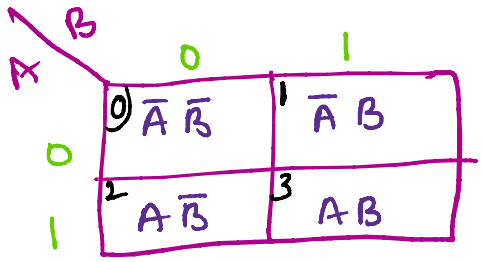
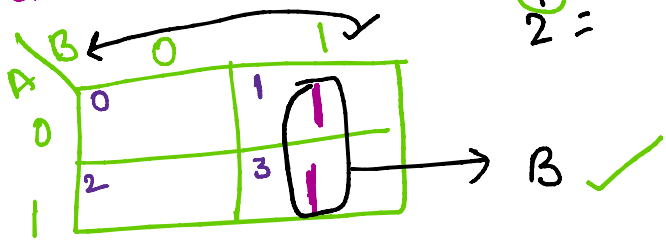
Two Variable K-map



4 cells

① Grouping of two adjacent cells represent a term of single literal

$f(A,B) = \Sigma m(1,3)$

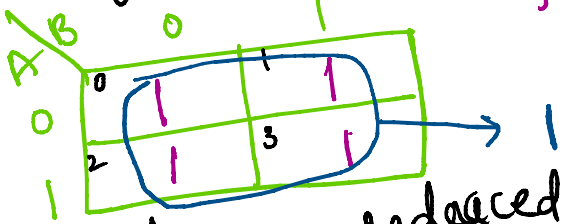


1
2 =

② Grouping of four adjacent cells containing 1's → gives = 1

$f(A,B) = \Sigma m(0,1,2,3)$

$= 1$



literals are reduced

$2^2 = 4$

3-Variable K-map

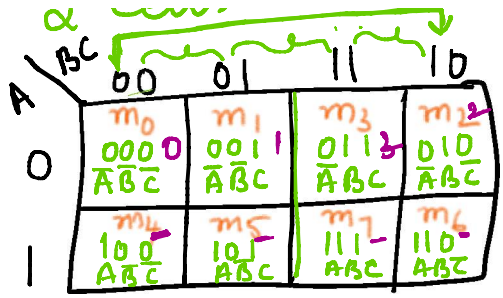
$f(A,B,C)$

2^3 cells

2^3 possible combinations

A	B	C
0	0	0
0	0	1
0	1	0

BC



0	0	1
0	1	0
0	1	1
1	0	0
1	0	1
1	1	0

BC	
0	0
0	1
1	0
1	1

Sequence X

A \ BC	00	01	11	10
0	0	1	3	2
1	4	5	7	6

Gray Code

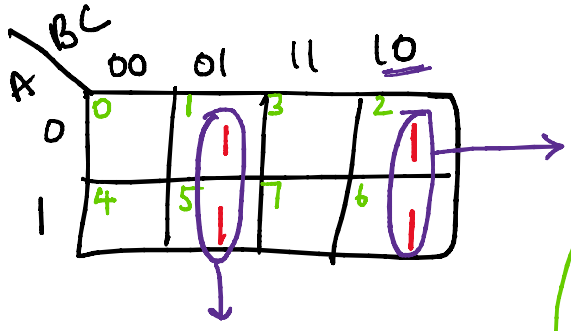
0	0
0	1
1	1
1	0

unit distance code

① Each cell contains 3 literals

AB \ C	0	1
00	0	1
01	2	3
11	6	7
10	4	5

$f(A,B,C) = \Sigma m(1,2,5,6)$



1 → Variable reduced

$2 = 2$ minterms

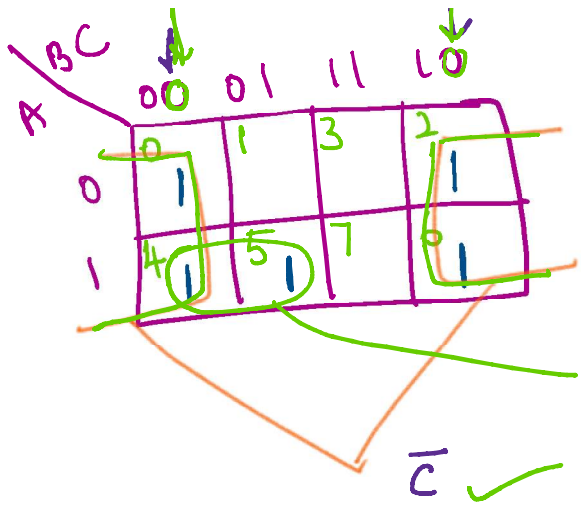
Grouping of '2' adjacent cells containing 1's represents a term of two literals

