CS & IT ENGINEERING

DIGITAL LOGIC

MINIMIZATION

Lecture No. 3

By- CHANDAN SIR

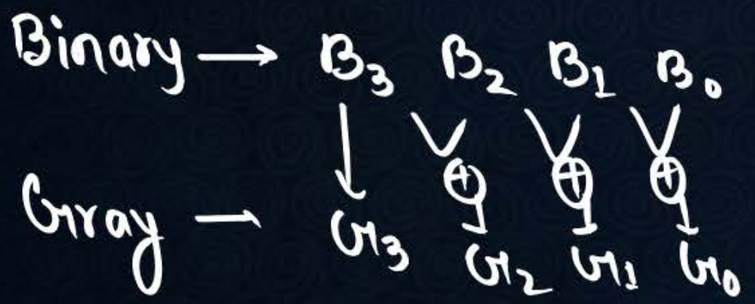
01 K-Map Basic

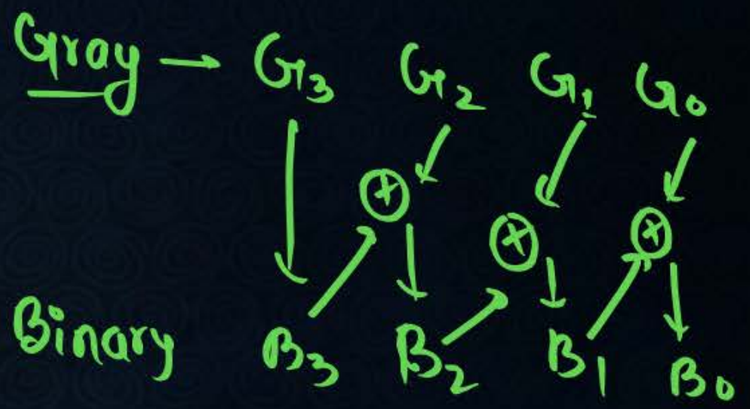
02 QUESTION PRACTICE

03 DISCUSSION

K-MAP

→ Gray code





K Map - Basics

Minimization by K-Map

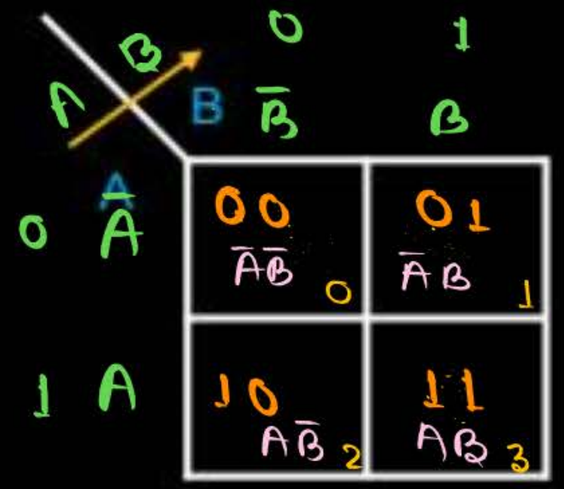
- Based on gray code
- Gray code
  - ↳ unity haming distance code
  - ↳ Cyclic code
  - ↳ Reflecting code

