CS & IT ENGINEERING

Digital Logic

Minimization

Lecture No. 03

By- CHANDAN SIR

01 THEOREM

02 D-MORGAN'S Law

03 QUESTION PRACTICE

04 DUAL & SELF DUAL

05 DISCUSSION

Modified Veitched Diagram

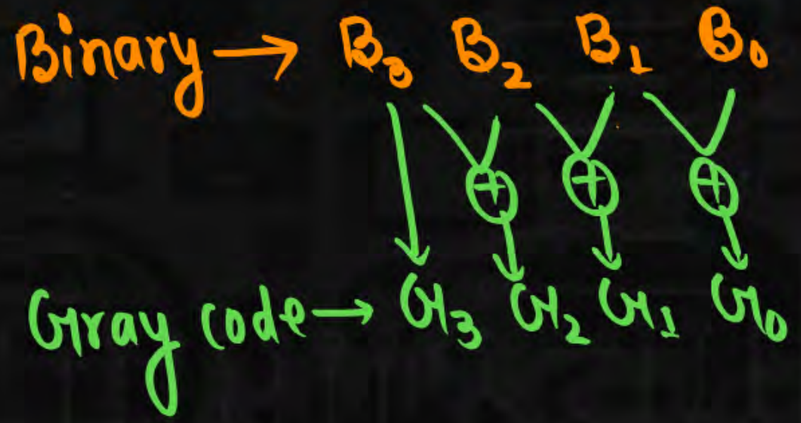
→ It is also known as (K-MAP)

K Map - Basics

Minimization by K-Map

→ Based on gray code.