$f(A,B,C) = B\bar{C} + \bar{B}C$

② Reduce the given function using K-map

$f(A,B,C) = \Sigma m(0,2,4,5,6)$

$2^0\ 2^1\ 2^2\ 2^3 \cdots 2^n$ Groups



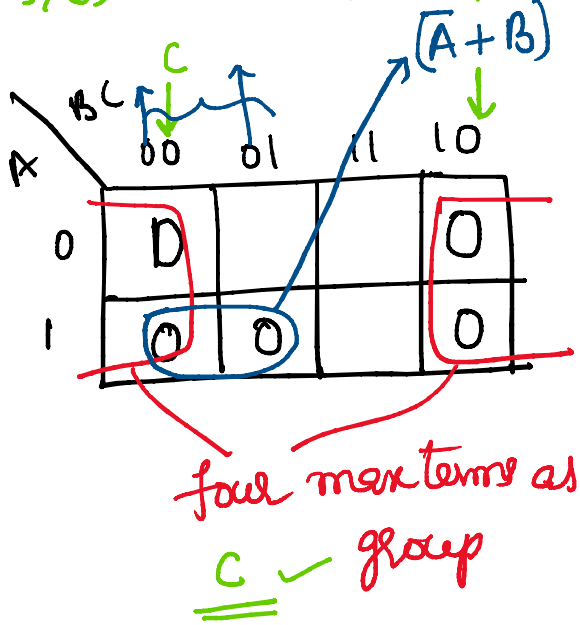
2^1 2 2 2 - - -
Groups

$f(A,B,C) = A\bar{B} + \bar{C}$ ✓

$A\bar{B}$

$\bar{C}$ ✓

② $f(A,B,C) = \Pi M(0,2,4,5,6)$



$(\bar{A}+B)\,C$ ✓

four maxterms as a group ✓

C

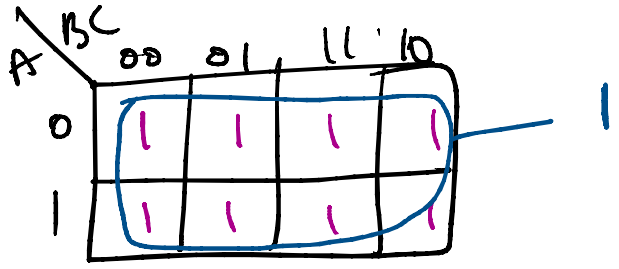
Grouping of four adjacent cells containing 1's (0's in standard POS) represent a term of one literal ✓

(2) → will be reduced

2 = 4 minterms

$f(A,B,C) = \Sigma m(0,1,2,3,4,5,6,7)$

$f(A,B,C) = \Sigma m(0,1,2,3,4,5,6,7)$



Grouping '8' adjacent cells containing 1's represent the function = 1

$f(A,B,C) = \Pi M(0,1,2,3,4,5,6,7)$

$f(A,B,C) = 0$

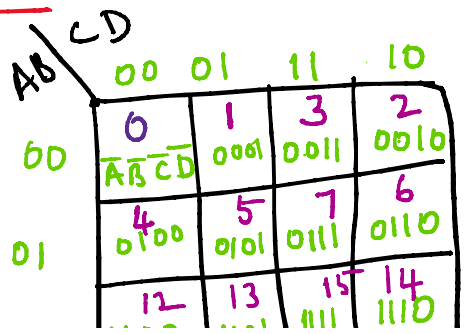
Grouping of '8' adjacent cells containing 0's represents function = 0