K Map - Basics

Gray Code

Decimal	Binary	Gray Code
0	0 0	0 0
1	0 1	0 1
2	1 0	1 1
3	1 1	1 0

K Map - Basics



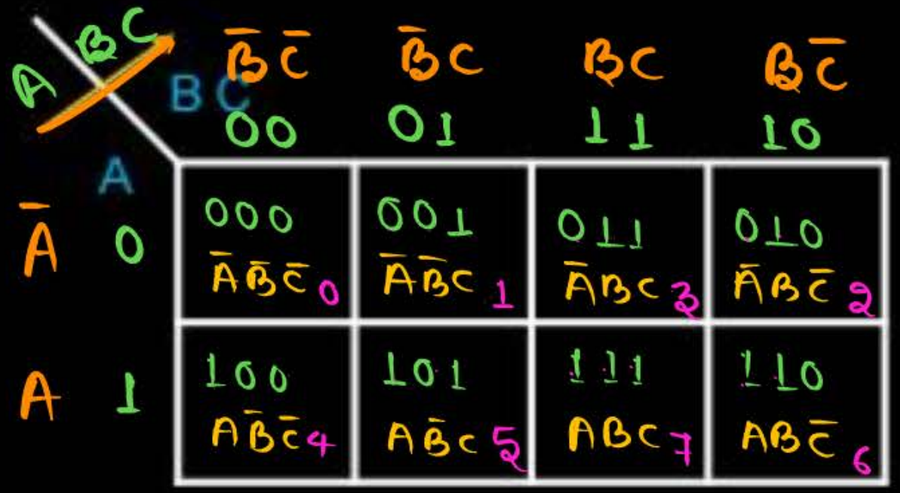
$f(A, B)$

MSB LSB

Most significant bit

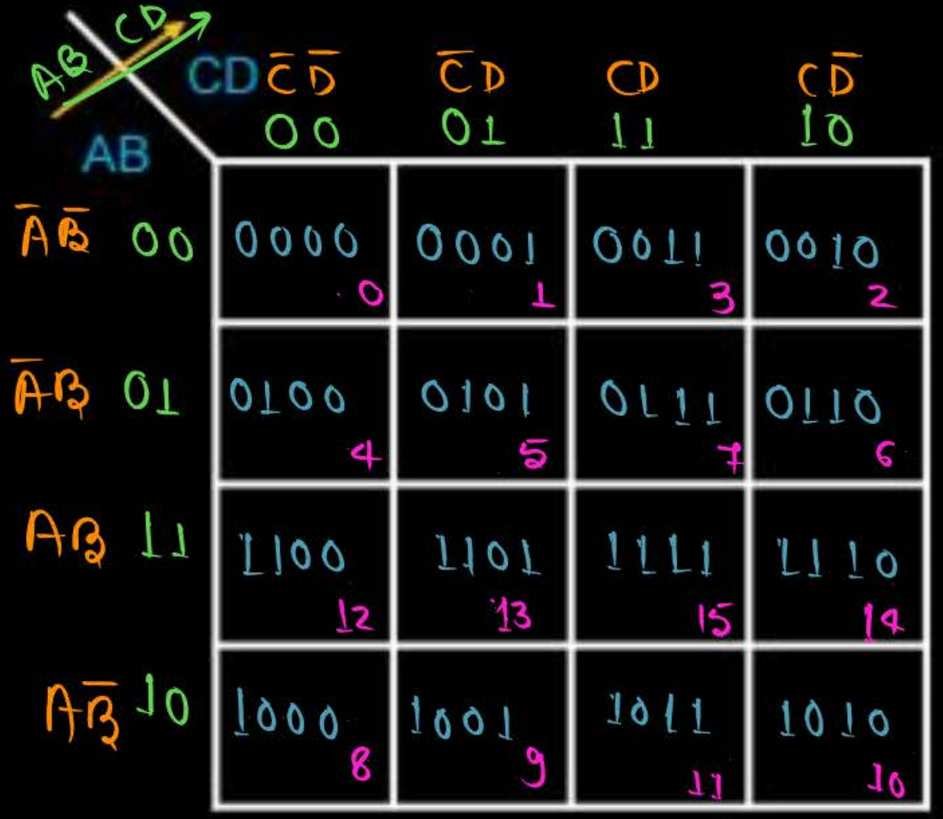
Least significant bit

K Map - Basics



$f(A,B,C)$
1

K Map - Basics



$f(A, B, C, D)$

K Map - Basics

16 group = 2^{4} → 4 Variables Reduce

8 group = 2^{3} → 3 Variables Reduce

4 group = 2^{2} → 2 Variables Reduce

2 group = 2^{1} → 1 Variable Reduce

1 group = 2^{0} → 0 Variable Reduce

$$f(A,B,C) = \underset{①}{\bar{A}\bar{B}\bar{C}} + \underset{②}{\bar{A}\bar{B}C} + \underset{③}{A\bar{B}C}$$

Terms = 3 Variable = 3

K Map - Basics

Rule of Minimization

CJ BABA RULE

First always form unique group.

Kam se kam group banana hai and Bade se Bada group banana hai.

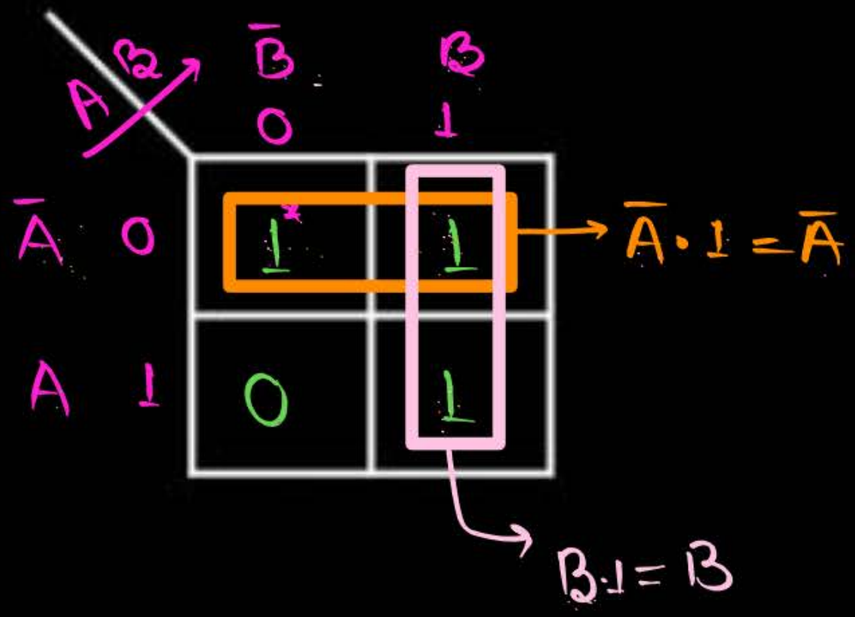
Terms will minimize

Variables will minimize

Q.1

$f(A, B) = \bar{A}\,\bar{B} + \bar{A}B + A\bar{B} = \sum m\,(0, 1, 3)$

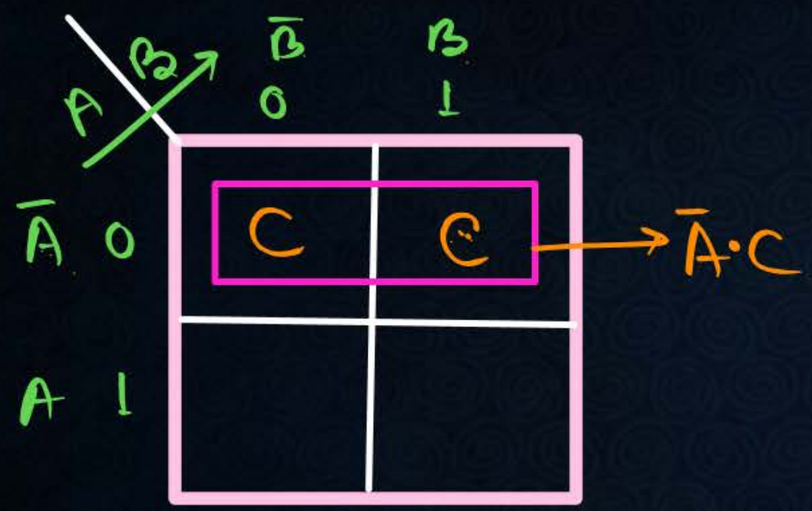
$\Rightarrow f(A,B) = \bar{A}\bar{B}\cdot 1 + \bar{A}B\cdot 1 + A\bar{B}\cdot 0 + AB\cdot 1$



