

# Mata Kuliah

# Dasar Teknik Digital

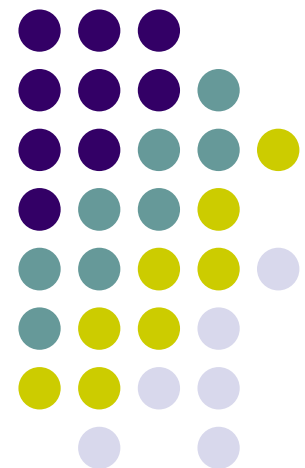
# TKE 113

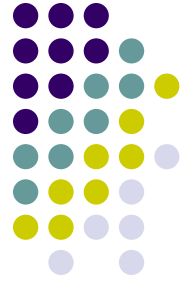


## 2. GERBANG - ALJABAR BOOLEAN

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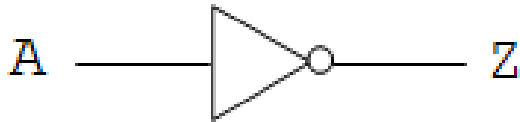




# Gerbang Dasar - NOT

- penyangkalan dengan kata-kata "*tidak*" (NOT)  
 $1' = 0$  dan  $0' = 1$

## Tabel Kebenaran NOT

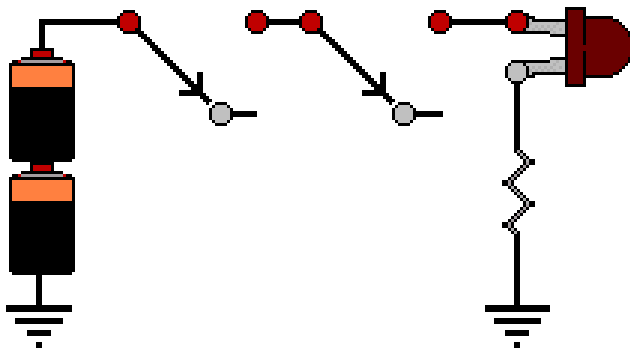
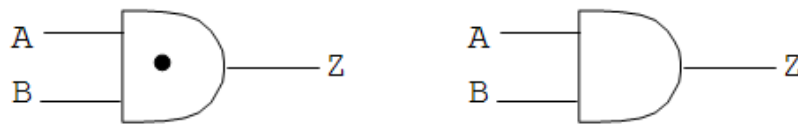


A	$Z = \bar{A}$
0	1
1	0



# Gerbang Dasar - AND

- AND :  $Z = A.B = AB$



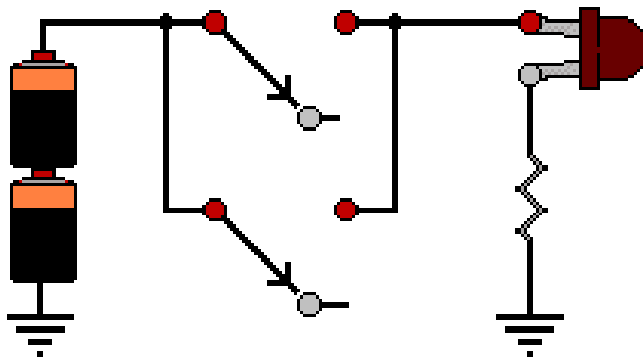
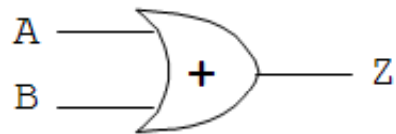
animasi