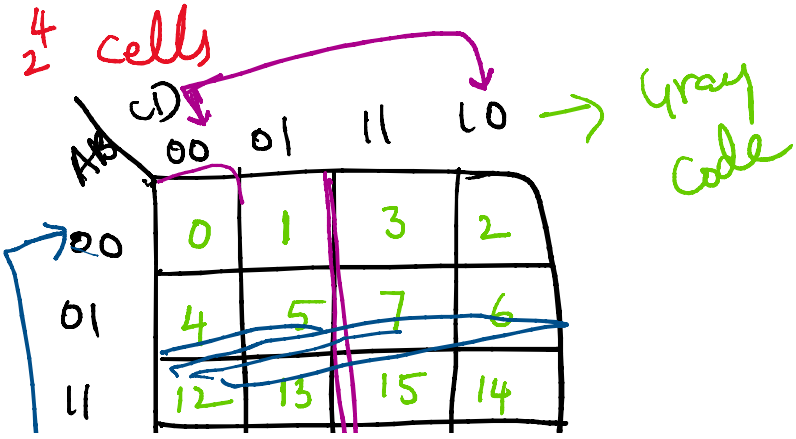
(3) → will be reduced

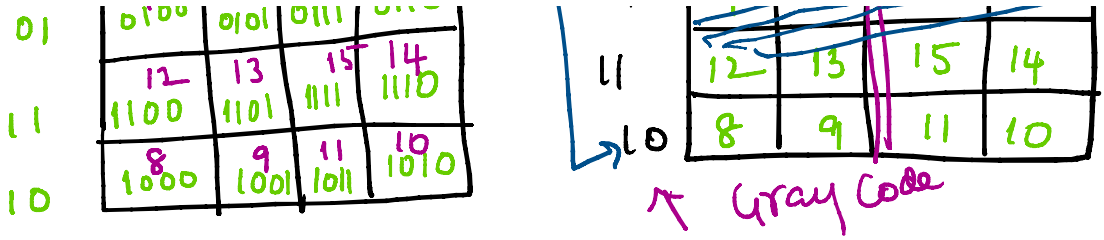
2^3 = minterm

= maxterm

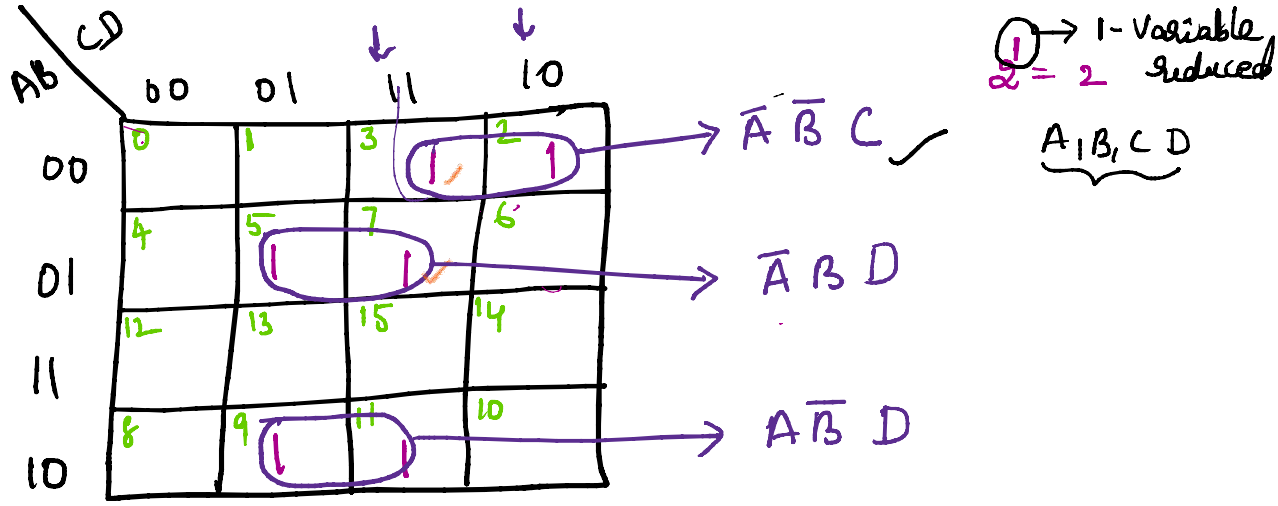
4-Variable K-map → 2^4 cells





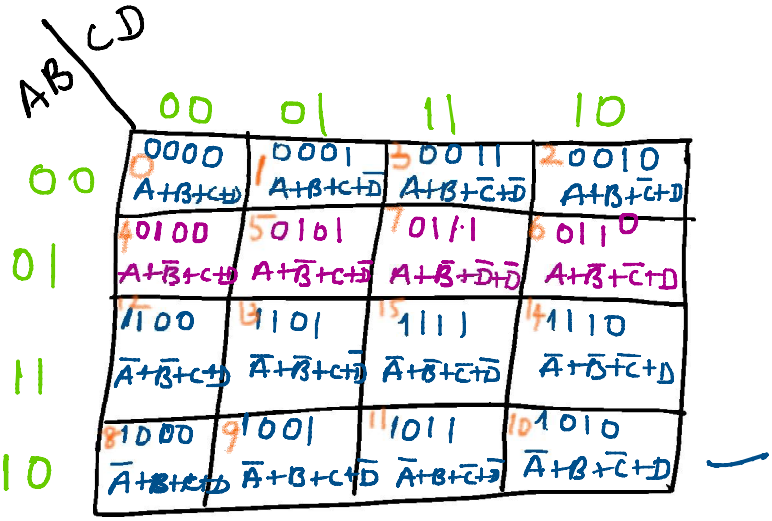


$f(A,B,C,D) = \Sigma m(2,3,5,7,9,11)$

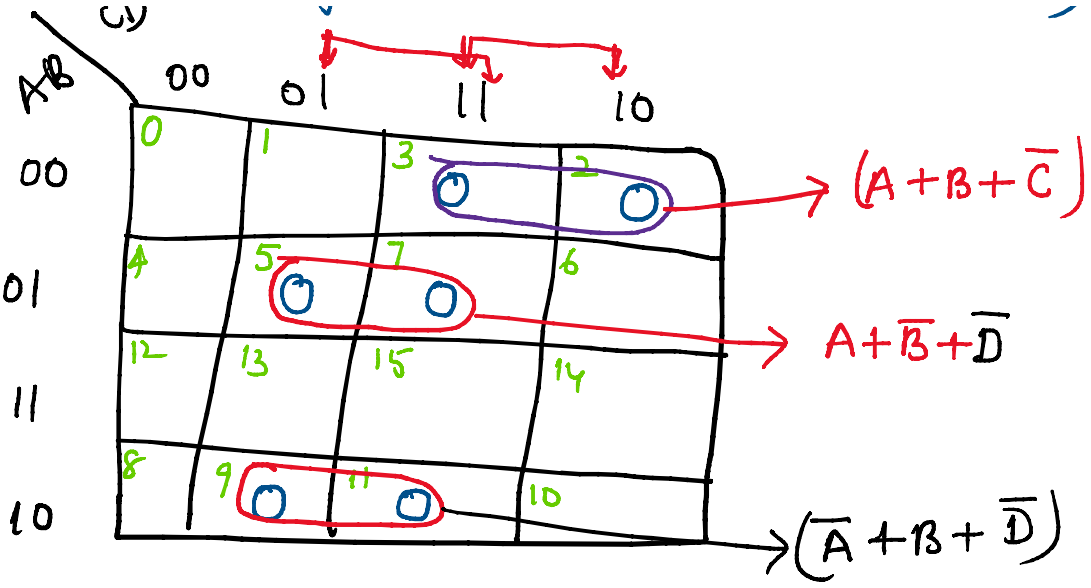


$f(A,B,C,D) = \bar{A}\bar{B}C + \bar{A}BD + A\bar{B}D$

$f(A,B,C,D) = \pi m(2,3,5,7,9,11)$

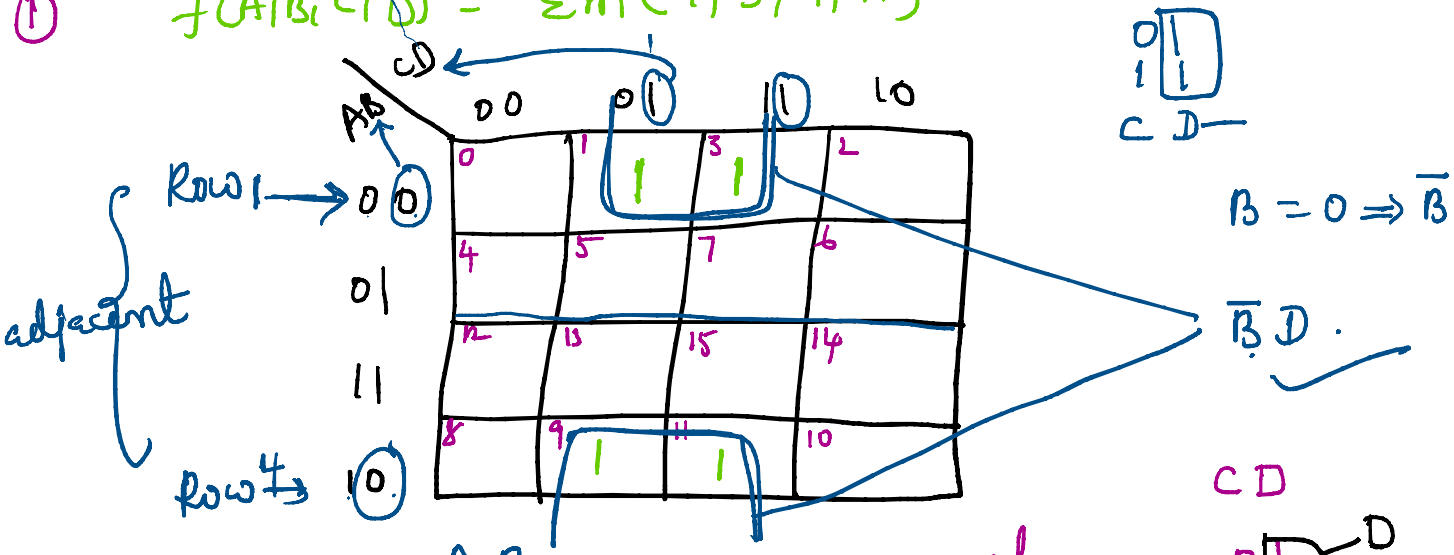