$\bar{A} + B$

$A \odot B$

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



$\bar{A}\cdot C$

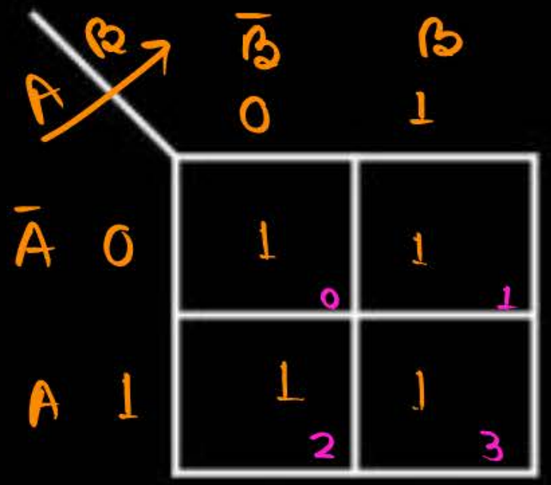
$\bar{A}\bar{B}\cdot C + \bar{A}B\cdot C$

$= \bar{A}C$

Ans

Q.2

$f(A, B) = \overline{A}\,\overline{B} + \overline{A}B + A\overline{B} + AB = \Sigma m(0,1,2,3)$



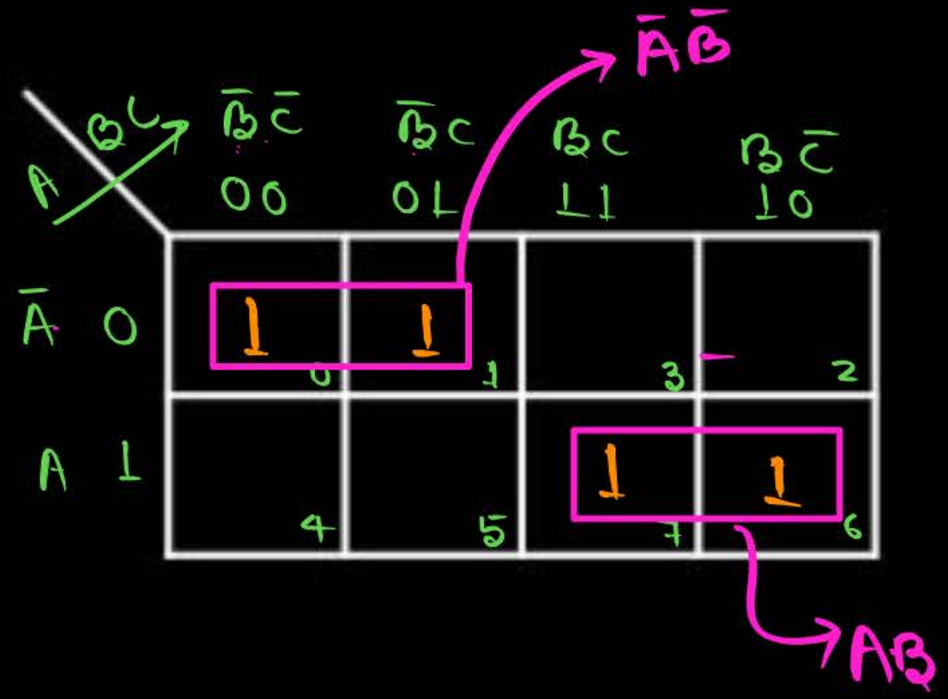
