

Truth Table

7400 IC NAND gates

$$\sim(xy)$$

$y \backslash x$	0	1
0	1	1
1	1	0

x	y	$\sim(xy)$	
0	0	1	LED روشن
0	1	1	"
1	0	1	"
1	1	0	" خاموش

7402 IC NOR gates

$$\sim(x+y)$$

$y \backslash x$	0	1
0	1	0
1	0	0

x	y	$\sim(x+y)$	
0	0	1	LED روشن
0	1	0	" خاموش
1	0	0	"
1	1	0	"

7004 IC inverter gate

$$\sim x$$

x	$\sim x$	
0	1	LED روشن
1	0	" خاموش

7008 IC AND gates

$$xy$$

$y \backslash x$	0	1
0	0	0
1	0	1

x	y	xy	
0	0	0	LED خاموش
0	1	0	"
1	0	0	"
1	1	1	" روشن

7432 OR gates

$$x+y$$

$y \backslash x$	0	1
0	0	1
1	1	1

x	y	$x+y$	
0	0	0	LED خاموش
0	1	1	" روشن
1	0	1	"
1	1	1	"

7486 IC XOR gates

$y \backslash x$	0	1
0	0	1
1	1	0

x	y	$x \oplus y$	
0	0	0	LED خاموش
0	1	1	" روشن
1	0	1	"
0	0	0	" خاموش

Universal NAND Gate

IC 7400 NAND Gates

a) an inverter

$$\sim x = \sim x x$$

x	$\sim x x$
0	1
1	0

b) AND

$$xy = \sim(\sim(xy))$$

x	y	xy
0	0	0
0	1	0
1	0	0
1	1	1

c) OR

$$x+y = \sim(\sim x \sim y)$$

$$= \sim(\sim x x \sim y y)$$

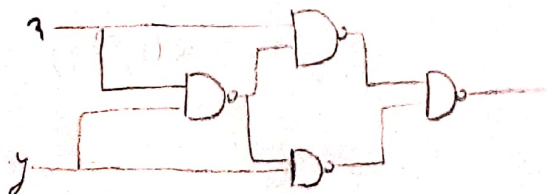
x	y	x+y
0	0	0
0	1	1
1	0	1
1	1	1

d) NOR

$$\sim(x+y) = \sim(\sim(\sim x \sim y))$$

x	y	$\sim(x+y)$
0	0	1
0	1	0
1	0	0
1	1	0

e) XOR

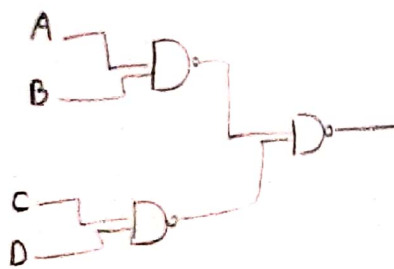


x	y	x XOR y
0	0	0
0	1	1
1	0	1
1	1	0

NAND Circuit

$$F = AB + CD = \sim(\sim(AB) \sim(CD))$$

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



A	B	C	D	F
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	1
1	1	0	1	1
1	1	1	1	1