→ Gray code

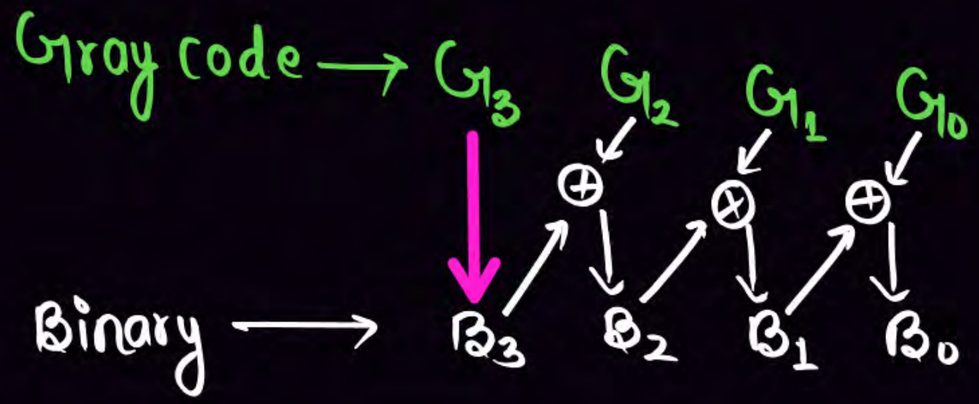


Ex Binary → 0 1 1 0 1 0 1

Gray code → 0 1 0 1 1 1 1

Ex. Binary → 1 1 1 0 0 1 0 1 1

Gray code → 1 0 0 1 0 1 1 1 0



Ex

Gray code → 1 1 1 1 0 0 0 1

Binary → 1 0 1 0 0 0 0 1

Ex Gray code → 1 1 0 1 0 1 1

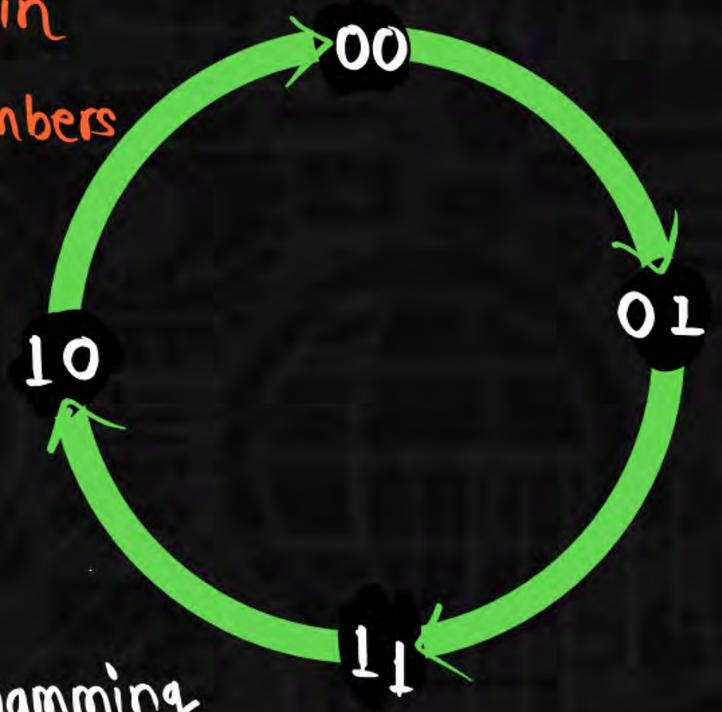
Binary → 1 0 0 1 1 0 1

K Map - Basics

Gray Code

Gray code is a code in which successive numbers are differ by 1 bit.

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



1> unity hamming distance code.

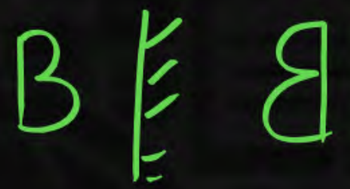
2> cyclic code

3> Reflecting code

K Map - Basics

Gray Code

Decimal	Binary	Gray Code
0	000	000
1	001	001
2	010	011
3	011	010
4	100	110
5	101	111
6	110	101
7	111	100



K Map - Basics

$f(A, B)$

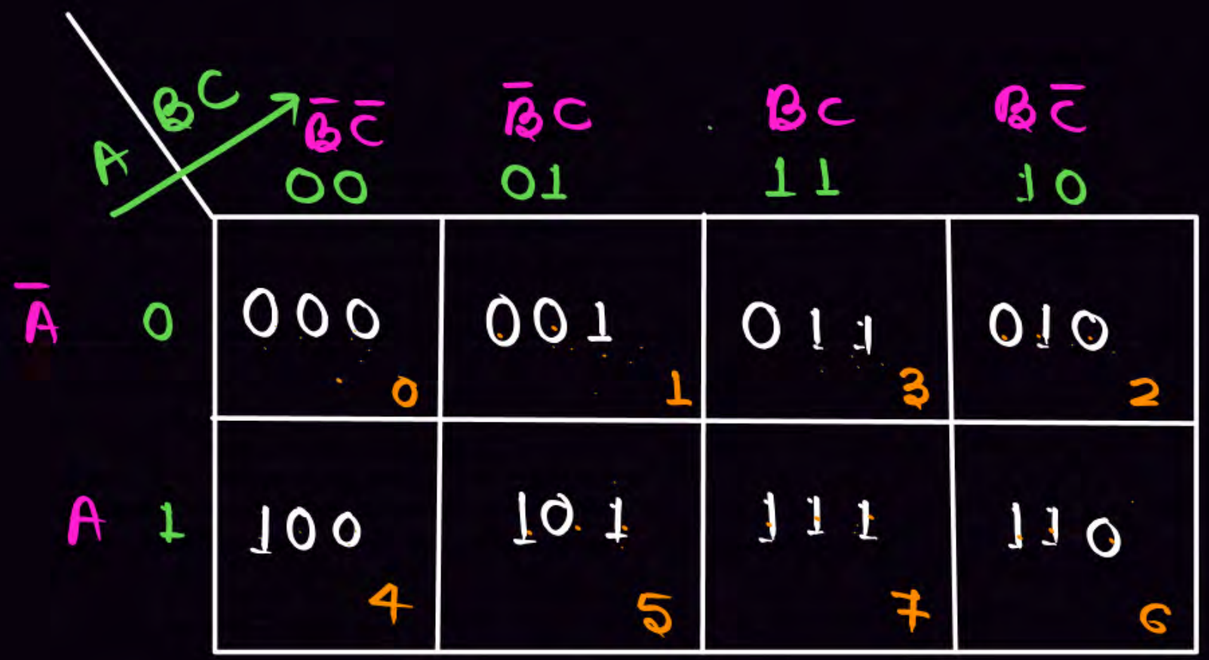
MSB LSB

Most significant Bit

Least significant bit

$f(A, B)$

$f(A, B, C)$


BC
A
$\bar{B}\bar{C}$ 00
$\bar{B}C$ 01
BC 11
$B\bar{C}$ 10
$\bar{A}$ 0
000 0
001 1
011 3
010 2
A 1
100 4
101 5
111 7
110 6

K Map - Basics

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

Group can be formed in order of 2^n.