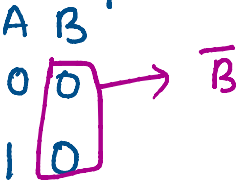
$f(A,B,C,D) = \pi m(2,3,5,7,9,11)$

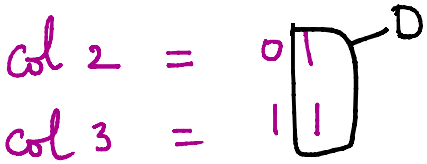


$$f(A,B,C) = (A+B+\overline{C})(A+\overline{B}+\overline{D})(\overline{A}+B+\overline{D})$$

① $f(A,B,C,D) = \Sigma m(1,3,9,11)$







4 Variable K-map

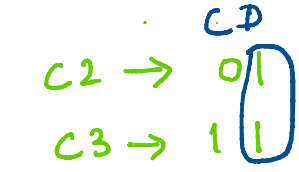
4 minters as group (2) → Variables reduced means, my boolean exp using 2 variables

$A,B,C,D = \overline{B}D$

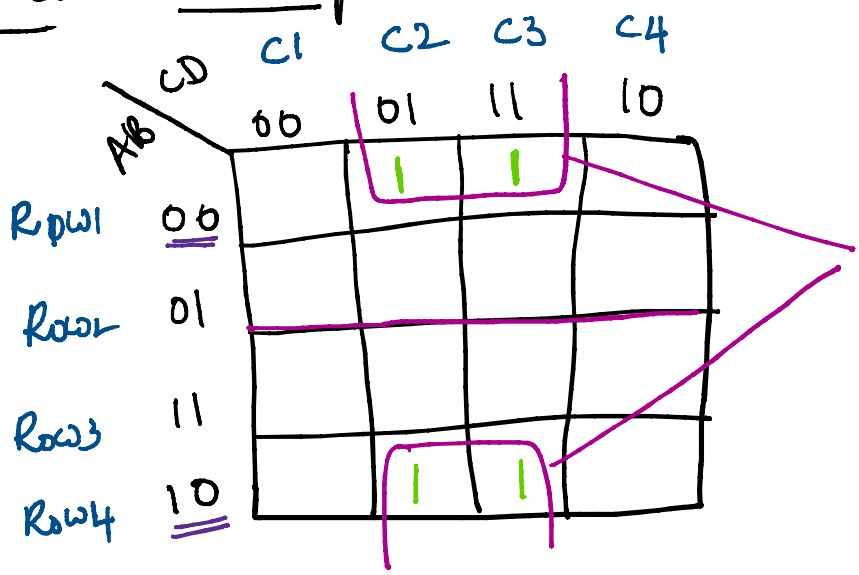
(X, X)

