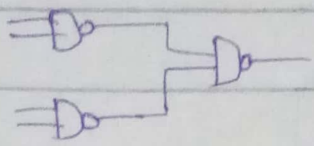
·D

$F = A \cdot B + C \cdot D$

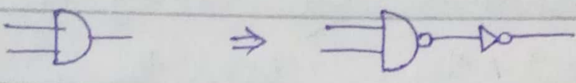
$F' = (A \cdot B + C \cdot D)'$

$F' = (A \cdot B)' \cdot (C \cdot D)'$

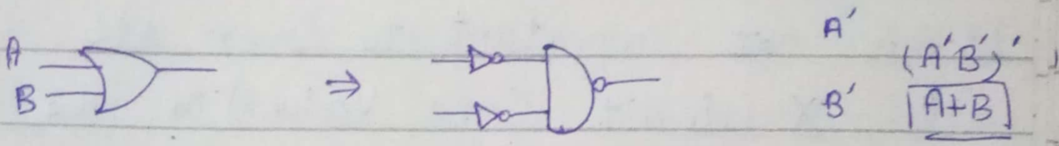
$(F')' = [(A \cdot B)' \cdot ((C \cdot D)')']'$



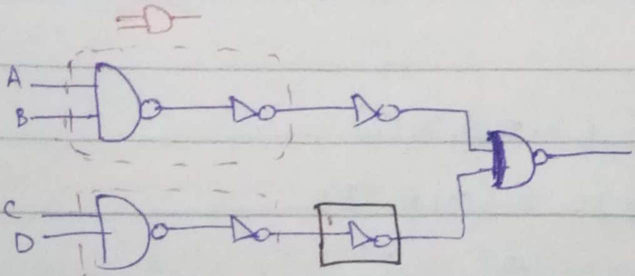
AND's equivalent with NAND:

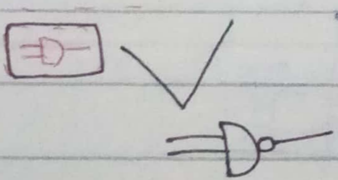


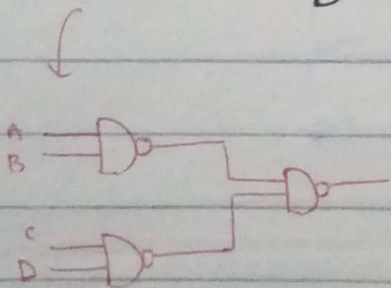
OR's equivalent with NOR + NAND



$F = AB + CD$







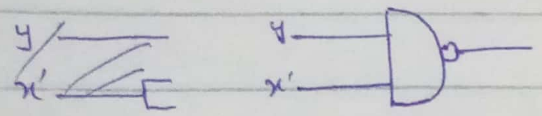
$F(x,y,z) = \Sigma(0,1,4,5,6,7)$ NAND

	$y'z'$	$y'z$	yz	yz'
x'	1 m_0	1 m_1	m_3	m_2
x	1 m_4	1 m_5	1 m_7	1 m_6

$F = y' + x$

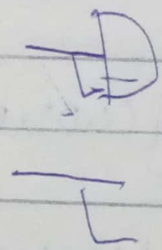
$F' = (y' + x)'$

$(F')' = (y \cdot x')'$



$F(x,y,z) = \Sigma(0,1,3,\cancel{4},5,6,7)$

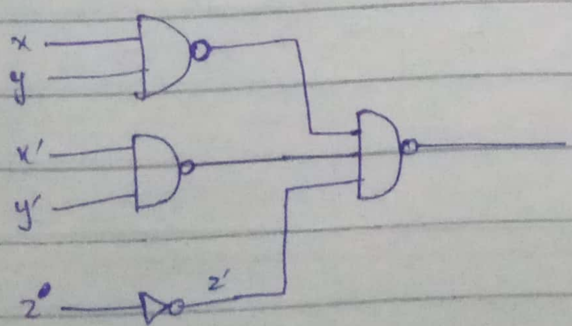
	$y'z'$	$y'z$	yz	yz'
x'	1	1	1	
x		1	1	1



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

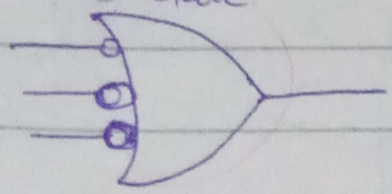
$(F')' = (x+y) \cdot z' \cdot (x'+y')$

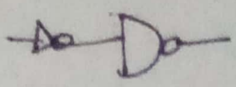
$(F')' = [(x+y) \cdot z' \cdot (x'+y')]'$



