EXAMPLE:

Simplify the Boolean Expression using Quine McClusky method (Tabular Method)

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

CONVERT DECIMAL NUMBERS TO BINARY NUMBERS

DECIMAL NUMBER	EQUIVALENT BINARY NUMBER	MINTERMS
0	0000	m0
1	0001	m1
3	0011	m3
7	0111	m7
8	1000	m8
9	1001	m9
11	1011	m11
15	1111	m15

STEP 1:

Arrange all Minterms according to number of 1 as shown in table 2

STEP: 2

Compare each minterm in group ‘n’ with each minterm in group (n+1) and identify the match pairs. A match pair is a pair of minterms which differ only in one variable. For the variables differ place (-) dash, as shown in Table 3

Group	Minterm No.	IN BINARY			
		A	B	C	D
0	0	0	0	0	0
1	1	0	0	0	1
	8	1	0	0	0
2	3	0	0	1	1
	9	1	0	0	1
3	7	0	1	1	1
	11	1	0	1	1
4	15	1	1	1	1

TABLE : 2

STEP 3:

Now compare all the pairs of minterms of table 3 with those in the adjacent groups. As shown in table 4

Group	Minterm No.	IN BINARY			
		A	B	C	D
0	0	0	0	0	0
1	1	0	0	0	1
	8	1	0	0	0
2	3	0	0	1	1
	9	1	0	0	1
3	7	0	1	1	1
	11	1	0	1	1
4	15	1	1	1	1

TABLE : 2

Group	Minterm No.	IN BINARY			
		A	B	C	D
0	(0,1)	0	0	0	-
	(0,8)	-	0	0	0
1	(1,3)	0	0	-	1
	(1,9)	-	0	0	1
	(8,9)	1	0	0	-
2	(3,7)	0	-	1	1
	(3,11)	-	0	1	1
	(9,11)	1	0	-	1
3	(7,15)	-	1	1	1
	(11,15)	1	-	1	1

TABLE : 3

STEP 3:

Now compare all the pairs of minterms of table 3 with those in the adjacent groups. As shown in table 4

Group	Minterm No.	IN BINARY			
		A	B	C	D
0	0	0	0	0	0
1	1	0	0	0	1
	8	1	0	0	0
2	3	0	0	1	1
	9	1	0	0	1
3	7	0	1	1	1
	11	1	0	1	1
4	15	1	1	1	1

TABLE : 2

Group	Minterm No.	IN BINARY			
		A	B	C	D
0	(0,1)	0	0	0	-
	(0,8)	-	0	0	0
1	(1,3)	0	0	-	1
	(1,9)	-	0	0	1
	(8,9)	1	0	0	-
2	(3,7)	0	-	1	1
	(3,11)	-	0	1	1
	(9,11)	1	0	-	1
3	(7,15)	-	1	1	1
	(11,15)	1	-	1	1

TABLE : 3

Group	Minterm No.	IN BINARY			
		A	B	C	D
1	0,1,8,9	-	0	0	-
	~~0,8,1,9~~	~~-~~	~~0~~	~~0~~	~~-~~
2	1,3,9,11	-	0	-	1
	~~1,9,3,11~~	~~-~~	~~0~~	~~-~~	~~1~~
3	3,7,11,15	-	-	1	1
	~~3,11,7,15~~	~~-~~	~~-~~	~~1~~	~~1~~

TABLE : 4

STEP 3:

Now compare all the pairs of minterms of table 3 with those in the adjacent groups. As shown in table 4

GROUP	MINTERMS	BINARY REPRESENTATION				
		A	B	C	D	
1	m_0-m_1-m_8-m_9	-	0	0	-	$\overline{B}\,\overline{C}$
	m_0-m_8-m_1-m_9	-	0	0	-	
2	m_1-m_3-m_9-m_{11}	-	0	-	1	$\overline{B}\,D$
	m_1-m_9-m_3-m_{11}	-	0	-	1	
3	m_3-m_7-m_{11}-m_{15}	-	-	1	1	CD
	m_3-m_{11}-m_7-m_{15}	-	-	1	1	

TABLE: 5

STEP: 4

Repeat the procedure for grouping. If can group the Quads of minterms in the adjacent groups of table 4 to obtain groups of eight minterms. There are no such matching.

Now prepare Prime Implicant Table as shown in Table 5

PI	Minterms group & Boolean representation	GIVEN MINTERMS							
		0	1	3	7	8	9	11	15
√	(0,1,8,9) $\overline{B}\,\overline{C}$	(X)	X			(X)	X		
	(1,3,9,11) $\overline{B}\,D$		X	X			X	X	
√	(3,7,11,15) $C\,D$			X	(X)			X	(X)
		√	√	√	√	√	√	√	√

TABLE: 6

From table 6 Essential Prime Implicants are $\overline{B}\ \overline{C}$ *and* CD

Required Output

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