K Map - Basics

16 group = 2^4 → 4 Variables Reduce

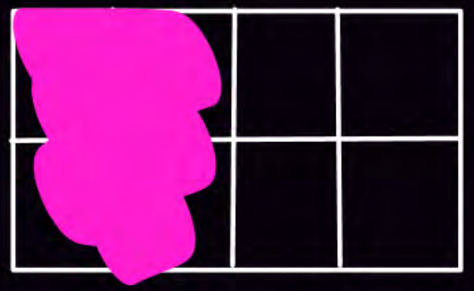
8 group = 2^3 → 3 Variables Reduce

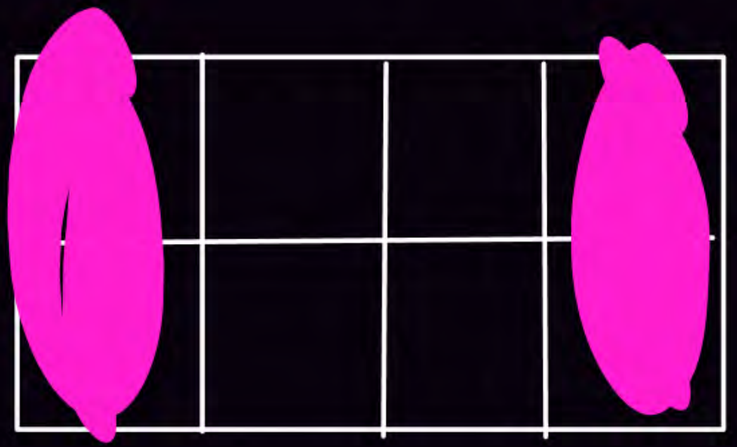
4 group = 2^2 → 2 Variables Reduce

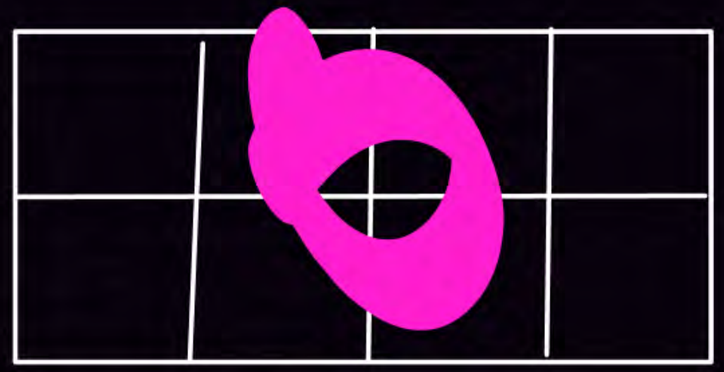
2 group = 2^1 → 1 Variable Reduce

1 group = 2^0 → '0' Variable Reduce.

