# Tugas Mandiri 3

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Kelas : C
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① d. $F(A,B,C,D) = D + A(C.D + B) + \bar{B}.C.\bar{D}$ => L=8, G=12, GN=14

| | | |
|---|---|---|
| => | $D + ACD + AB + \bar{B}C\bar{D}$ | distribution law |
| => | $D + AB + \bar{B}C\bar{D}$ | Absorption law $(A + AB = A)$ |
| => | $D + AB + \bar{B}C$ | Absorption law $(A + \bar{A}B = A+B)$ |

↳ L=5, G=7, GN=8

② $F(A,B,C,D) = (\bar{D}.\bar{D} + A.B).C + D.C$ => L=7, G=12, GN=13

| | | |
|---|---|---|
| => | $(\bar{D} + AB)C + DC$ | Idempotent law $(AA = A)$ |
| => | $C\bar{D} + ABC + DC$ | distributive law |
| | $C\bar{D} + DC + ABC$ | Commutative law |
| | $C(\bar{D} + D) + ABC$ | distributive law |
| | $C.1 + ABC$ | Complement law $(A + \bar{A} = 1)$ |
| | $C$ | Absorption law $(A + AB = A)$ |

=> L=1, G=1, GN=1

③ $F(A,B,C,D) = D.(A.C + C(B.B) + D.A)) + AC$ => L=10, G=18, GN=18

| | | |
|---|---|---|
| => | $D.(AC + C(B + DA)) + AC$ | Idempotent law $(AA = A)$ |
| => | $D.(AC + BC + ACD) + AC$ | distributive law |
| => | $D.(AC + ACD + BC) + AC$ | Commutative law |
| => | $D.(AC + BC) + AC$ | Absorption law $(A + AB = A)$ |
| => | $ACD + BCD + AC$ | distributive law |
| => | $AC + ACD + BCD$ | Commutative law $(A+B = B+A)$ |
| => | $AC + BCD$ | Absorption law $(A + AB = A)$ |
| => | $C(A + BD)$ | distributive law |

↳ L=5, G=7, GN=7

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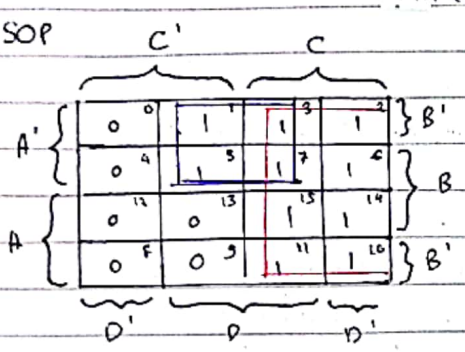
2. a. $F(A, B, C, D) = \Sigma m\ (1, 2, 3, 5, 6, 7, 10, 11, 14, 15)$ SOM

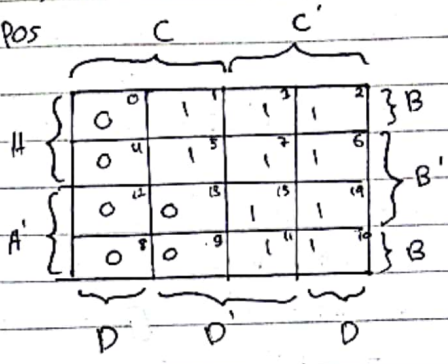
$\Pi M\ (0, 4, 8, 9, 12, 13)$ POM

SOP




$\Rightarrow C + A'D$

POS

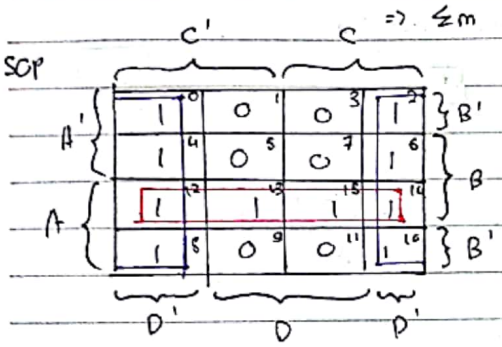



$\Rightarrow (C+D)(A'+C)$

b. $F(A, B, C, D) \Rightarrow \Pi M\ (1, 3, 5, 7, 9, 11)$

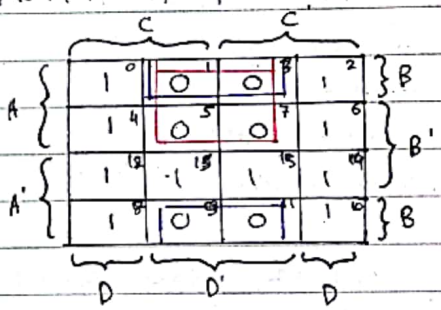
$\Rightarrow \Sigma m\ (0, 2, 4, 6, 8, 10, 12, 13, 14, 15)$

