Latihan Aljabar Boolean

1. Nyatakan $f(a, bc) = ((ab)'c)'((a'+c)(b'+c'))'$
   dalam bentuk kanonik SOP

2. Cari komplemen dari fungsi $f(w, x, y, z) = x'z +$
   $w'xy' + wyz + w'xy$ dengan cara:
   a. deMorgan
   b. Dualitas

3. Sederhanakan fungsi Boolean berikut secara aljabar
   a. $xy + x'z + yz$
   b. $(x+y)(x'+z)(y+z)$

4. Minimisasi fungsi-fungsi Boolean berikut dengan metode
   peta Karnaugh, dalam bentuk baku SOP dan
   bentuk baku POS
   a. $f(x, yz) = \sum(2, 5, 6, 7)$
   b. $f(x, y, z) = xy + x'y'z + x'yz'$
   c. Diberikan table kebenaran!

x	y	z	$f(x, y, z)$
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

1. $ab = ab(c + c')$

$= abc + abc'$

$c = c(a + a')$

$= ca + ca'$

$= ca(b + b') + ca'(b + b')$

$= abc + ab'c + a'bc + a'b'c$

$a' = a'(b + b')$

$= a'b + a'b'$

$= a'b(c + c') + a'b'(c + c')$

$= a'bc + a'bc' + a'b'c + a'b'c'$

$b' = b'(a + a')$

$= ab' + a'b'$

$= ab'(c + c') + a'b'(c + c')$

$= ab'c + ab'c' + a'b'c + a'b'c'$

$c' = c'(a + a')$

$= ac' + a'c'$

$= ac'(b + b') + a'c'(b + b')$

$= abc' + ab'c' + a'c'b + a'b'c'$

$f(a,b,c) = ((abc + abc')' abc + abc + a'bc + abc)' (a'b'c +$
$a'b'c + a'bc' + a'bc + abc' + ab'c' + abc + ab'c)'$

$= ((abc + abc')' abc + abc + a'bc + ab'c)$
$(abc + ab'c' + a'b'c' + abc' + a'bc')'$

$= (a'b'c' + a'b'c + a'b'c' + a'bc' + ab'c' +$
$abc')' (ab'c + ab'c' + a'bc' + abc' + a'bc')'$

$= abc + abc' + ab'c + a'bc + ab'c' + ab'c$
$a'bc + abc + a'bc + ab'c$

$= abc + abc' + ab'c + a'bc + ab'c + a'bc'$

$f(a,b,c) = m_7 + m_6 + m_5 + m_3 + m_1 + m_2$ ~~$\Sigma (0,...)$~~
$= \Sigma(1,2,3,5,6,7)$

2. $f(w,x,y,z) = x'z + w'xy' + wyz + w'xy$

a. de Morgan
$f(w,x,y,z) = (x + z')(w + x' + y)(w' + y + z')(w+x$

b. dualities
$f(w,x,y,z) = (x' + z)(w' + x + y')(w + y + z)(w' + x + y$
$= (x + z')(w + x' + y)(w' + y' + z)(w + x' + y) = $

3. 2. $f(x,y,z) = xy + x'z + yz$

$= xy + x'z + yz(x+x')$

$= xy + x'z + xyz + x'yz$

$= xy + xyz + x'z = x'yz$

$= xy(1+z) + x'z(1+y)$

b. $f(x,y,z) = (x+y)(x'+z)(y+z)$

$= x' + (yz) + (y+z)$

4. 2. $f(x,y,z) = \sum(2,3,6,7)$

· Peta Karnaugh

$= m_2 + m_3 + m_6 + m_7$

yz \ x	00	01	11	10
0	$x'y'z'$	$x'y'z$	$x'yz$	$x'yz'$
1	$xy'z'$	$xy'z$	xyz	xyz'

m_0	m_1	m_3	m_2
m_4	m_5	m_7	m_6

$= x'yz' + x'yz + xyz' + xyz$

· SOP $= m_2 + m_3 + m_6 + m_7$

$= x'yz' + x'yz + xyz' + xyz$

· POS $= M_2 + M_3 + M_6 + M_7$

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

b. $f(x,y,z) = xy + x'y'z + x'yz'$

Cbentuk belum sempurna maka hitung dalam kenonik SoP)

- SoP :

$$xy = xy(z+z')$$
$$= xyz + xyz'$$

$$= xyz + xyz' + x'y'z + x'yz'$$
$$= m_7 + m_6 + m_1 + m_2 \qquad = \Sigma(1,2,6,7)$$

- Peta Kernaugh

m_0	m_1	m_3	m_2
m_4	m_5	m_7	m_6

$x \backslash yz$	00	01	11	10
0	$x'y'z'$	$\boxed{x'y'z}$	$x'yz$	$\boxed{x'yz'}$
1	$xy'z'$	$xy'z$	$\boxed{xyz}$	$\boxed{xyz'}$

$m_1 \to$, $m_2 \to$, $m_7 \downarrow$, $m_6 \downarrow$

$$= m_7 + m_6 + m_1 + m_2$$
$$= xyz + xyz' + x'y'z + x'yz'$$

- PoS: $M_2 + M_7 + M_6 + M_4$

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

c.

x	y	z	$f(x,y,z)$	
0	0	0	0	
0	0	1	1	$\to m_1 = M_1$
0	1	0	1	$\to m_2 = M_2$
0	1	1	0	
1	0	0	1	$\to m_4 = M_4$
1	0	1	0	
1	1	0	0	
1	1	1	1	$\to m_7 = M_7$

• Peta Karnaugh

m_0	m_1	m_3	m_2
m_4	m_5	m_7	m_6

x\\yz	00	01	11	10
0	$x'y'z$	$x'yz$	xyz	$xy'z$
1	$x'y'z'$	$x'yz$	xyz	$xy'z'$

$$= m_1 + m_2 + m_4 + m_7$$
$$= x'y'z + x'yz' + xyz' + xyz$$

• SOP $= m_1 + m_2 + m_4 + m_7$
$$= x'y'z + x'yz' + xy'z' + xyz$$

• POS $= M_1 + M_2 + M_4 + M_7$
$$= (x+y+z') + (x+y+z).(x'+y+z).(x'+y'+z')$$

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