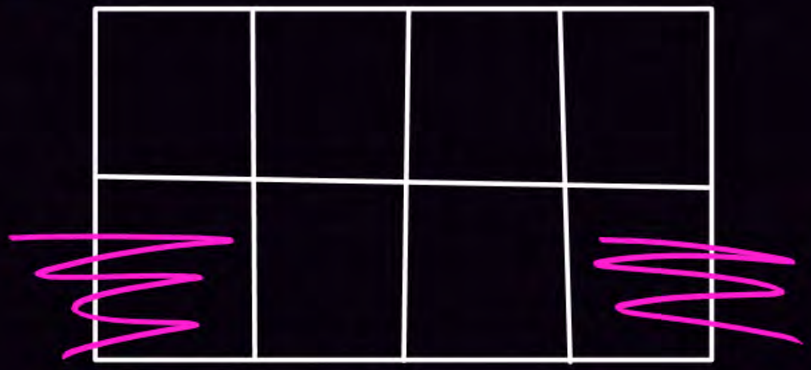
Quad

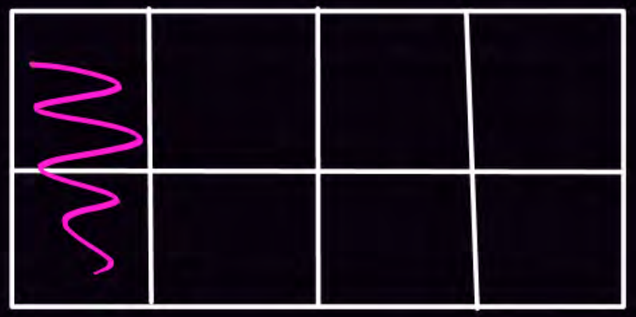


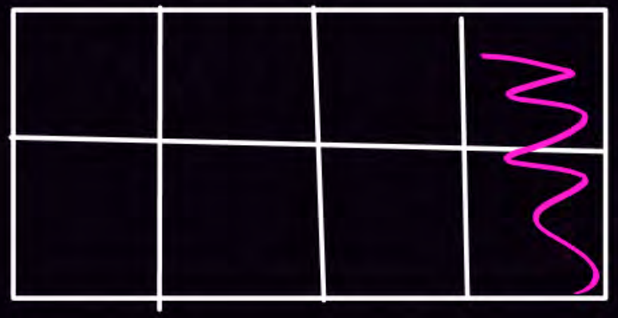


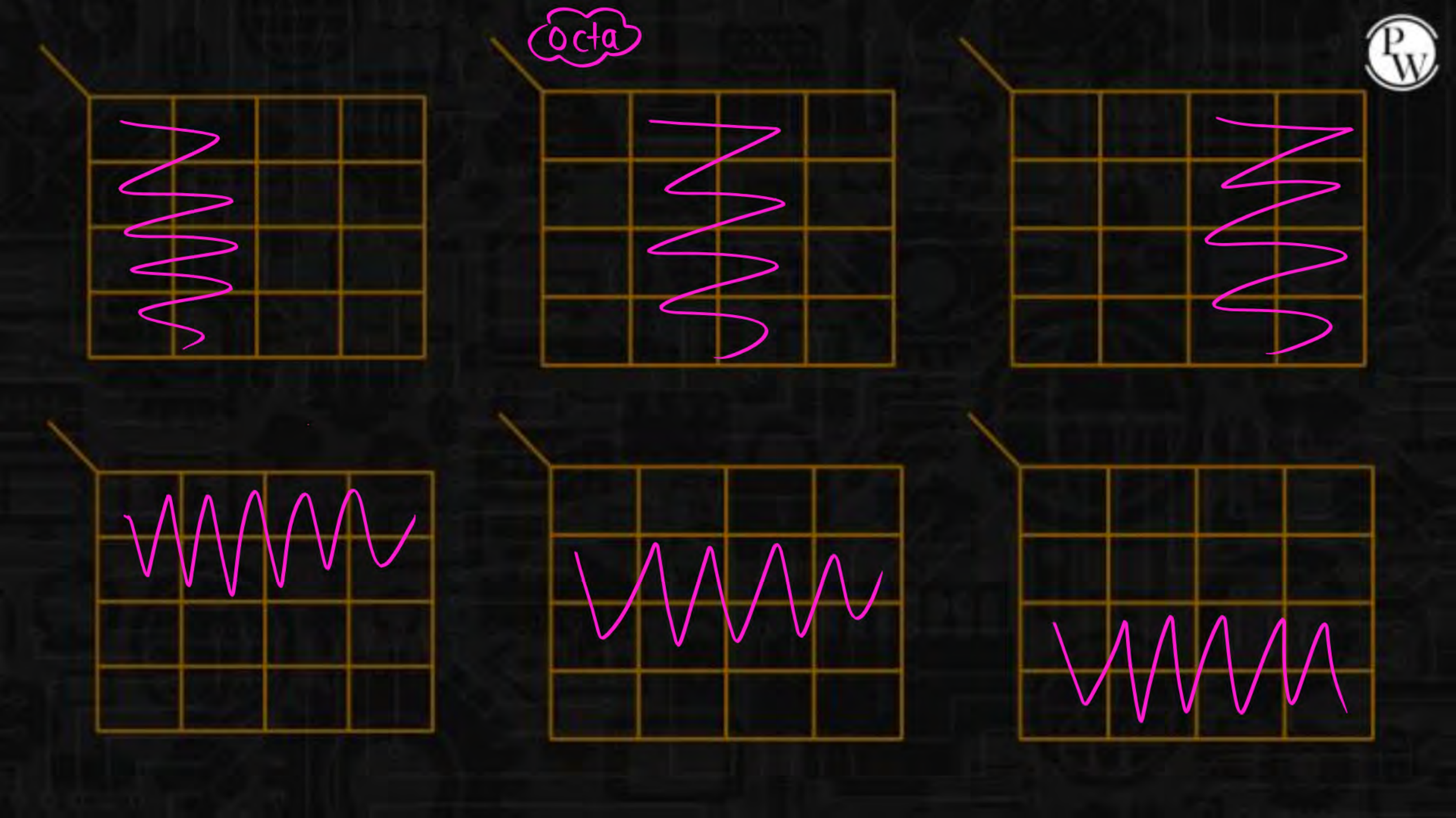