$= 1$

Ans

Q.3

→ SOP

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

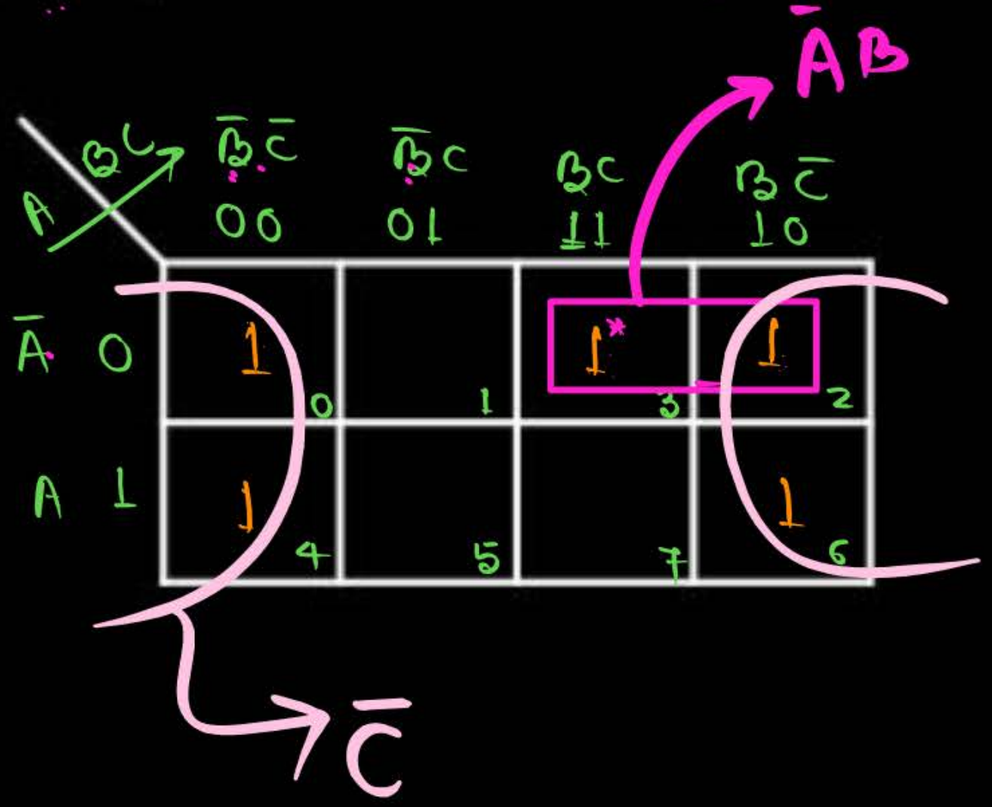


$= \bar{A}\bar{B} + AB$

Q.3

SOP

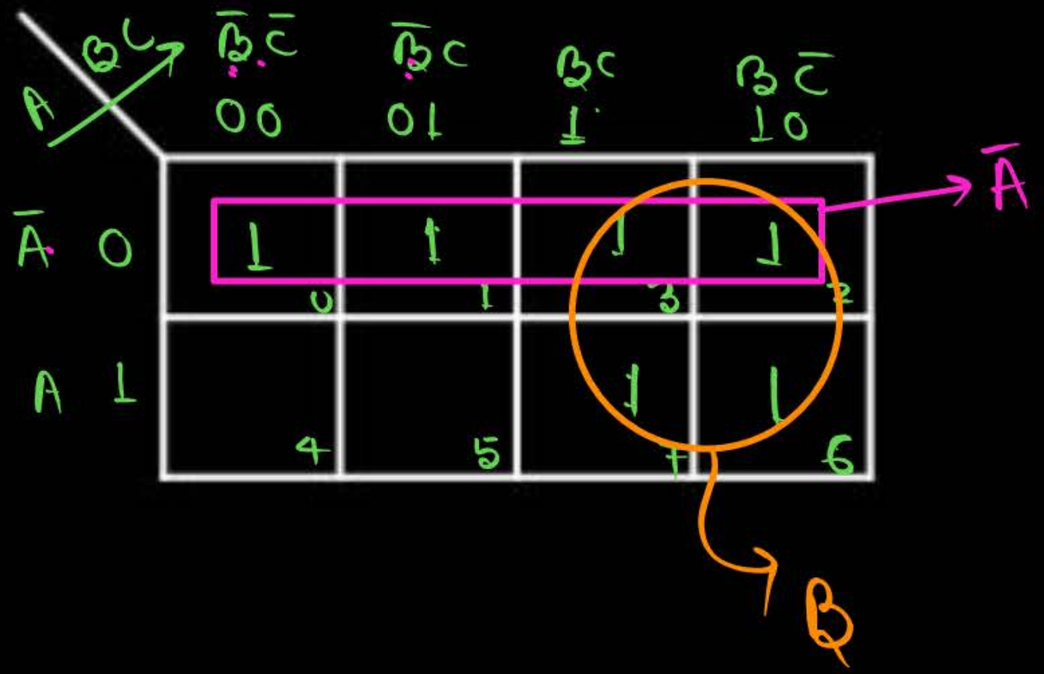
$f(A, B, C) = \Sigma m(0, 2, 3, 4, 6)$



$= \bar{A}B + \bar{C}$

Q.3

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

