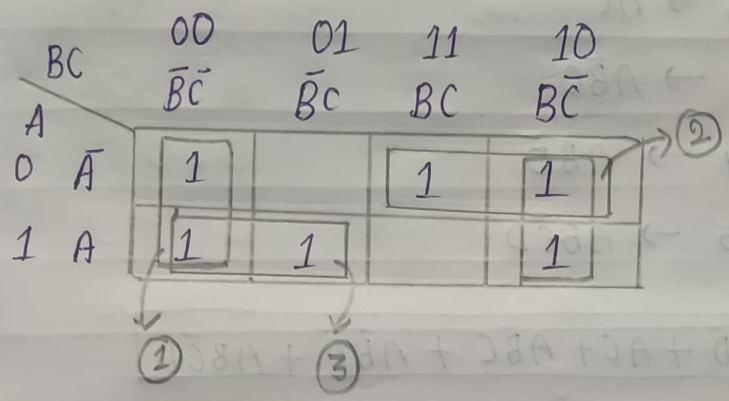
Tutorial-1

1. Reduce $F(A,B,C) = \Sigma m(0,2,3,4,5,6)$.

Sol:



	A B C
0	0 0 0
2	0 1 0
3	0 1 1
4	1 0 0
5	1 0 1
6	1 1 0

Group 1 → $\bar{C}$

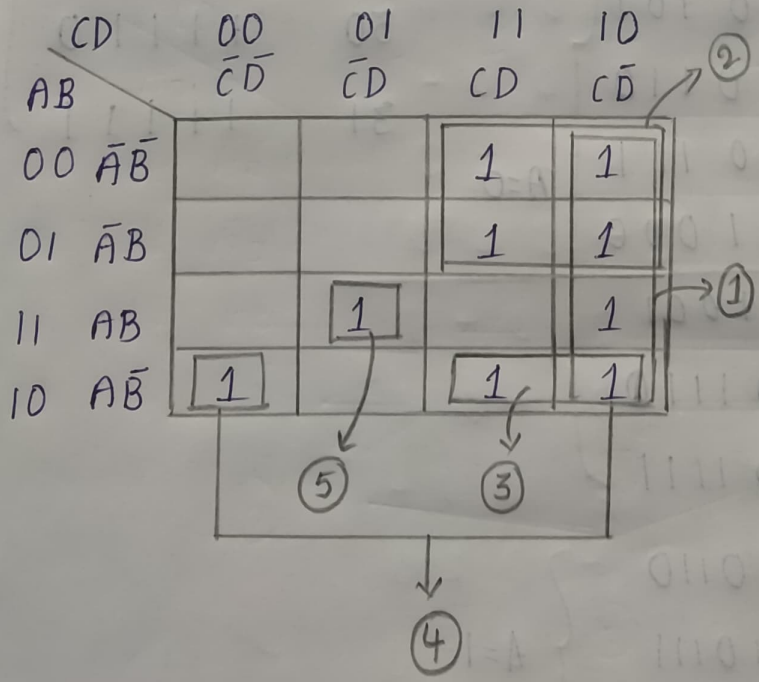
Group 2 → $\bar{A}B$

Group 3 → $A\bar{B}$

⇒ $\boxed{F = \bar{C} + \bar{A}B + A\bar{B}}$

2. Reduce $F(A,B,C,D) = \Sigma m(2,3,6,7,8,10,11,13,14)$

Sol:



	A B C D
2	0 0 1 0
3	0 0 1 1
6	0 1 1 0
7	0 1 1 1
8	1 0 0 0
10	1 0 1 0
11	1 0 1 1
13	1 1 0 1
14	1 1 1 0

Group 1 → $C\bar{D}$

Group 2 → $\bar{A}C$

Group 3 → $A\bar{B}C$

Group 4 → $A\bar{B}\bar{D}$

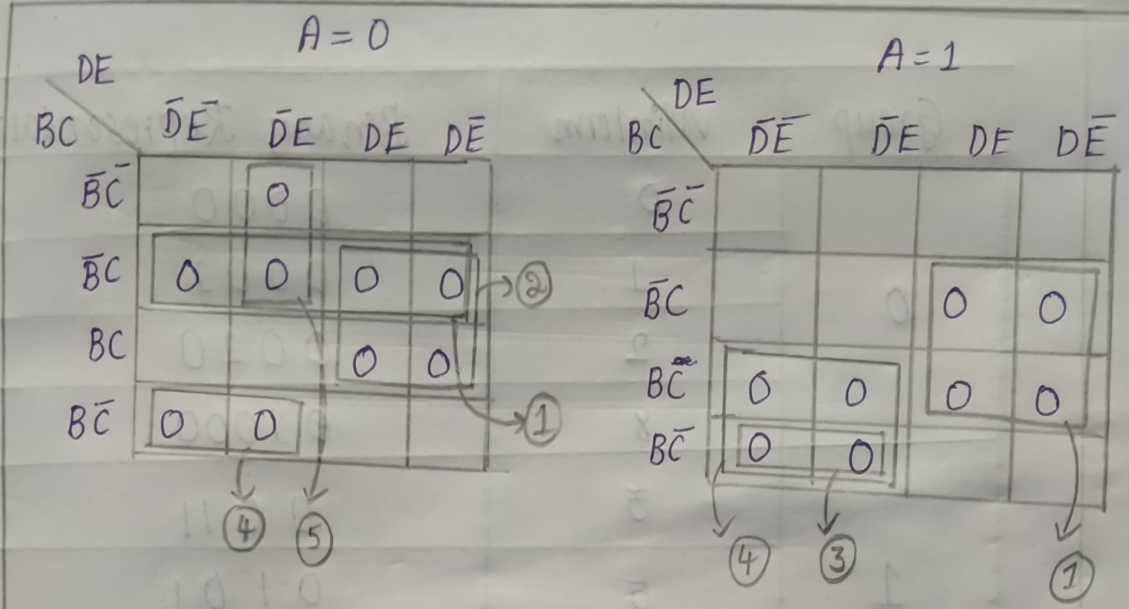
Group 5 → $AB\bar{C}D$

⇒ $\boxed{F = C\bar{D} + \bar{A}C + A\bar{B}C + A\bar{B}\bar{D} + AB\bar{C}D}$

3. Reduce the following in canonical POS form $F(A,B,C,D,E) = \Pi m(1,4,5,6,7,8,9,14,15,22,23,24,25,28,29,30,31)$

Sol:

	A	B	C	D	E	
1	0	0	0	0	1	A=0
4	0	0	1	0	0	
5	0	0	1	0	1	
6	0	0	1	1	0	
7	0	0	1	1	1	
8	0	1	0	0	0	
9	0	1	0	0	1	
14	0	1	1	1	0	
15	0	1	1	1	1	
22	1	0	1	1	0	A=1
23	1	0	1	1	1	
24	1	1	0	0	0	
25	1	1	0	0	1	
28	1	1	1	0	0	A=1
29	1	1	1	0	1	
30	1	1	1	1	0	
31	1	1	1	1	1	



Group 1 → CD

Group 2 → $\bar{A}\bar{B}C$

Group 3 → $AB\bar{D}$

Group 4 → $\bar{C}\bar{D}B$

Group 5 → $\bar{A}\bar{B}\bar{D}E$

In SOP form:

$F(A,B,C,D,E) = CD + \bar{A}\bar{B}C + AB\bar{D} + \bar{C}\bar{D}B + \bar{A}\bar{B}\bar{D}E$

In POS form:

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

4. Reduce $F(A,B,C,D) = (0,1,2,3,5,7,8,10,12,13)$ using Quine-McCluskey method (tabular method)

Sol: I) Make a table and arrange all the minterms/ maxterms according to the no. of 1's/0's contained.

Group	Minterm	Binary Representation
0	0	0000
	1	0001
	2	0010
	8	1000
1	3	0011
	5	0101
	10	1010
	12	1100
2	7	0111
	13	1101
3	15	1111

II)

	A B C D
(0,1)	0 0 0 -
(0,2)	0 0 - 0
(0,8)	- 0 0 0
(1,3)	0 0 - 1
(1,5)	0 - 0 1
(2,3)	0 0 1 -
(2,10)	- 0 1 0
(8,10)	1 0 - 0
(8,12)	1 - 0 0

$A\bar{C}\bar{D}$

(3,7)	0 - 1 1	
(5,7)	0 1 - 1	
(5,13)	- 1 0 1	
(12,13)	1 1 0 -	
		$A\bar{B}\bar{C}$
(7,15)	- 1 1 1	
(13,15)	1 1 - 1	

III)

	A B C D	
(0,1),(2,3)	0 0 - -	$\bar{A}\bar{B}$
(0,2),(1,3)	0 0 - -	
(0,2),(8,10)	- 0 - 0	$\bar{B}\bar{D}$
(0,8),(2,10)	- 0 - 0	
(1,3),(5,7)	0 - - 1	$\bar{A}D$
(1,5),(3,7)	0 - - 1	
(5,7),(13,15)	- 1 - 1	BD
(5,13),(7,15)	- 1 - 1	

$$\Rightarrow \boxed{F = \bar{A}\bar{B} + \bar{B}\bar{D} + \bar{A}D + BD + A\bar{C}\bar{D} + AB\bar{C}}$$