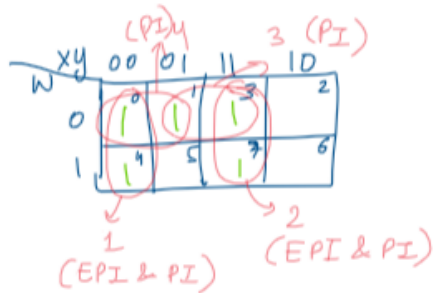


Q1. Find all prime implicants and the essential prime implicants.

① $f(x, y, z) = \sum m(0, 1, 3, 4, 7)$



$PI = 4 (\bar{w}\bar{x}, \bar{w}y, \bar{x}\bar{y}, xy)$

$EPI = 2 (\bar{x}y, xy)$

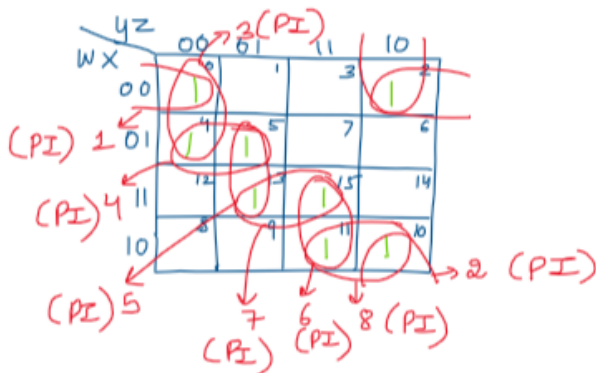
② $f(x, y, z) = \sum m(0, 1, 2, 3, 4, 5, 6, 7)$



$PI = 1 (1)$

$EPI = 1 (1)$

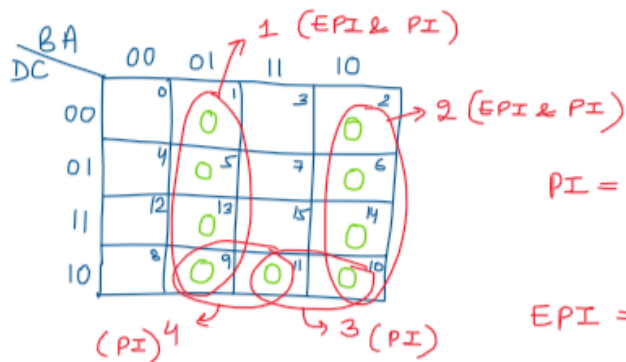
③ $f(w, x, y, z) = \sum m(0, 2, 4, 5, 10, 11, 13, 15)$



$PI = 8 (\bar{w}\bar{x}\bar{z}, \bar{x}y\bar{z}, \bar{w}y\bar{z}, \bar{w}x\bar{y}, x\bar{y}z, wyz, wxz, w\bar{x}y)$

$EPI = 0$

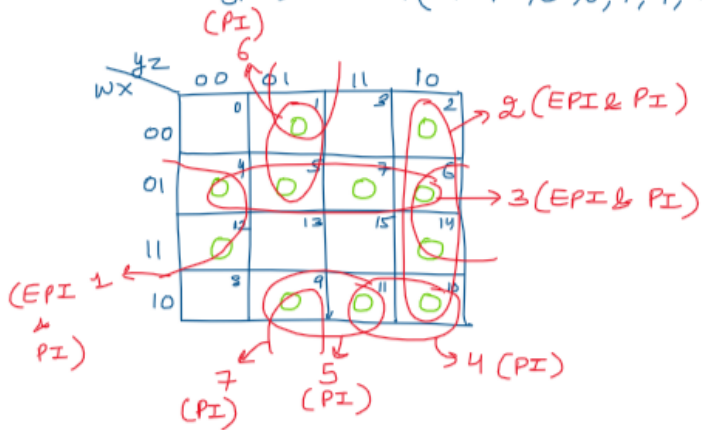
④ $f(D, C, B, A) = \sum m(1, 2, 5, 6, 9, 10, 11, 13, 14)$



$PI = 4 (B + \bar{A}, \bar{B} + A, \bar{D} + C + \bar{A}, \bar{D} + C + \bar{B})$

$EPI = 2 (B + \bar{A}, \bar{B} + A)$

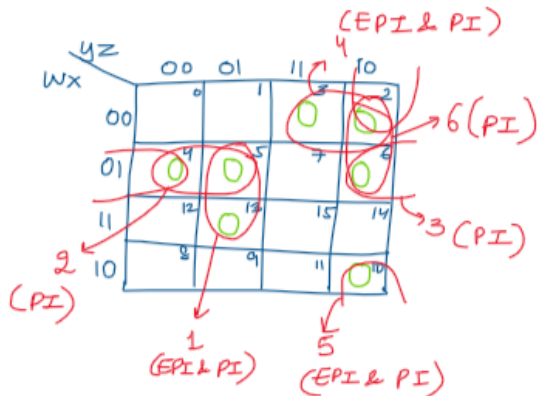
⑤ $f(w,x,y,z) = \prod M(1,2,4,5,6,7,9,10,11,12,14)$