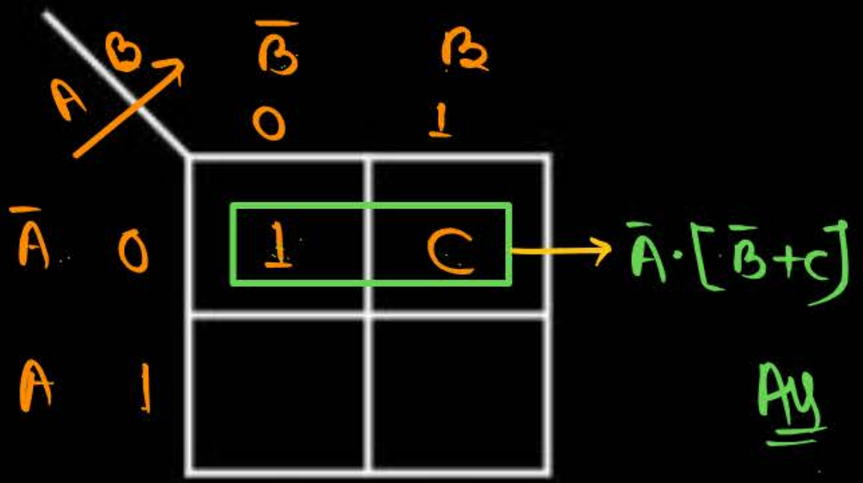


$\bar{A} + B$

Ans

Q.4

$f(A, B, C) =$



Ans

By Boolean algebra

$\bar{A}\bar{B}\cdot 1 + \bar{A}BC$

$\bar{A}\,[\bar{B}+BC]$

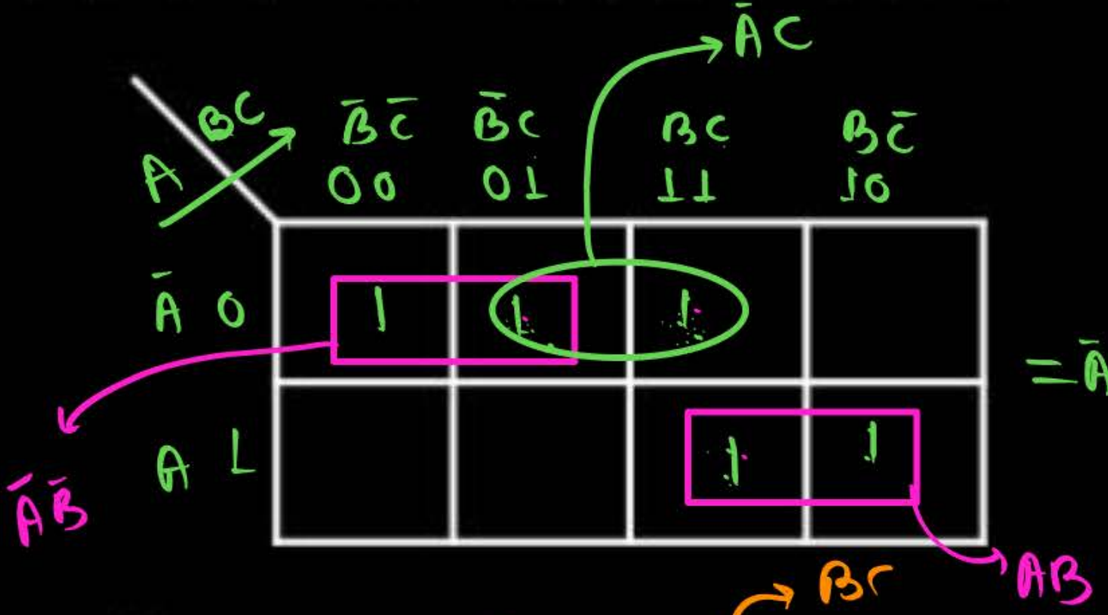
$\bar{A}\,[(\bar{B}+B)(\bar{B}+C)]$

$\bar{A}\cdot(\bar{B}+C)$

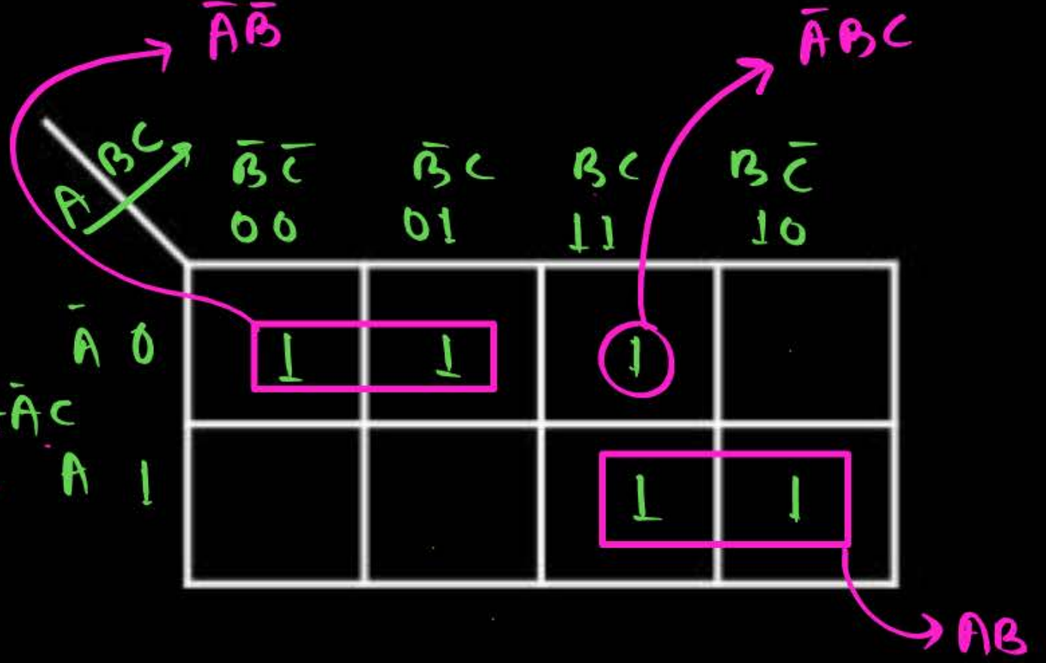
Ans