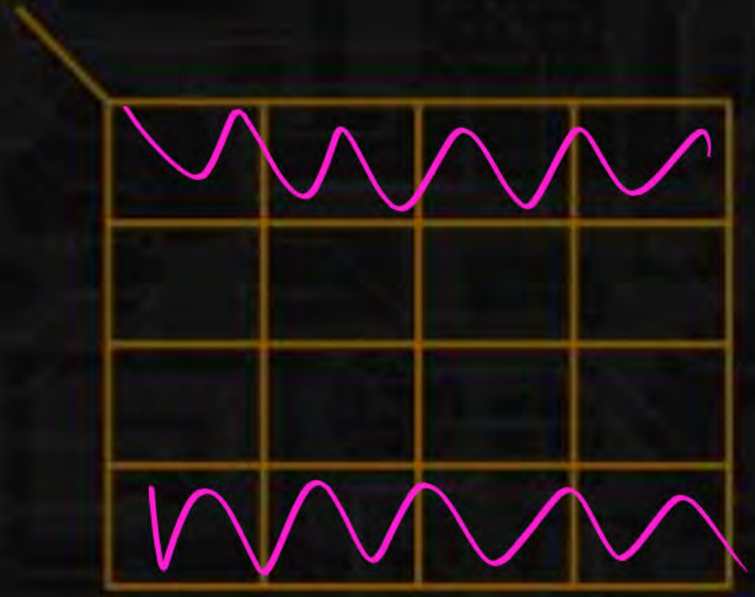
Pair



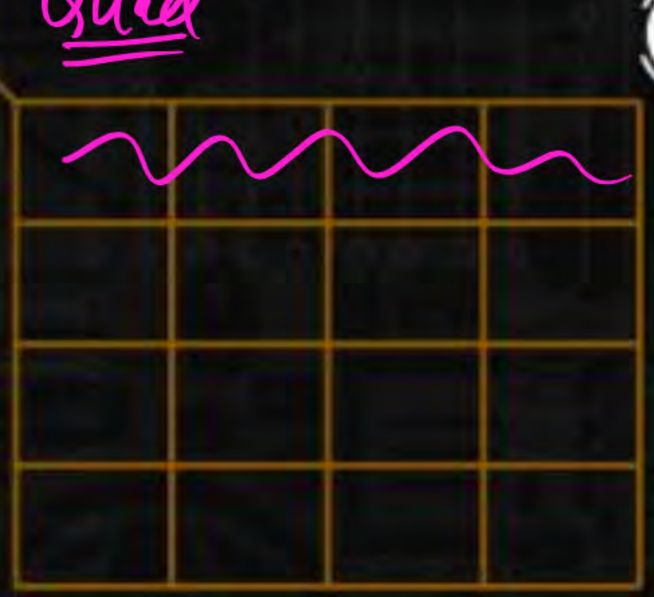





octa



Quad

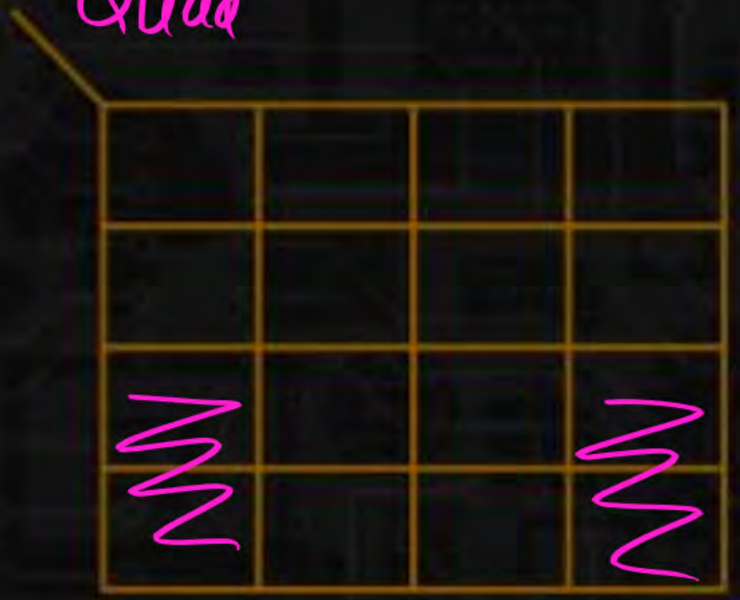