SOP




$\Rightarrow D' + AB$

POS




$\Rightarrow (A+D')(B+D')$

c. $F(A, B, C, D) = (\bar{A}.A + A.C)B + \bar{D}.A$ Simplifikasi Aljabar

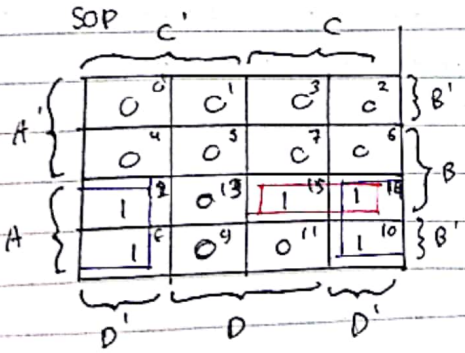
$= (0 + AC)B + \bar{D}A$ Complement law

$= (ABC) + (A\bar{D})$

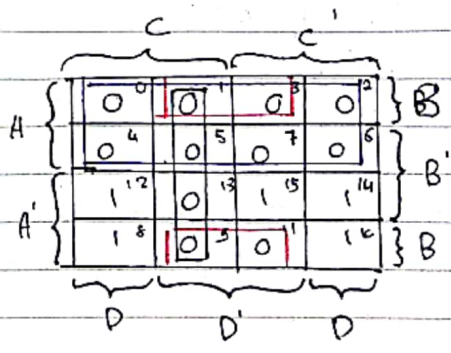
$\Sigma m = (8, 10, 12, 14, 15)$

$\Pi M = (0, 1, 2, 3, 4, 5, 6, 7, 9, 11, 13)$

SOP




$\Rightarrow ABC + A\bar{D}$




$\Rightarrow (A)(B+D')(C+D')$

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3. a. $F(A,B,C,D) = C.D + (A.B + C.C).C$

$\Rightarrow CD + (AB + C).C$ — idempotent law ($AA = A$)

$\Rightarrow CD + ABC + CC$ — distributive law

$\Rightarrow CD + ABC + C$ — idempotent law ($AA = A$)

$\Rightarrow C + CD + ABC$ — commutative law

$\Rightarrow C + ABC$ — Absorption law ($A + AB = A$)

$\Rightarrow C + CAB$ — Commutative law

$\Rightarrow C$ — Absorption law ($A + AB = A$)

Truth Table

| A | B | C | D | F |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 1 |

Sum of minterms (SOM)

$\Rightarrow \Sigma m\,(2,3,6,7,10,11,14,15)$

Product of Maxterms (POM)

$\Rightarrow \Pi M\,(0,1,4,5,8,9,12,13)$

b. $F(A,B,C,D) = \bar{D}.A + B(CB + DD)$

$= \bar{D}.A + B(CB + D)$ — Idempotent law ($AA = A$)

$= \bar{D}A + BBC + BD$ — distributive law

$= \bar{D}A + BC + BD$ — Idempotent law ($AA = A$)

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Truth Table

| A | B | C | D | F |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 1 |

Sum of Minterms (SOM)
$\Rightarrow \Sigma m (5, 6, 7, 8, 10, 12, 13, 14, 15)$

Product of Maxterms (POM)
$\Rightarrow \Pi M (0, 1, 2, 3, 4, 9, 11)$

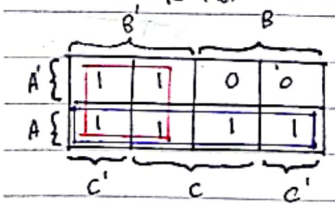
4. a. $F(A, B, C) = A(BA + BC) + \overline{B} \cdot \overline{B}$ (NAND)

$= A(BA + BC) + \overline{B}$ idempotent law ($AA = A$)