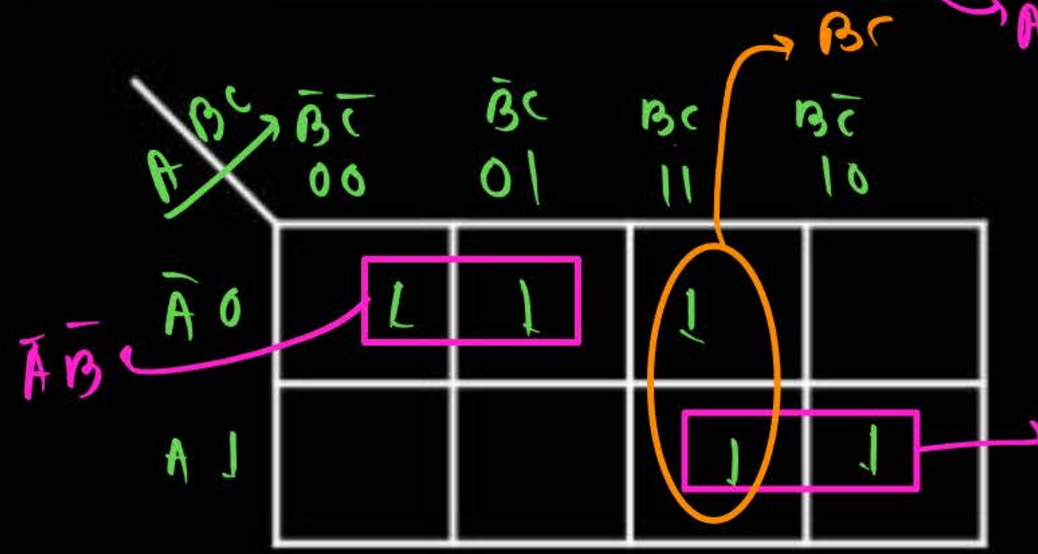
Q.5

$f(A, B, C) = \sum m\,(0, 1, 3, , 6, 7)$



$= \bar{A}\bar{B} + AB + \bar{A}C$ ✓





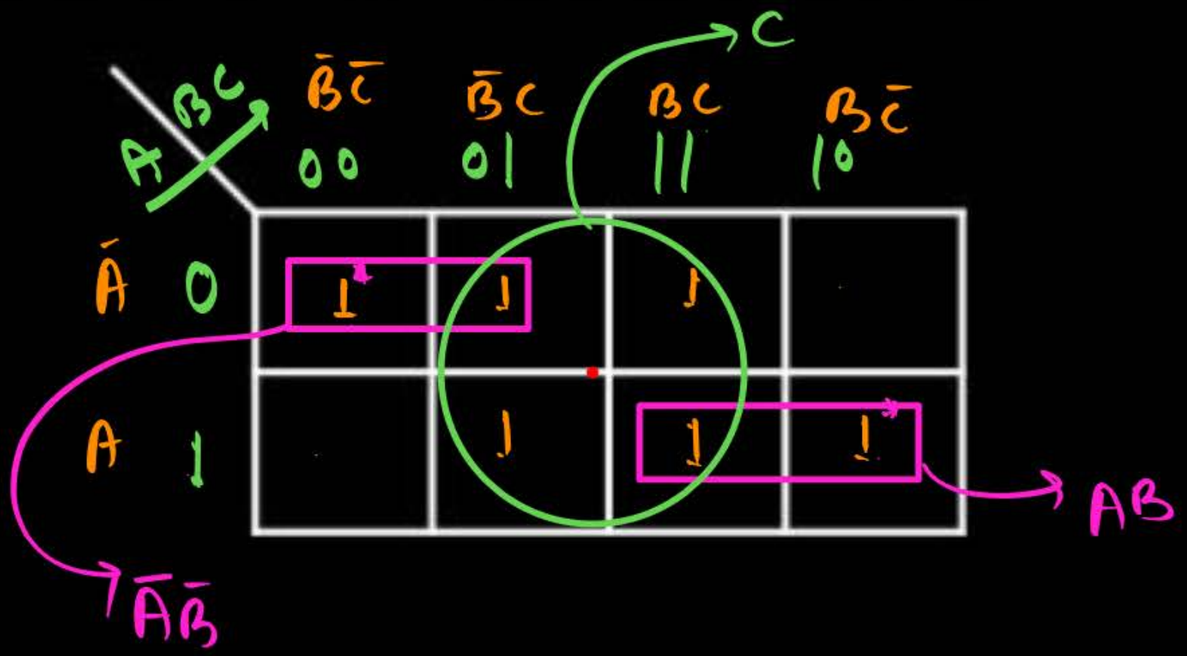
$= \bar{A}\bar{B} + AB + BC$ ✓

$\bar{A}\bar{B} + AB + \bar{A}BC$

↳ seminimized

Q.6

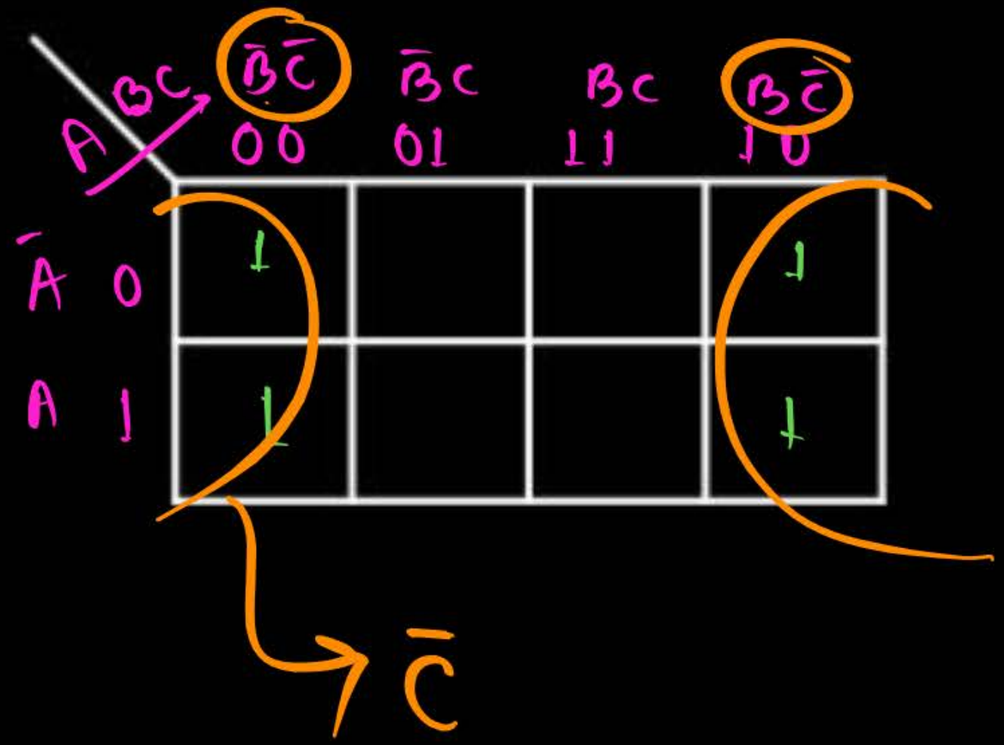
$f(A, B, C) = \sum m\,(0, 1, 3, 5, 6, 7)$



