	$x\bar{y}z$
1	1	0	1	$xy\bar{z}$
1	1	1	1	xyz

0 000
1 001
2 010
3 011
4 100
5 101
6 110
7 111

min Term (Sop)

$F = \Sigma (m_0, m_1, m_2, m_4, m_5, m_6, m_7)$

$F = \bar{x}\bar{y}\bar{z} + \bar{x}\bar{y}z + \bar{x}y\bar{z} + x\bar{y}\bar{z} + x\bar{y}z + xy\bar{z} + xyz$

Max Term (POS)

$F = \Pi (M_3)$

$F = x + \bar{y} + \bar{z}$

Pos
$x=0$
$x'=1$

K - Map

	00	01	11	10
0	1	1	0	1
1	1	1	1	1

xyz		
000	000	100
001	010	101
100	100	111
101	110	110
$\bar{y}$	$\bar{z}$	x

$$x + \bar{y} + \bar{z}$$

Boolean

$$\bar{x}\bar{y}\bar{z} + \bar{x}\bar{y}z + \bar{x}y\bar{z} + x\bar{y}\bar{z} + x\bar{y}z + xy\bar{z} + xyz$$

$$\bar{x}\bar{y}(\bar{z}+z) + y\bar{z}(\bar{x}+x) + x\bar{y}\bar{z} + xz(\bar{y}+y)$$

$$\bar{x}\bar{y}(1) + y\bar{z}(1) + x\bar{y}\bar{z} + xz(1)$$

$$\bar{x}\bar{y} + y\bar{z} + x\bar{y}\bar{z} + xz$$