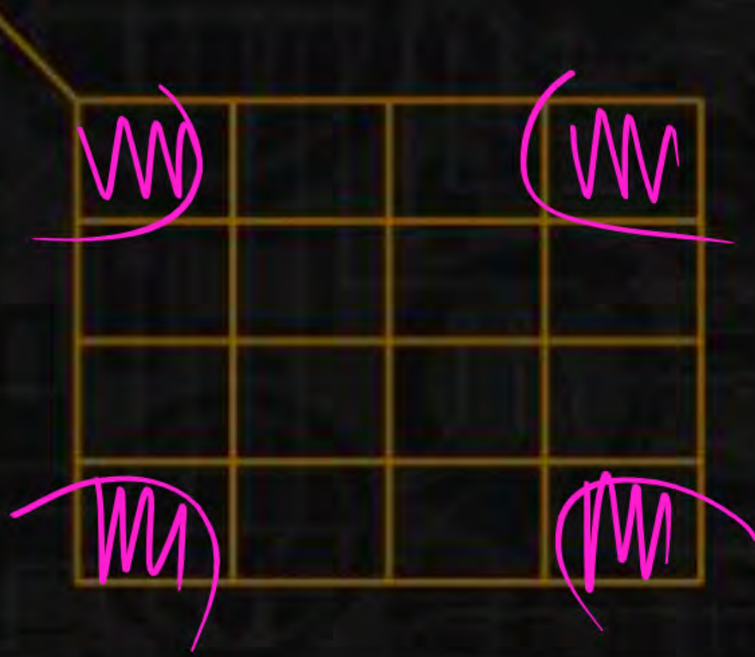
Quad

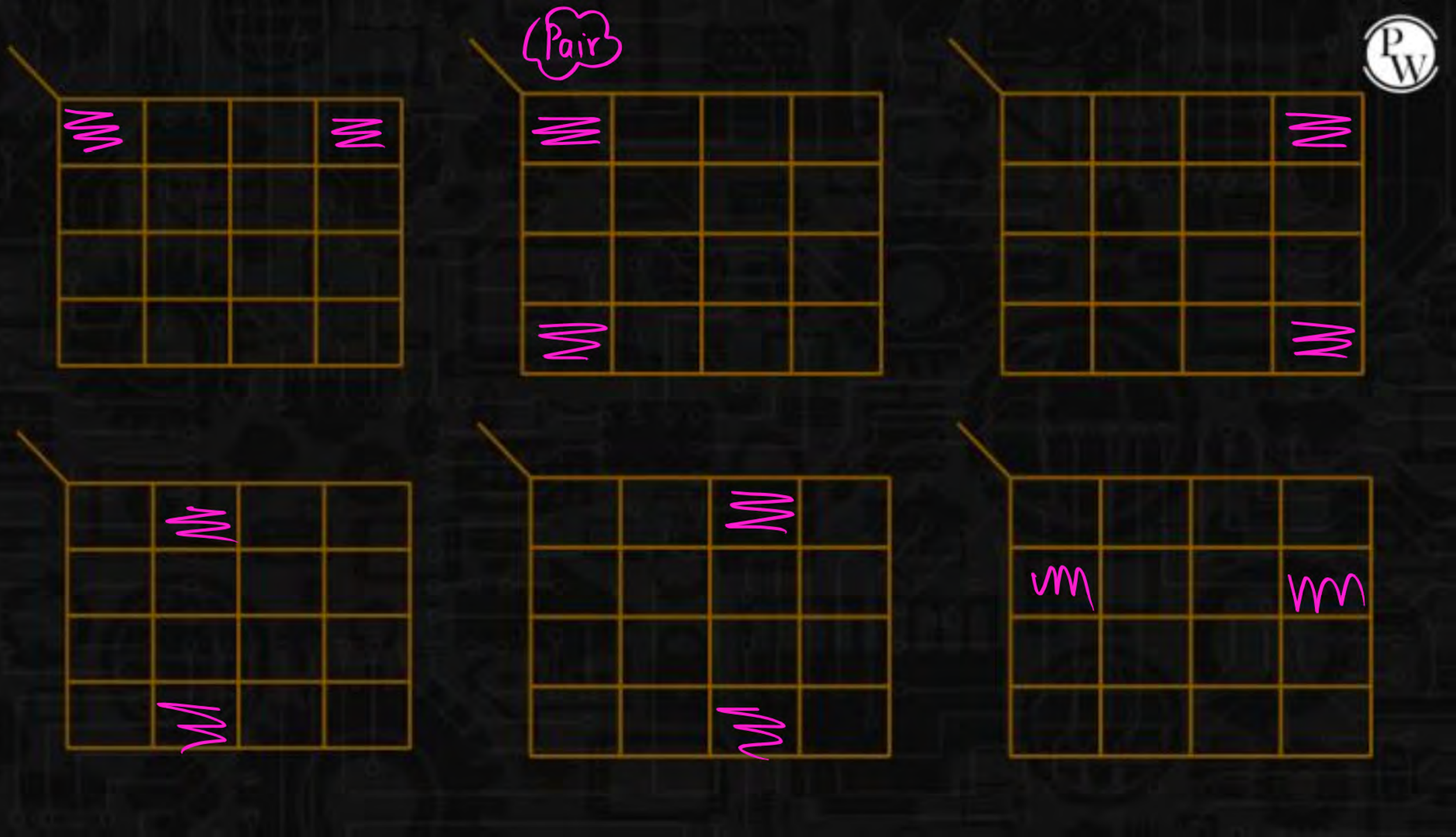
Quad

Quad

Quad






Pair

K Map - Basics