$= \bar{A}\bar{B} + AB + C$

Q.7

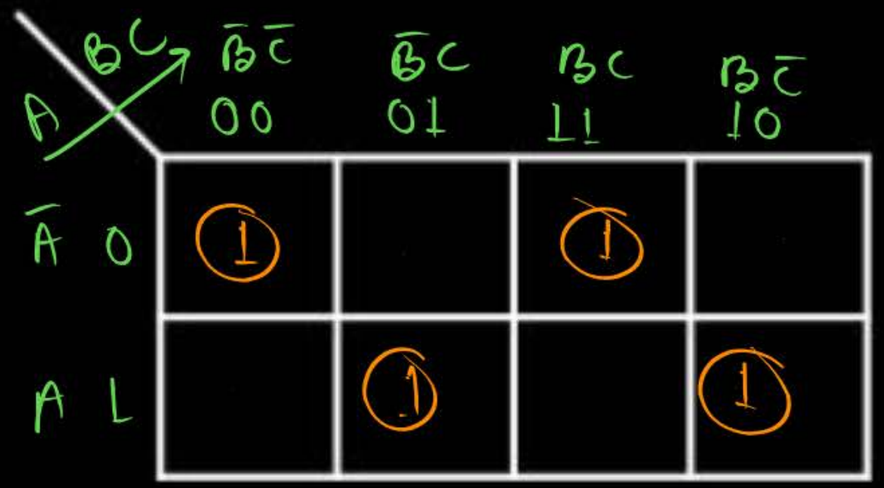
$f(A, B, C) = \sum m\,(0, 2, 4, 6)$



$= \bar{C}$

Q.8

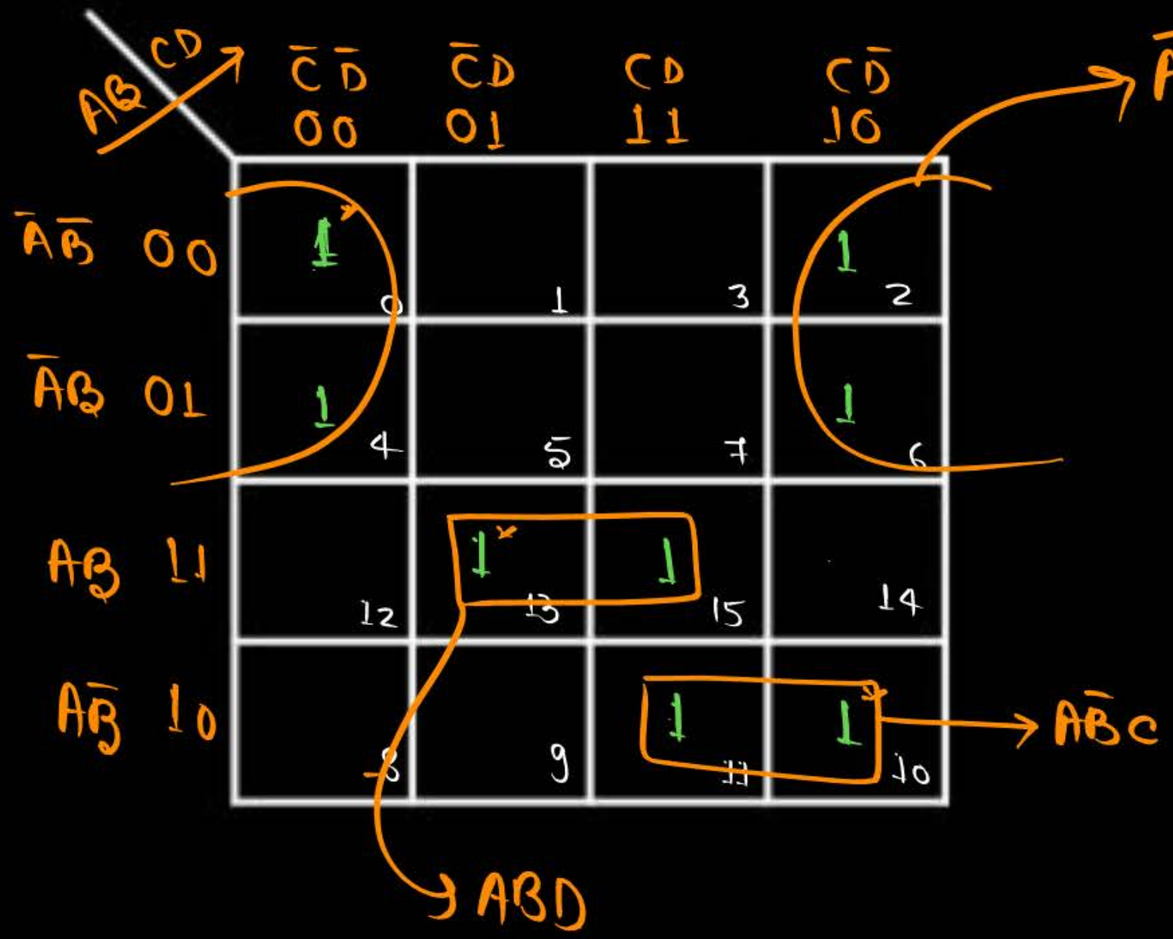
$f(A, B, C) = \sum m\,(0, 3, 5, 6)$



Reduce nahi hoga.