4-Variable K-map

C1 C2 C3 C4



4-variable



C3 → 1 1

If D = 1 means D

four minterms as a group

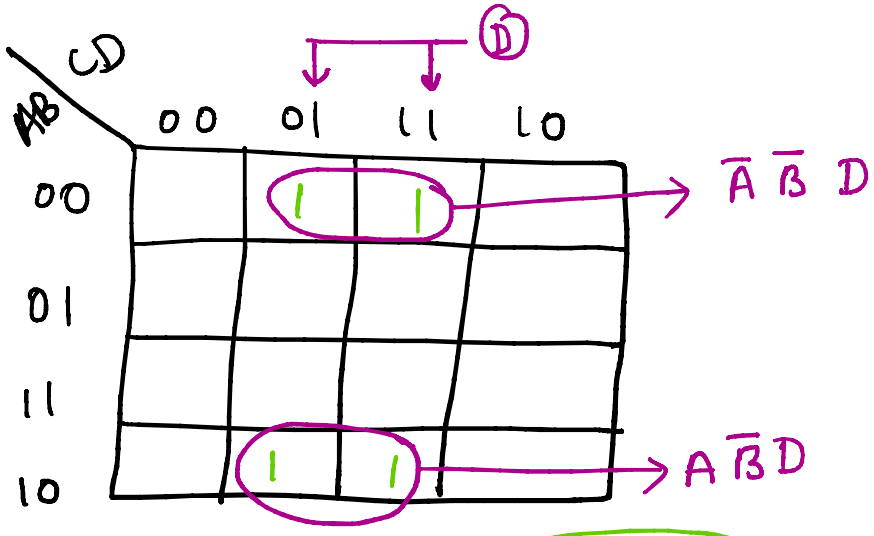
$\bar{B}D$

By folding Row 1 & Row 4 are adjacent

Row 1 = 0 0

Row 4 = 1 0

If B = 0 means $\bar{B}$



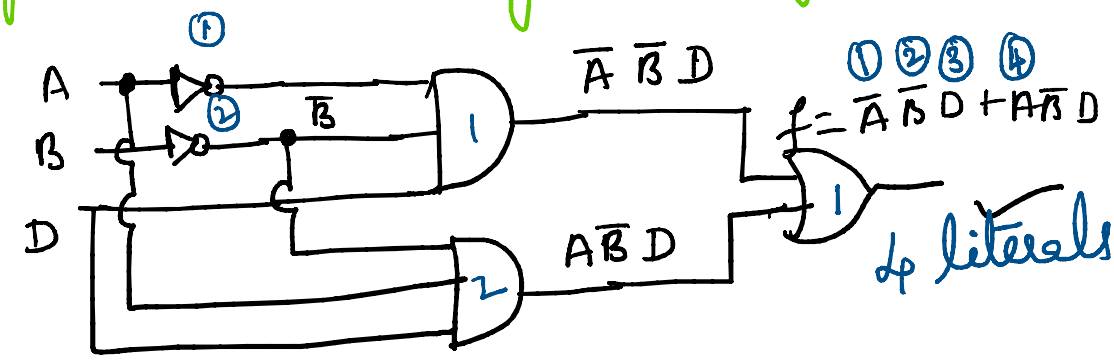
$f(A,B,C,D) = \bar{A}\bar{B}D + A\bar{B}D$