masukan		keluaran
A	B	$Z = A.B$
0	0	0
0	1	0
1	0	0
1	1	1



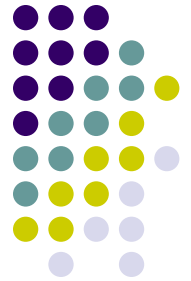
# Gerbang Dasar - OR

- OR :  $Z = A+B$



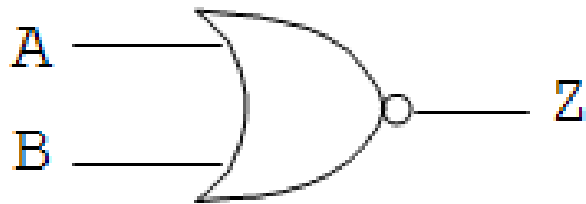
animasi

masukan		keluaran
A	B	$Z = A+B$
0	0	0
0	1	1
1	0	1
1	1	1



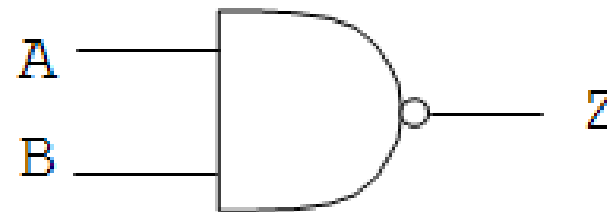
# Gerbang Tambahan

- NOR :  $Z = (A + B)'$

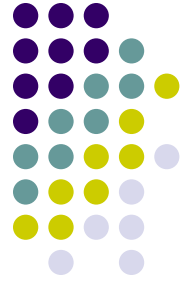


A	B	$Z = \overline{A + B}$
0	0	1
0	1	0
1	0	0
1	1	0

- NAND :  $Z = (A B)'$

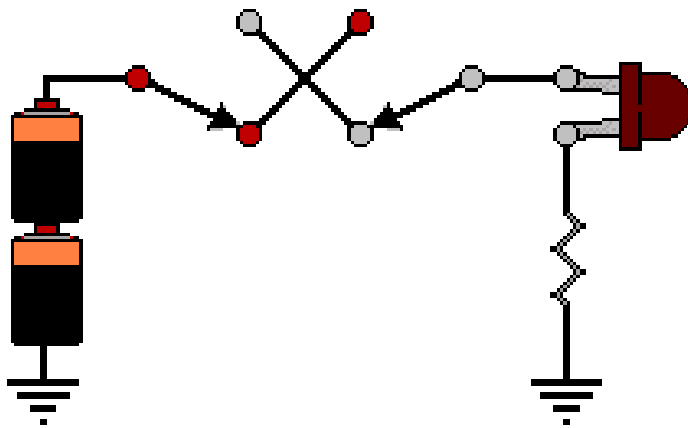
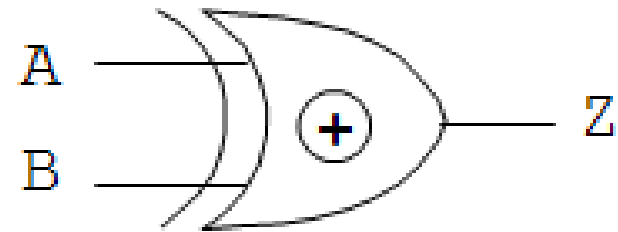


A	B	$Z = \overline{A B}$
0	0	1
0	1	1
1	0	1
1	1	0



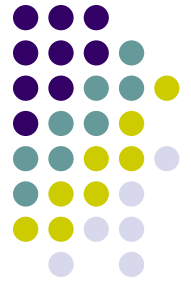
# Gerbang Tambahan

- EXOR :  $Z = \overline{A \oplus B}$



animasi

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



# Teorema Dasar Boole

1. Operasi dengan 0 dan 1	$x + 0 = x$ $x \cdot 0 = 0$ $x + 1 = 1$ $x \cdot 1 = x$
2. Hukum Idempoten	$x + x = x$ $x \cdot x = x$
3. Hukum Involusi	$\overline{\overline{x}} = x$
4. Hukum Komplement	$x + \overline{x} = 1$ $x \cdot \overline{x} = 0$
5. Hukum Komutatif	$x + y = y + x$ $x \cdot y = y \cdot x$
6. Hukum Asosiatif	$(x+y)+z = x+(y+z) = x+y+z$ $(xy)z = x(yz) = xyz$
7. Hukum Distributif	$x(y+z) = xy+xz$ $x+yz = (x+y)(x+z)$

# Teorema Tambahan Boole



1. Teorema penyederhanaan:	$x y + x \bar{y} = x$ $x + x y = x$ $(x + \bar{y}) y = x y$ $(x+y)(x+\bar{y}) = x$ $x(x+\bar{y}) = x$ $x\bar{y} + y = x + y$
2. Hukum de Morgan:	$\overline{x + y + z + \dots} = \bar{x} \bar{y} \bar{z} \dots$ $\overline{x \cdot y \cdot z \cdot \dots} = \bar{x} + \bar{y} + \bar{z} + \dots$
3. Teorema Konsensus:	$xy + yz + \bar{x}z = xy + \bar{x}z$ $(x+y)(y+z)(\bar{x}+z) = (x+y)(\bar{x}+z)$ $(x+y)(\bar{x}+z) = xz + \bar{x}y$
4. Dualitas	$(x + y + z + \dots)^D = x y z$ $(x y z \dots)^D = x + y + z + \dots$ $[f(x_1, x_2, x_3, \dots, x_n, 0, 1, +, \cdot)]^D = f(x_1, x_2, x_3, \dots, x_n, 0, 1, +, \cdot)$





# Penyajian Fungsi Boole

- **suku-min** (singkatan dari "suku minimum"  
**minterm**, minimum term)

→ Sum Of Product, nilai 1

$$m_0 + m_1 + m_2 + \dots + m_{n-1} = \sum_{i=0}^{n-1} m_i = \sum m(0,1,2,\dots,n-1)$$

- **sukumax** (singkatan dari "suku maksimum"  
**maxterm**, maximum term)

→ Product of sum, nilai 0

$$M_0 M_1 M_2 \dots M_{n-1} = \prod_{i=0}^{n-1} M_i = \prod M(0,1,2,\dots,n-1)$$

# contoh

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

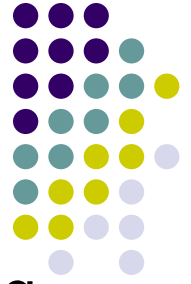
$$f = \sum m (1,3,4,6)$$

$$= \prod M (0,2,5,7)$$

$$f = \bar{A} \bar{B} C + \bar{A} B C + A \bar{B} \bar{C} + A B \bar{C}$$

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





# Fungsi Tidak Lengkap

- 'd' (dont care), dapat dianggap 1 ataupun 0 tergantung pertimbangan desain
- Contoh :  $y = \sum m (0,3,7) + \sum d (1,6),$

A	B	C	y
0	0	0	1
0	0	1	x
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	x
1	1	1	1