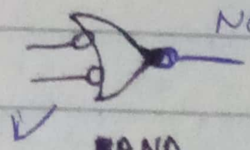
~~OR Gate:~~

NAND Gate



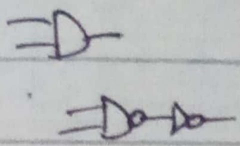


OR (+)

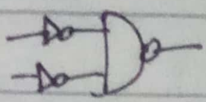


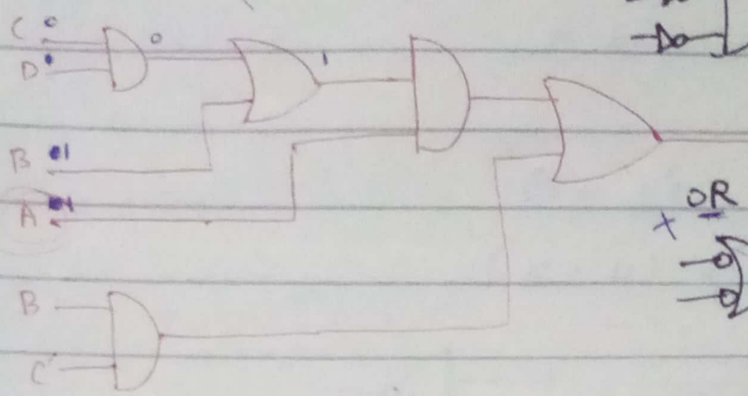
NOR →

AND

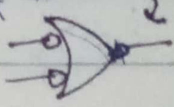


OR



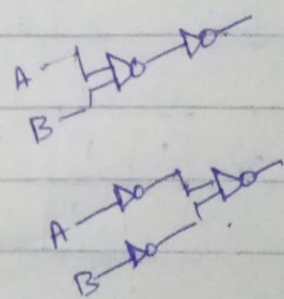


OR AND



C.D B.A B.C'

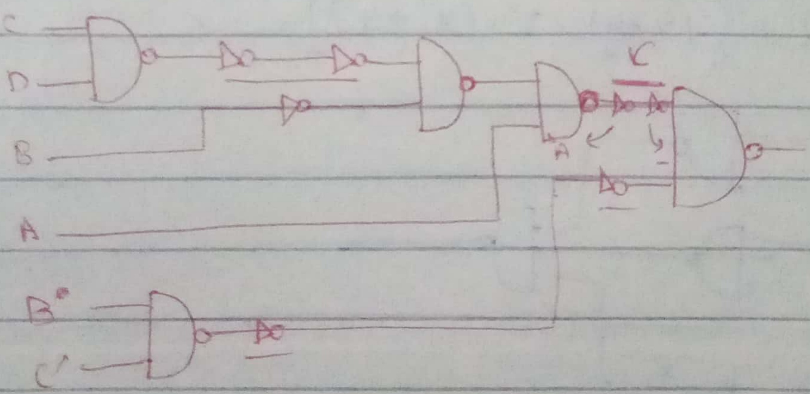
$F = [((C.D)+B).A + B.C']$



$F' = \{[((C.D)+B].A + B.C']\}'$

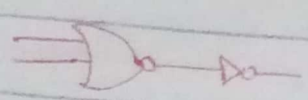
$= [((C.D)+B]'.A]' . (B.C')'$

$= ((C.D)+$

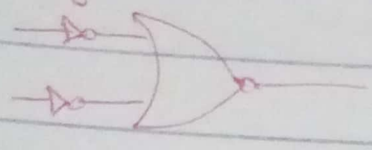


NOT 

OR by ~~NOR~~ NOR: +(OR)