$= \bar{B}D(\bar{A}+A)$ $\quad \because A+\bar{A}=1$

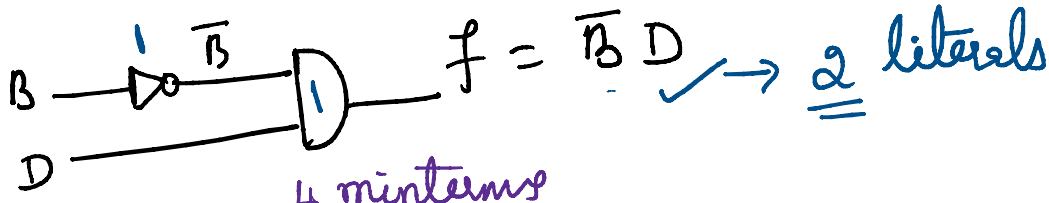
$= \bar{B}D$

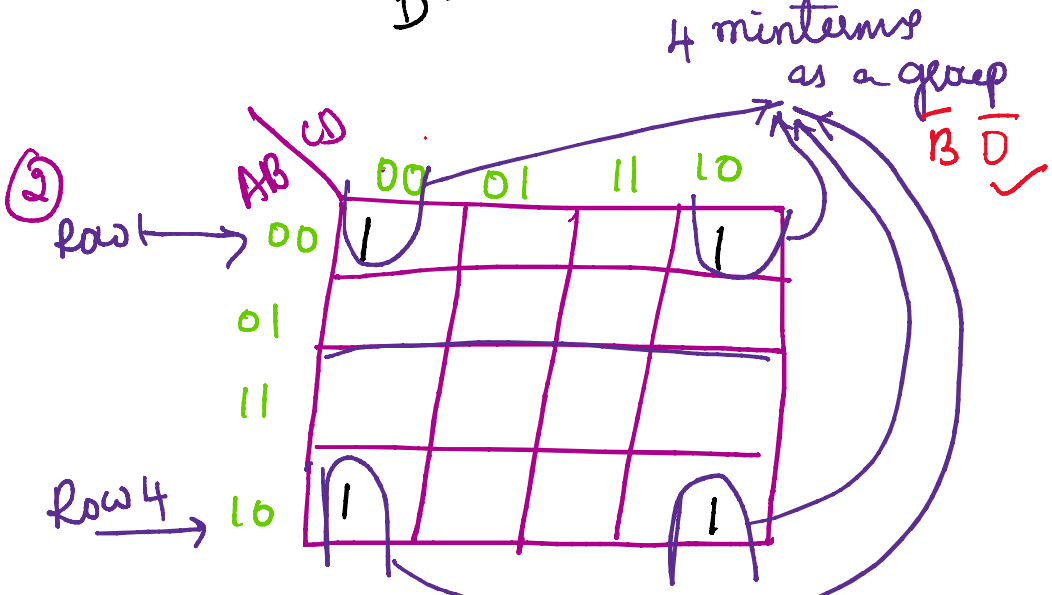
Implementation using Basic gates

Implementation using Basic gates

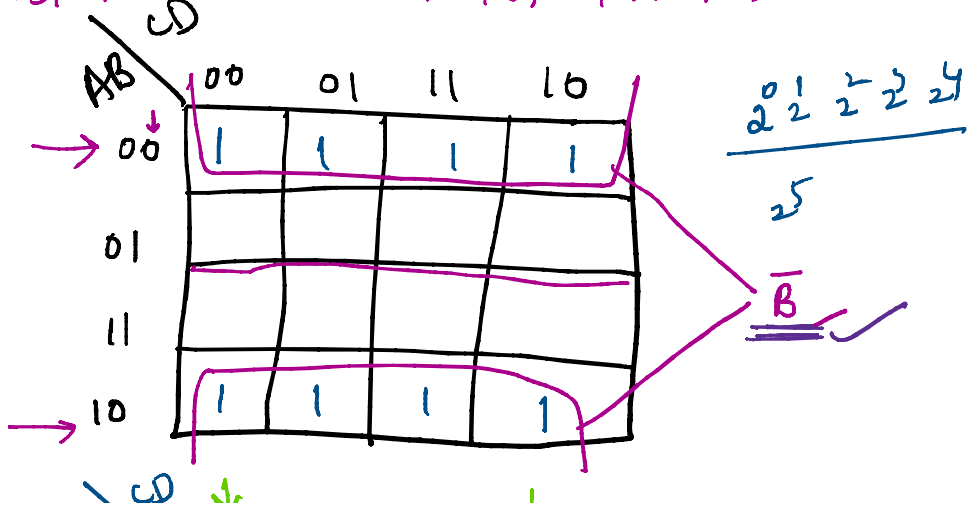


$f = \bar{B} D$



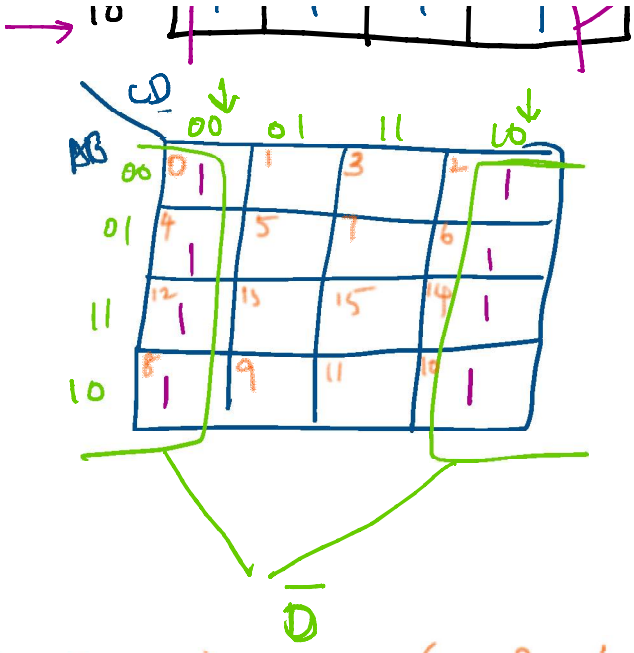


$f(A,B,C,D) = \Sigma m(0,1,2,3,8,9,10,11)$



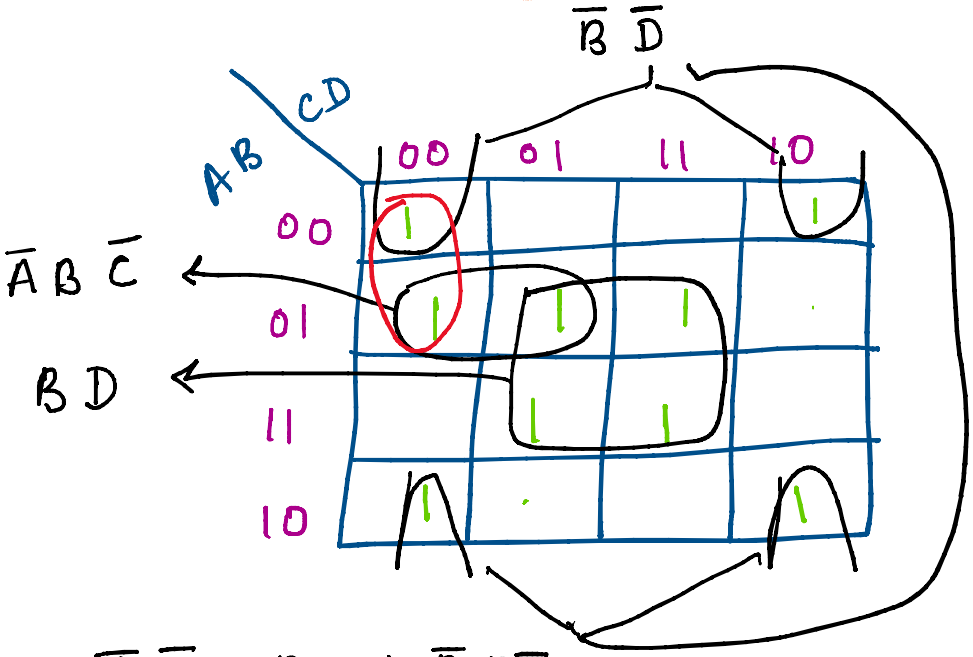
$2^0\ 2^1\ 2^2\ 2^3\ 2^4$

2^5



$$f(A,B,C,D) = \Sigma m(0,2,4,6,8,10,12,14)$$

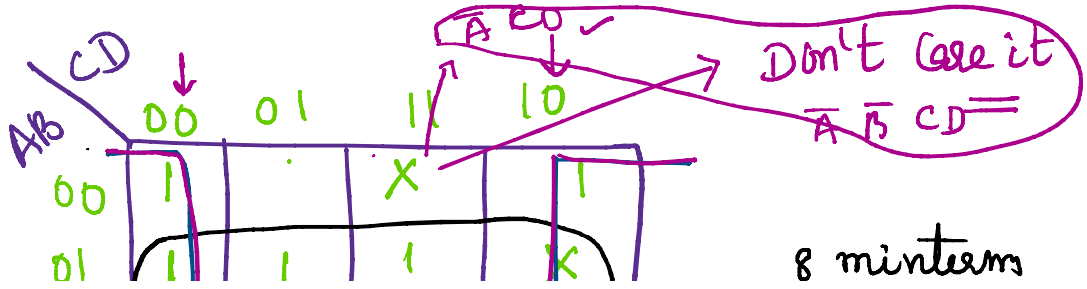
$$= \bar{D}$$



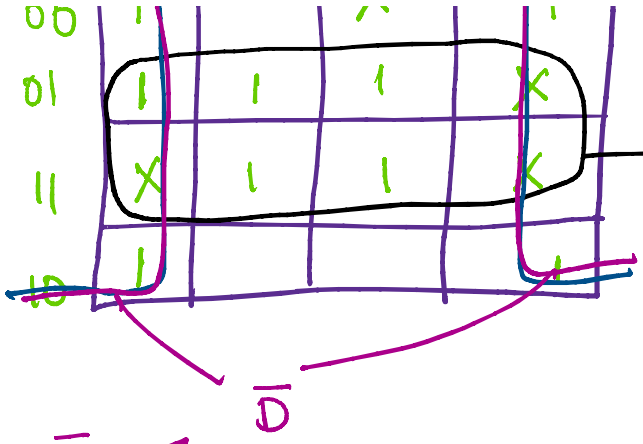
$$\bar{B}\bar{D} + BD + \bar{A}B\bar{C}$$