Q.9

$f(A, B, C, D) = \sum m\,(0, 2, 4, 6, 10, 11, 13, 15)$

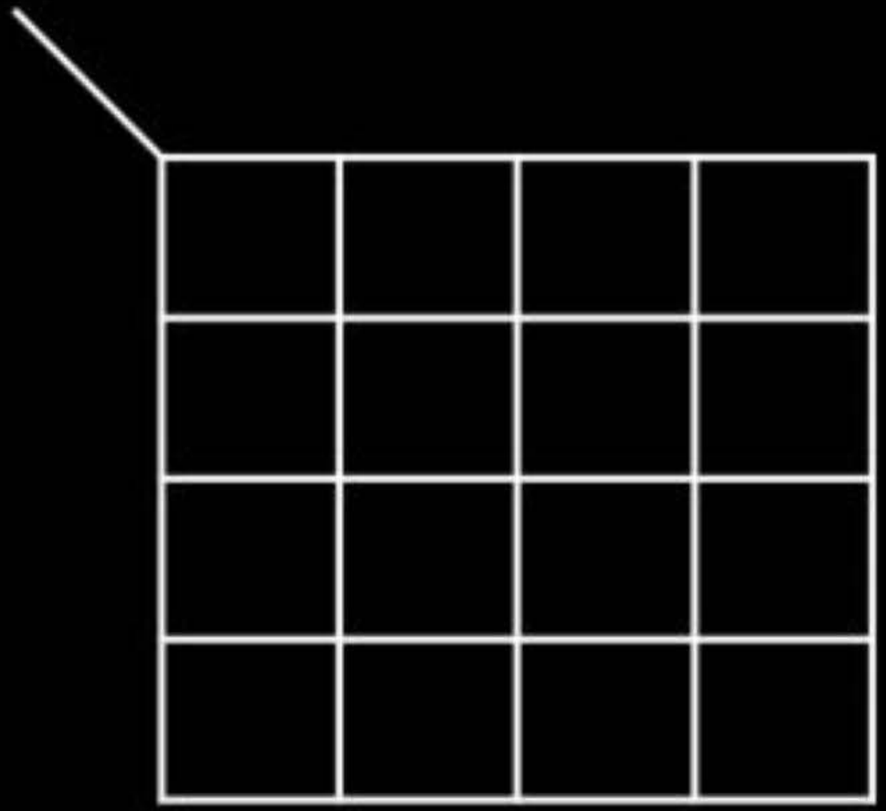


$\bar{A}\bar{D} + A\bar{B}C + ABD$

Q.10

HW

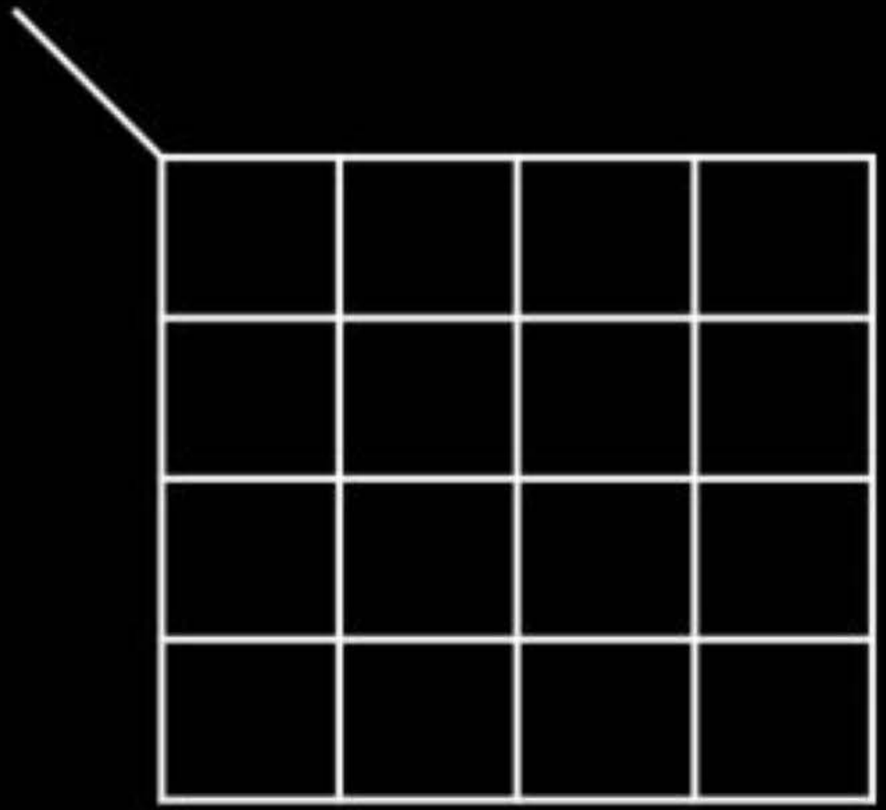
$f(A, B, C, D) = \sum m\ (0, 2, 4, 6, 10, 11, 12, 13, 14, 15)$



Q.11

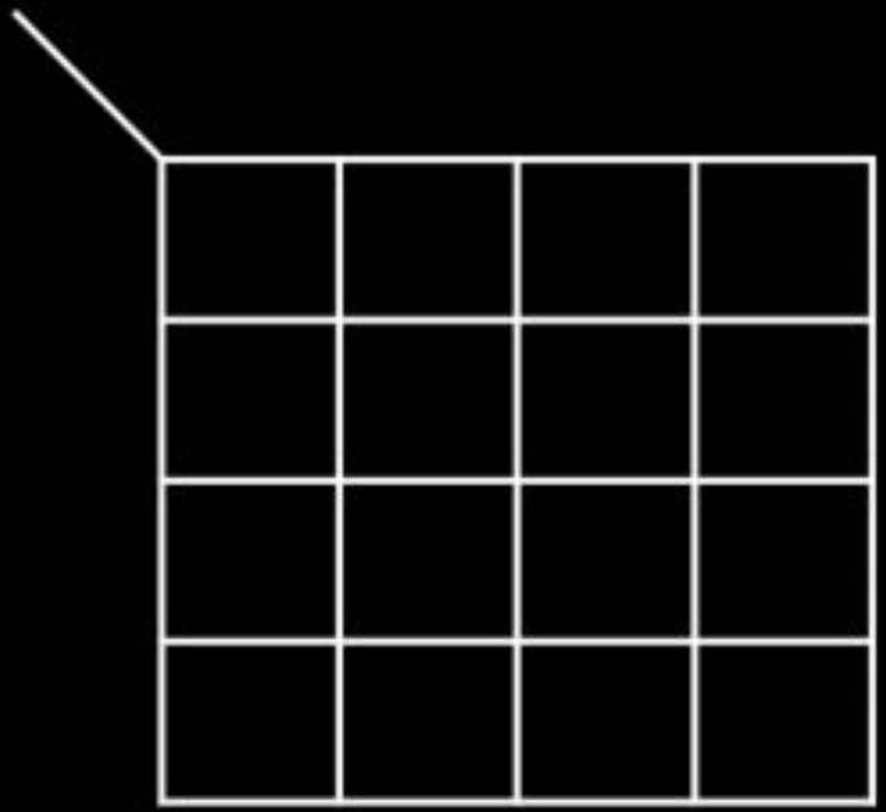
HW

$f(A, B, C, D) = \sum m\,(1, 5, 6, 7, 11, 12, 13, 15)$



Q.12

$f(A, B, C, D) = \sum m\,(1, 5, 6, 7, 11, 12, 13, 15)$



Thank you

GW

Soldiers!