01/11/21 Monday

$m_0\ m_1 \dots m_7$
$M_0\ M_1 \dots M_7$

$$F(x,y,z) = xy + x'z$$
$$= xy \cdot 1 + x'z \cdot 1$$
$$= xy \cdot (z+z') + x'z \cdot (y+y')$$
$$= xyz + xyz' + x'yz + x'y'z$$
$$= \sum(1,3,6,7)$$

111 → 7
110 → 6
011 → 3
001 → 1

$\therefore$ Sum of minterms of F $= \sum(1,3,6,7)$

$m_1 + m_3 + m_6 + m_7$

110
$0 \times 2^0 = 0$
$1 \times 2^1 = 2$
$1 \times 2^2 = 4$
6

$\therefore$ Product of maxterms of F $= \prod(0,2,4,5)$

Standard forms

Sum of products
↓
Boolean expression containing AND terms of one or more literals each

Product of sums
↓
Boolean expression containing 'OR' terms

Standard form

SOP

$(\cdot) + (\cdot) + (\cdot) + \dots$

Every term is made up of only AND operation

Canonical form

SOP of sum of minterms

$(\cdot) + (\cdot) + (\cdot) + \dots$

Every term is made up of AND operation of containing all the variables

Disjunction $\vee$ → OR
Conjunction $\wedge$ → AND
Negation $\neg$ & $\sim$ → Complement

T & F

x	y	x+y	x·y
0	0	0	0
0	1	1	0
1	0	1	0
1	1	1	1

P	Q	P∨Q	P∧Q
T	T	T	F
T	F	T	F
F	T	T	F
F	F	F	T

x	x'
0	1
1	0

P	¬P
T	F
F	T

T → Tautology
F → Contradiction

SOPCF → PDNF
POSCF → PCNF

Exclusive OR → $xy' + x'y$

x	y	x ⊕ y
0	0	0
0	1	1
0	1	1
1	0	1
1	1	0

x	y	x'	y'	xy'	x'y	xy'+x'y
0	0	1	1	0	0	0
0	1	1	0	0	1	1
1	0	0	1	1	0	1
1	1	0	0	0	0	0

x+y
x·y

NAND → $(x \cdot y)'$

x	y	x ↑ y
0	0	1
0	1	1
1	0	1
1	1	0

AND'

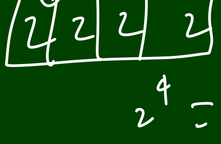
x·y
0
0
0
1

NOR → $(x+y)'$

x	y	x ↓ y
0	0	1
0	1	0
1	0	0
1	1	0

x+y
0
1
1
1

x	y	F=0	F=1	F=x·y	F=x'y	F=xy'	F=x+y	F=x⊙y	F=x	F=y	F=x'	F=y'	F=x+y	·	·	F=x↑y	F=x↓y	-
0	0	0	1	0	0	0	1	0	0	1	1	0	1	1	1	0	1	
0	1	0	1	0	0	1	0	0	1	0	1	1	0	1	1	1	0	
1	0	0	1	0	1	0	0	1	0	1	0	1	1	0	1	1	0	
1	1	0	1	1	0	0	0	1	1	0	0	1	1	1	0	0	1	

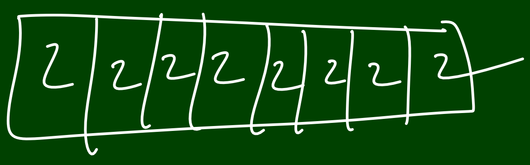


$2^4 = 16$

2 → 16 Boolean functions

3 → 81

2^8



2^8

2^{16}

$n = 4$

$n \longrightarrow 2^{2^n}$ Boolean functions