$$\bar{B}\bar{D} + BD + \bar{A}\bar{C}D$$

Don't Care = X



8 minterms



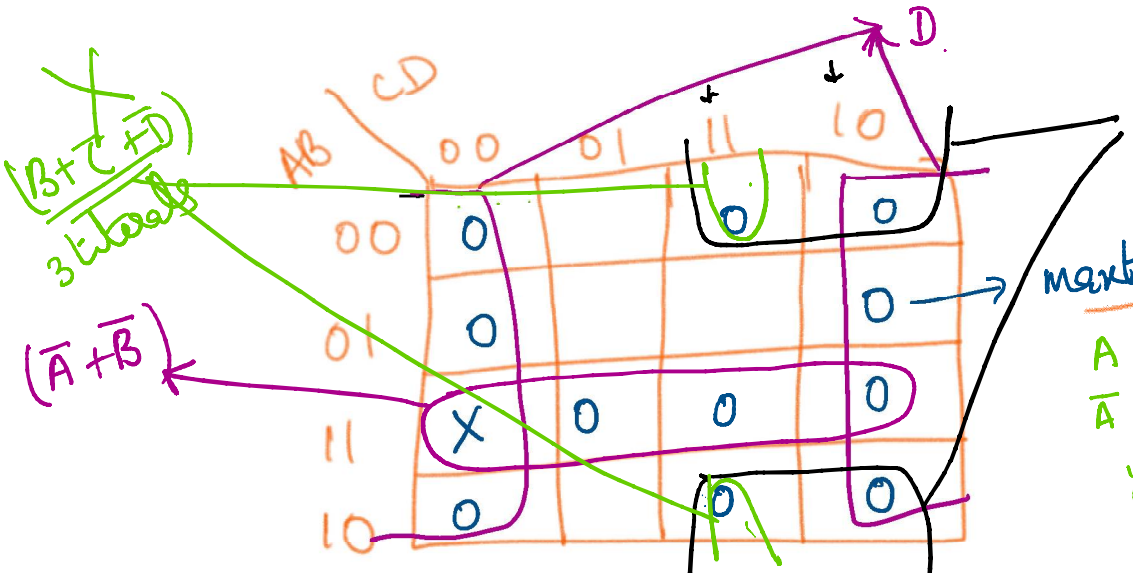
8 minterms

2^3

3 variable ↓

A, B, C, D →

$B + \bar{D}$ ✓



maxterms

A = 0 ✓

$\bar{A}$ = 1 ✓

'0'

minterm

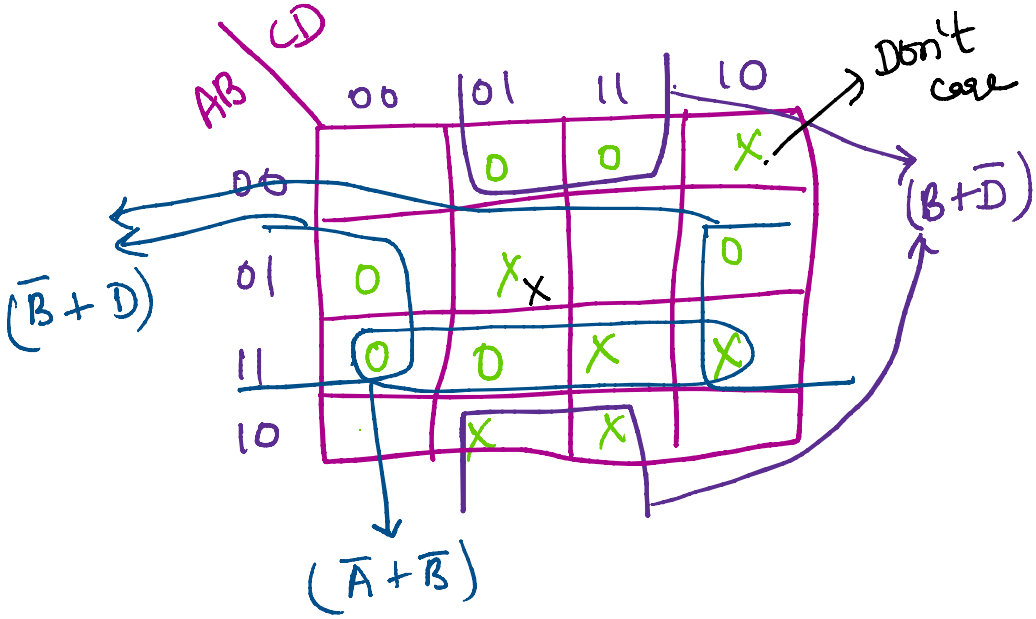
A = 1

$\bar{A}$ = 0

'1'

