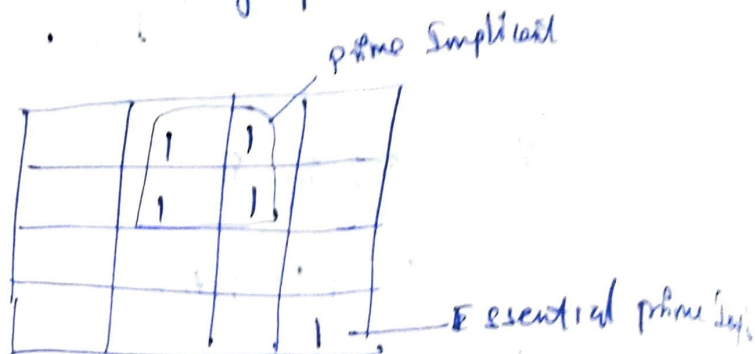


Quine-McCluskey or Tabular method.

no of variables increases 4, 5, 6

prime Implicants - Largest possible group of 1's

Essential prime Implicants - Having 1 minterm that can't be grouped to other ones.



EX

$$Y(A, B, C, D) = \sum m(0, 1, 3, 7, 8, 9, 11, 15)$$

- (1) Binary equivalent
- | | | | |
|--------|--------|--------|---------|
| 0-0000 | 3-0011 | 8-1000 | 11-1011 |
| 1-0001 | 7-0111 | 9-1001 | 15-1111 |

(2) Arrange minterms in table

Group		minterm	Bin rep	
			A B C D	
No ones	0	m_0	0 0 0 0	✓
one 1's	1	m_1	0 0 0 1	✓
		m_8	1 0 0 0	✓
two 1's	2	m_3	0 0 1 1	✓
		m_9	1 0 0 1	✓
three 1's	3	m_7	0 1 1 1	✓
		m_{11}	1 0 1 1	✓
4	4	m_{15}	1 1 1 1	✓

2

miniterm pairs	Binary rep A B C D	miniterm	Binary rep
(0,1)	000- ✓	0,1,8,9	-00-
(0,8)	-000 ✓	0,8,1,9	-00-
(1,3)	000-1 ✓	1,3,9,11	-0-1
(1,9)	-001 ✓	3,7,11,15	--11
(8,9)	100- ✓		
(3,7)	0-11 ✓		
(3,11)	-011 ✓		
(9,11)	10-1 ✓		
(7,15)	-111 ✓		
(11,15)	1-11 ✓		

$-00- = \overline{B}C$
 $-0-1 = \overline{B}D$
 $--11 = CD$

P Implicant (table)
 ↓
 PI table

P-I	m ₀	m ₁	m ₃	m ₇	m ₈	m ₉	m ₁₁	m ₁₅
0,1,8,9	⊙	•			⊙	•		
1,3,9,11		•	•			•	•	
3,7,11,15			•	⊙			•	⊙

$Y = \overline{B}C + CD$

Using the tabular method, obtain the minimal expression $f(a, b, c, d)$

$$f = \sum m(6, 7, 8, 9) + d(10, 11, 12, 13, 14, 15)$$

Step 1	min term	Binary representation	Step 2	group of 2's	m	Binary
	m_6	0110 ✓	2	m_6	0110 ✓	0110 ✓
	m_7	0111 ✓		m_7		
	m_8	1000 ✓	3	m_8	1010 ✓	1011 ✓
	m_9	1001 ✓		m_9		
	m_{10}	1010 ✓	4	m_{10}	1100 ✓	1110 ✓
	m_{11}	1011 ✓		m_{11}		
	m_{12}	1100 ✓		m_{12}	1101 ✓	1110 ✓
	m_{13}	1101 ✓		m_{13}		
	m_{14}	1110 ✓		m_{14}	1110 ✓	
	m_{15}	1111 ✓		m_{15}	1111 ✓	

steps
min term Binary rep

8,9	100- ✓	11,15	1-11 ✓
8,12	1-00 ✓	13,15	11-1 ✓
8,10	10-0 ✓	14,15	111- ✓
6,7	011- ✓		
6,14	-110 ✓		
9,11	10-1 ✓		
9,13	1-01 ✓		
10,11	101- ✓		
10,14	1-10 ✓		
14,15	110- ✓		
12,14	11-0 ✓		
7,15	-111 ✓		

8, 9, 6, 7

8, 9, 10, 11 1 0 - - ✓

8, 9, 12, 13 1 - 0 - ✓

~~8, 10, 9, 13 1 - 0 -~~

~~8, 10, 9, 11 1 0 - -~~

6, 7, 14, 15 - 1 1 -

~~6, 7, 14, 15 - 1 1 -~~

9, 11, 14, 15 1 - - 1 ✓

~~9, 13, 11, 15 1 - - 1~~

10, 11, 14, 15 1 - 1 - ✓

~~10, 14, 14, 15 1 - 1 -~~

14, 13, 14, 15 1 1 - - ✓

~~12, 14, 13, 15 1 1 - -~~

8, 9, 10, 11, 12, 13, 14, 15 1 - - -

PE's missing

6 7 8 9

⊙ ⊙

8, 9, 10, 11, 12, 13, 14, 15

⊙ ⊙

6, 7, 14, 15

8, 9 = 1 - - - ⇒ A = W

6, 7 - 1 1 - ⇒ BC = XY

Find minimal expression for $f = \sum m(2,3,8,12,13)$ of (a,b,c)

When binary rep

2 →	0010
3	0011
8 →	1000
10 →	1010
12 →	1100
13 →	1101
14 →	1110

When binary	Pass	Binary rep
2	0010 ✓	001
8	1000 ✓	-010
3	0010 ✓	1-00 ✓
10	1010 ✓	10-0 ✓
12	1100 ✓	
13	1101 ✓	
14	1110 ✓	

8,12,10,14 1--0
 8,10,12,14 1--0

PI / minterms	2	3	8	12	13
8,12,10,14	✓	✓	⊙	•	✓
12,13				•	⊙
9,10					
9,13					

P, Q, S are essential Simpllicants

1--0 ⇒ $(\bar{A} + D) & \bar{C}$

110- ⇒ $(\bar{A} + \bar{B} + C)$

1001- ⇒ $(A + B + \bar{C})$

$f_{min} = (\bar{A} + D) (\bar{A} + \bar{B} + C) (A + B + \bar{C})$