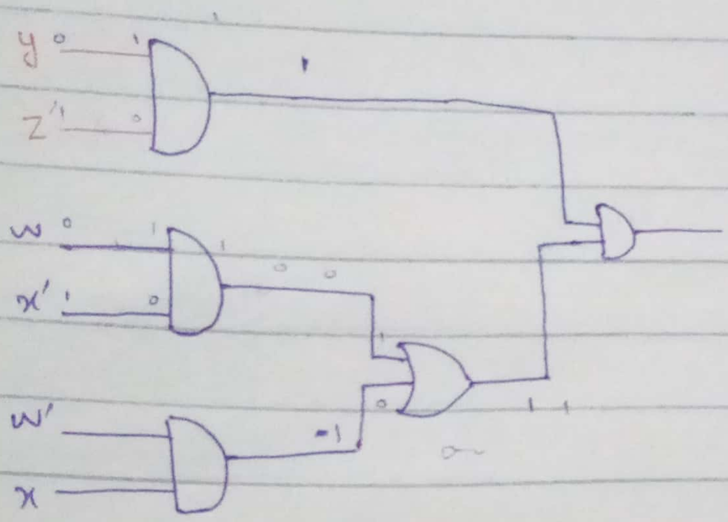


AND by OR & NOT

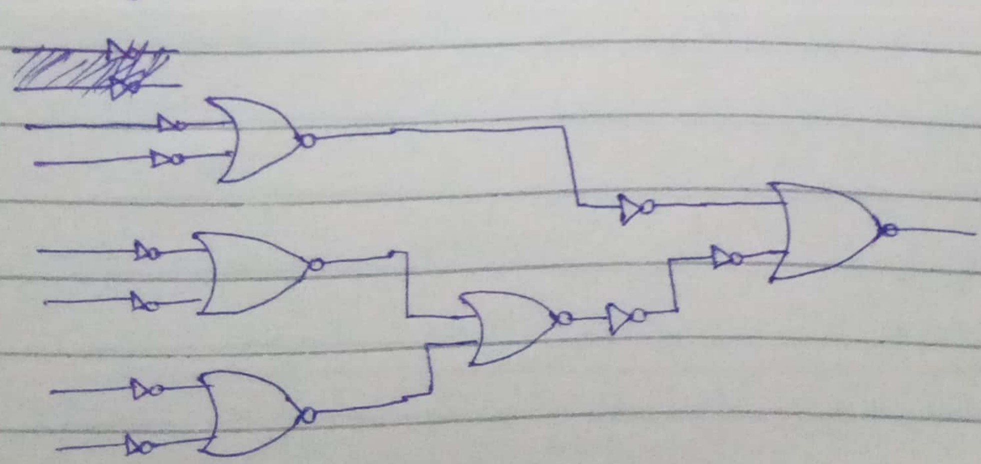


NOR , (NOT + OR)

$F = (y + z') \cdot (wx' + w'x)$



1 using NOR



3.15

(b) $F(A,B,C,D) = \Sigma(0,6,8,13,14)$

$d = \Sigma(2,4,10)$

	$AC'D'$	$C'D$	CD	CD'
$A'B'$	1 m_0	m_1	m_3	X m_2
$A'B$	X m_4	m_5	m_7	1 m_6
AB	m_{12}	1 m_{13}	m_{15}	1 m_{14}
AB'	m_8 1	m_9	m_{11}	X m_{10}

$F = CD' + B'C'\cancel{D'} + ABC'D$

(c) $F(A,B,C,D) = \Sigma(5,6,7,12,14,15)$

$d = \Sigma(3,9,11,15)$

	$C'D'$	$C'D$	CD	CD'
$A'B'$	0	1	X 3	2
$A'B$	4	1 5	1 7	1 6
AB	1 12	13	1 X 15	1 14
AB'	m_8	X 9	X 11	10

$F = A'BD + ABD' + BC$

Q# 16:

14,15   11,10   0,4

(a) $F(A,B,C,D) = AC'D' + A'C + ABC + AB'C + A'C'D'$

12, 8   3,2,6,7   0,4,3,2

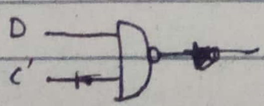
1 0	1	1 3	1 2
1 4	5	1 7	1 6
1 12	13	1 15	1 14
1 8	9	1 11	1 10

$= \cancel{C}D' + C$

NAND

$F' = (D'.C)'$

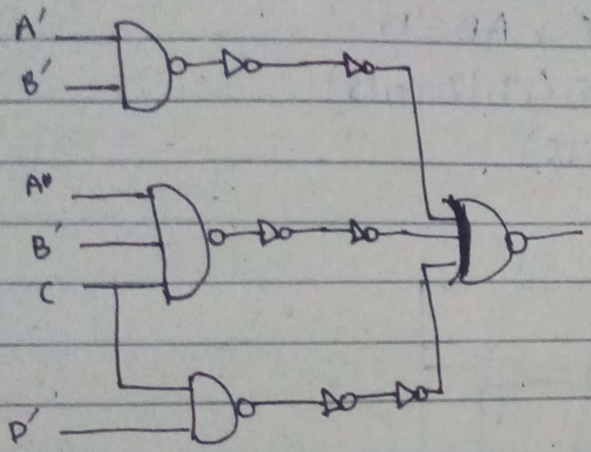
$(F')' = (D.C')'$



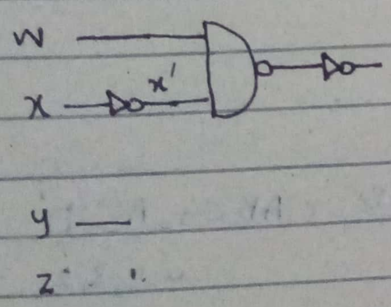
$F(A,B,C,D) = \Sigma(0,1,2,3,6,10,11,14)$