(D) $(B+\bar{C})$ $(\bar{A}+\bar{B})$ ✓

↳ 2 literal

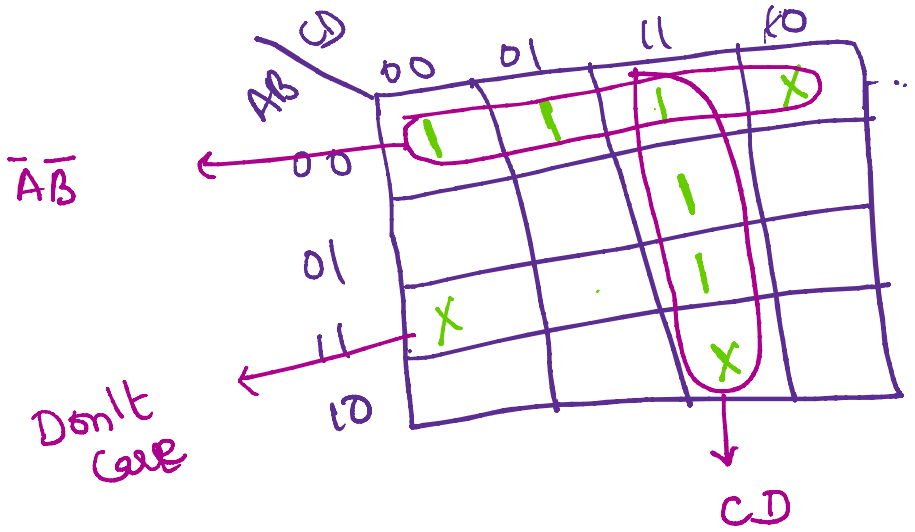


$(\bar{A}+B)$

$(B+\bar{D})(\bar{B}+D)(\bar{A}+\bar{B})$

① find the reduced form of SOP for the following function

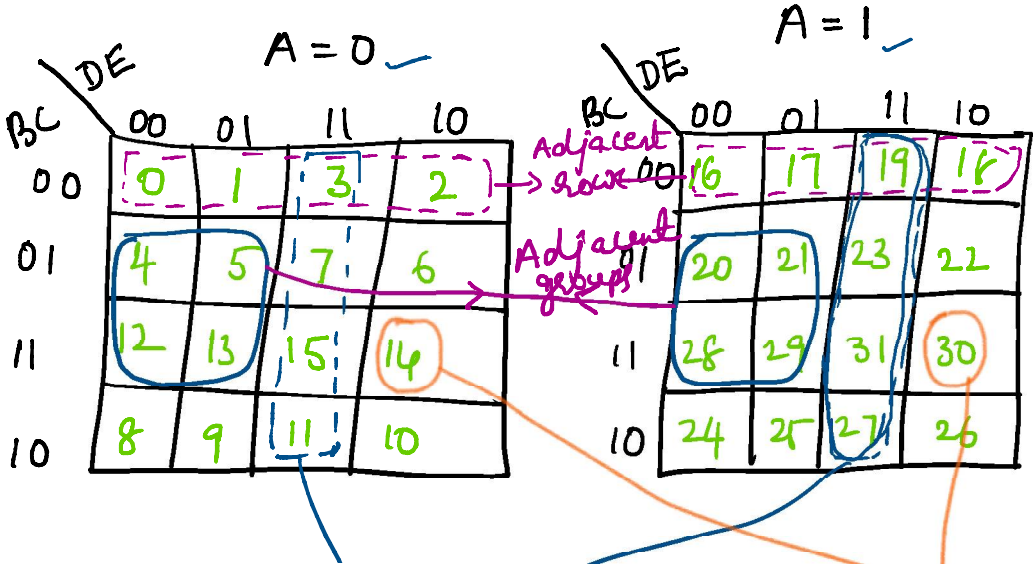
$f(A,B,C,D) = \Sigma m(0,1,3,7,15) + \Sigma d(2,11,12)$



$\bar{A}\bar{B} + CD$ ✓

5- Variable K-map

2^5 cells = 32 cells



Adjacent columns

Adjacent cells

A B C D E

0 0 0 0 0 → 0

1 1 1 1 → 15

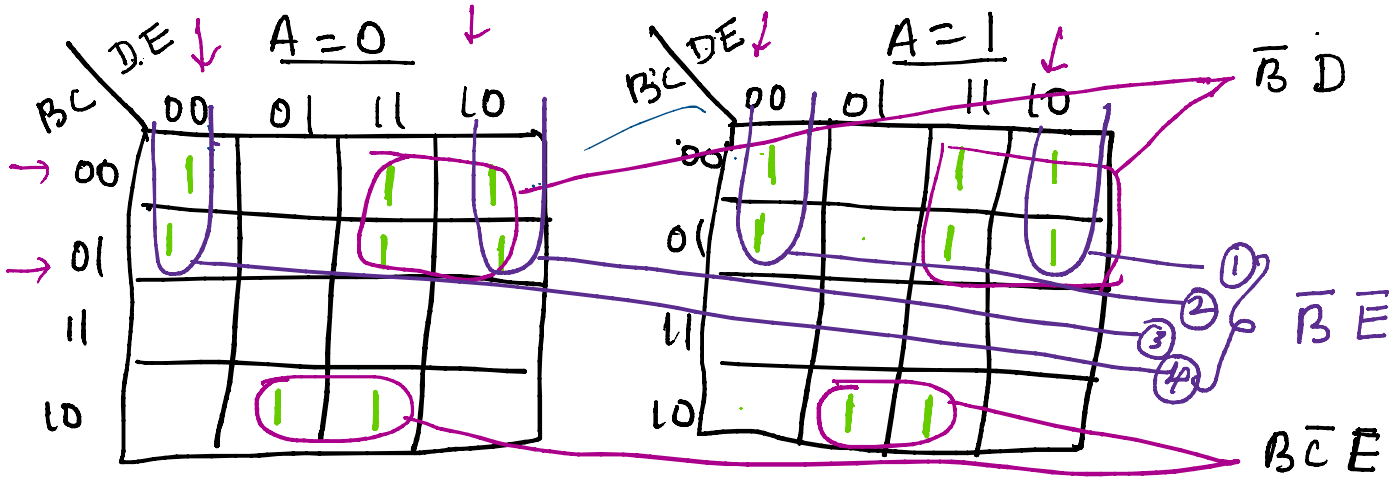
1 0 0 0 0 → 16

1 0 0 0 1 → 17

1 1 1 1 1 → 31

5-Variable K-map

$f(A,B,C,D,E) = \Sigma m(0,2,3,4,6,7,9,11,16,18,19,20,22,23,25,27)$



$\bar{B}D + \bar{B}\bar{E} + B\bar{C}E$ ✓