$PI = 7(\bar{x}+z, \bar{y}+z, w+\bar{x}, \bar{w}+x+\bar{y}, \bar{w}+x+\bar{z}, w+y+\bar{z}, x+y+\bar{z})$

$EPI = 3(\bar{x}+z, \bar{y}+z, w+\bar{x})$

⑥ $f(w,x,y,z) = \prod M(2,3,4,5,6,10,13)$

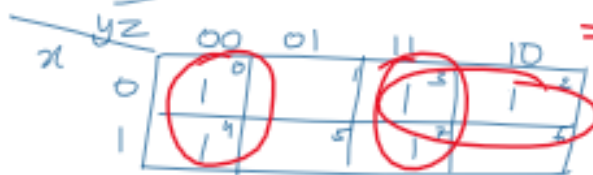


$PI = 6(\bar{x}+y+\bar{z}, w+\bar{x}+y, w+\bar{x}+z, w+x+\bar{y}, x+\bar{y}+z, w+\bar{y}+z)$

$EPI = 3(\bar{x}+y+\bar{z}, w+x+\bar{y}, x+\bar{y}+z)$

Q2. Find minimized SOP

① $f(x,y,z) = \sum m(0,2,3,4,7)$
3 variables



$\Rightarrow \bar{y}\bar{z} + yz + \bar{x}y$

② $f(w, x, y, z) = \sum m(0, 4, 8, 10, 11, 12, 13, 15)$
 4 variables

| | yz | | | |
|----|----|----|----|----|
| wx | 00 | 01 | 11 | 10 |
| 00 | 1 | 0 | 1 | 0 |
| 01 | 1 | 1 | 0 | 0 |
| 11 | 1 | 1 | 1 | 0 |
| 10 | 1 | 1 | 1 | 1 |

$\Rightarrow \bar{y}\bar{z} + wxz + w\bar{x}y$

③

$f(w, x, y, z) = \sum m(1, 3, 5, 7, 8, 10, 12, 14)$

| | yz | | | |
|----|----|----|----|----|
| wx | 00 | 01 | 11 | 10 |
| 00 | 0 | 1 | 1 | 0 |
| 01 | 0 | 1 | 1 | 0 |
| 11 | 1 | 1 | 1 | 0 |
| 10 | 1 | 1 | 1 | 1 |

$\Rightarrow \bar{w}z + w\bar{z} + wx\bar{y}$

Q3. Find minimized POS.

① $f(x, y, z) = \prod M(0, 1, 2, 3, 5, 7)$

| $x \backslash yz$ | $y\bar{z}$ | $y+z$ | $\bar{y}\bar{z}$ | $\bar{y}+z$ |
|-------------------|------------|-------|------------------|-------------|
| x | 1 | 1 | 1 | 1 |
| \bar{x} | 0 | 1 | 1 | 0 |

$f(x, y, z) = \bar{x} + z$

② $f(w, x, y, z) = \prod M(0, 2, 7, 8, 9, 11, 12, 14, 15)$

| $w \backslash x \backslash yz$ | $y\bar{z}$ | $y+z$ | $\bar{y}\bar{z}$ | $\bar{y}+z$ |
|--------------------------------|------------|-------|------------------|-------------|
| $w+x$ | 1 | 1 | 0 | 1 |
| $w+\bar{x}$ | 0 | 0 | 1 | 0 |
| $\bar{w}+\bar{x}$ | 1 | 0 | 1 | 1 |
| $\bar{w}+x$ | 1 | 1 | 1 | 0 |

$f(w, x, y, z) = (\bar{x} + y + \bar{z})(w + \bar{x} + z)$
 $(w + x + \bar{y} + \bar{z})(\bar{w} + x + \bar{y} + z)$

③ $f(w, x, y, z) = \prod M(5, 10, 11, 13, 14, 15)$

| $w \backslash x \backslash yz$ | $y\bar{z}$ | $y+z$ | $\bar{y}\bar{z}$ | $\bar{y}+z$ |
|--------------------------------|------------|-------|------------------|-------------|
| $w+x$ | 0 | 0 | 0 | 0 |
| $w+\bar{x}$ | 0 | 1 | 0 | 0 |
| $\bar{w}+\bar{x}$ | 0 | 1 | 1 | 1 |
| $\bar{w}+x$ | 0 | 0 | 1 | 1 |

$f(w, x, y, z) = (w + \bar{y})(x + y)(y + z)$