	A'B'	B'D	CD	C'D'
A'B'	1	1	1	1
A'B				1
AB				1
AB'			1	1

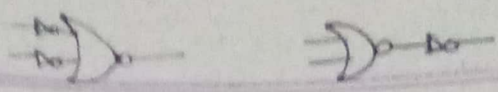
$F = A'.B' + AB'.C + CD'$



3.19. $F = wx' + y'z' + w'yz'$

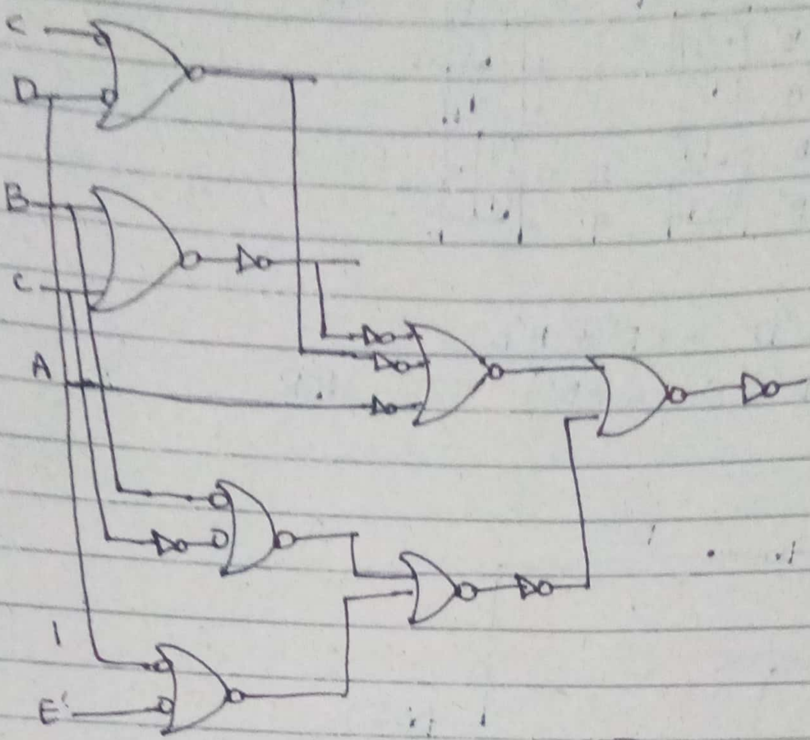


AND



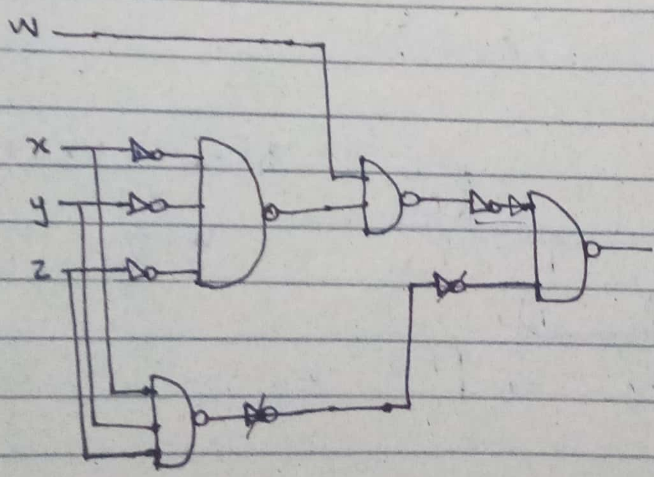
3.20. NOR

(C.D)(B+C)A + (BC' + DE')



3.21 NAND

w.(x+y+z) + x.y.z



3-23.

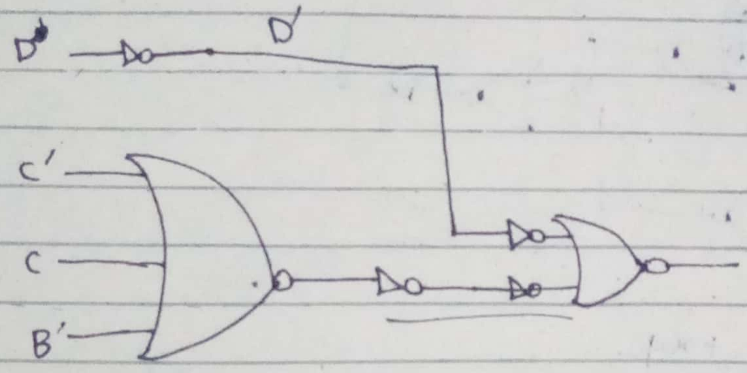
$F(A,B,C,D) = \Sigma(2,4,10,12,14)$

$d = (0,1,5,8)$

	$C'D'$	CD'	CD	CD'
$A'B'$	X	X		1
$A'B$	1	X		1
AB	1			1
AB'	X			1

$F = C'D' + CD' + B'D'$

$= D' \cdot (C' + C + B')$ NOR



$F(w,x,y,z) = \Sigma(0,2,4,5,6,7,8,9,10,13,15)$

	$y'z'$	$y'z$	yz	yz'
$w'x'$	1			1
$w'x$	1	1	1	1
wx		1	1	
wx'	1	1		1

also ⇒ $F_2 = w'z' + xz + x'z'$ (prime implicants)

$F_1 = w'x + x'z' + xz$ (prime implicants)

$F_2 = w'z' + xz + x'z'$

common varients

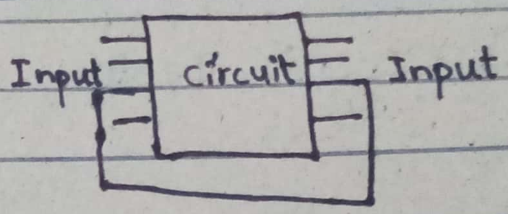
essential prime implicants

The varients/implicants are essential if they remain same in all the possible combinations/functions

If any other grouping of implicants is not possible and there is only one F, then all the prime implicants are essential.

Combinational Circuits:

(other type of circuit is sequential circuit)



* Output is dependent on input and input is dependent on output.

Combinational Circuits: → circuit which generates output from inputs using gates