$= AAB + ABC + \overline{B}$ distribution law

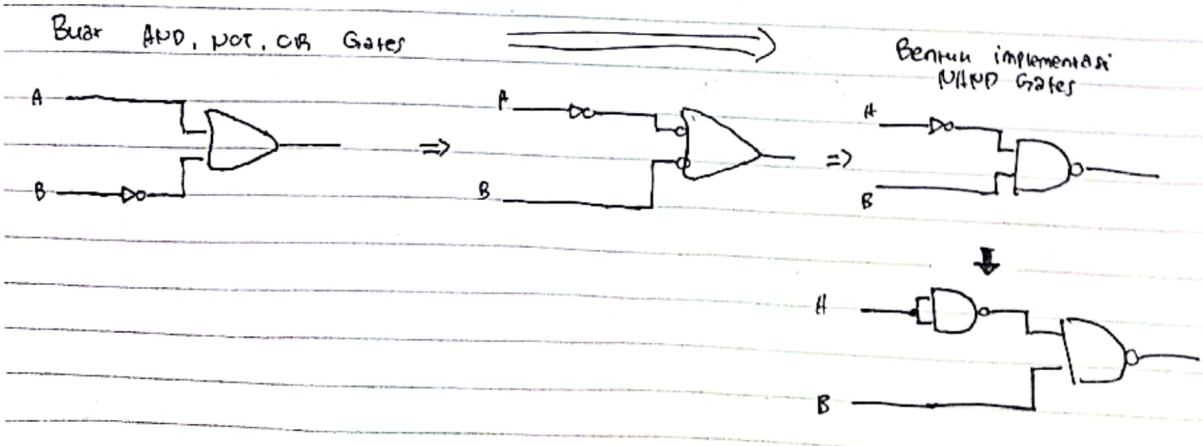
$= AB + ABC + \overline{B}$ Idempotent law ($AA = A$)

K-Map




SOP = $A + B'$

Buat AND, NOT, OR Gates




Bentuk implementasi NAND Gates

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b. $F(A, B, C) = (B.C' + C.C)A + C.B$ (NOR Gates)

$(B.C + C)A + CB$ Idempotent law ($AA = A$)

$ABC + AC + CB$ Distribution law

K-Map

| | B' | B | B | B' |
|---|---|---|---|---|
| A' | 0 | 0 | 1 | 0 |
| A | 0 | 1 | 1 | 0 |
| | C' | C | C' | |

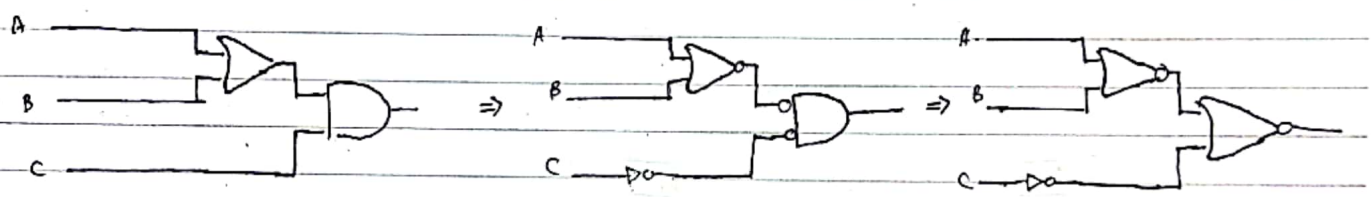
⇒ Buat menjadi K-maps POS ⇒

| | B | B' | B | B' |
|---|---|---|---|---|
| A | 0 | 0 | 1 | 0 |
| A' | 0 | 1 | 1 | 0 |
| | C | C' | C | |

Mana bentuk POS nya

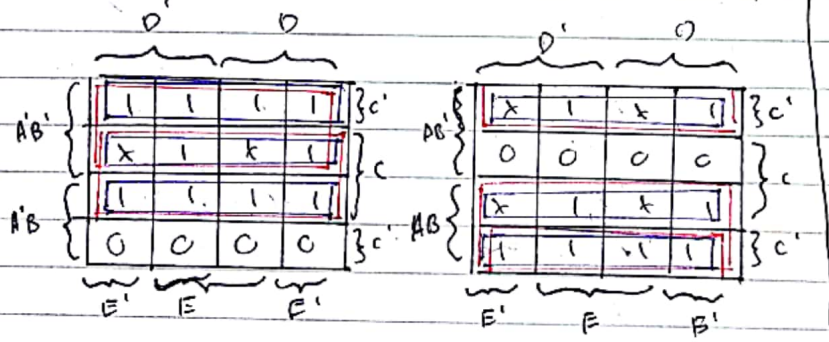
⇒ $C.(A + B)$

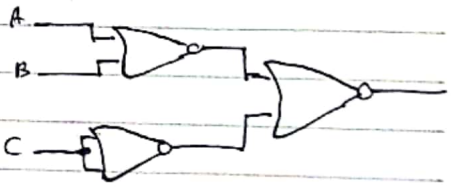
Buat AND, NOT, OR Gates




Bentuk PCB implement

5.




Prime Implicants
- B'C'
- BC
- A'B'
- A'C
- AB
- AC'

Essential Prime Implicants
- A'B'
- BC
- AC'