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

Rule of Minimization

CJ BABA RULE

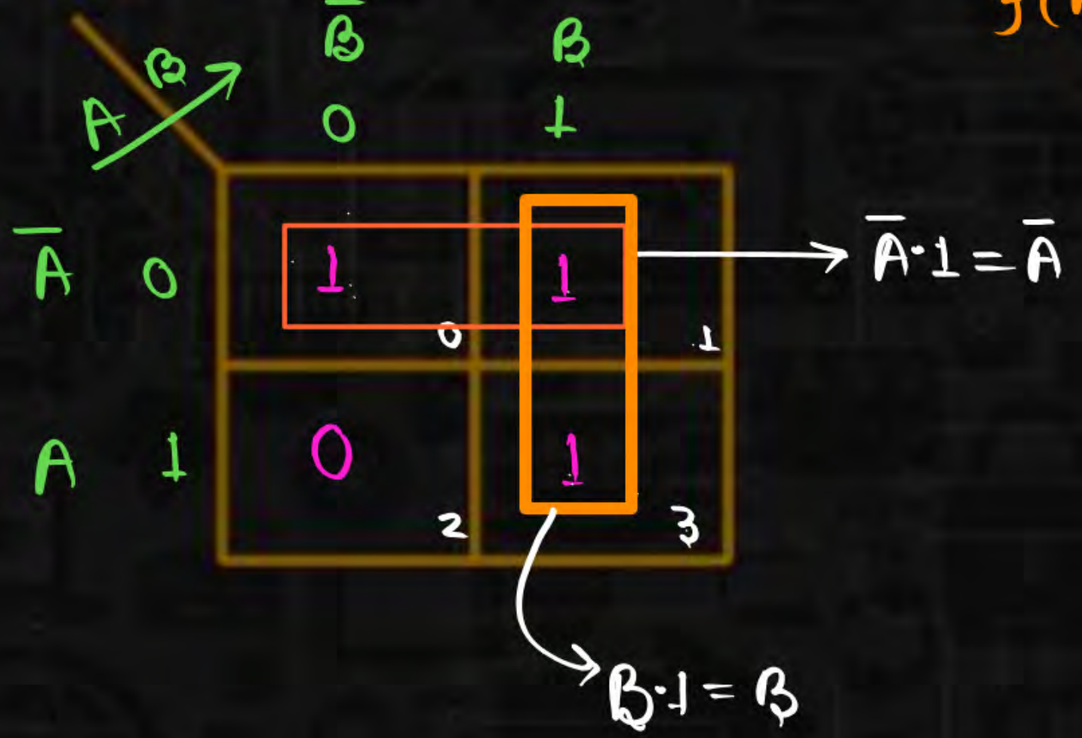
Terms will minimize

→ Kam se kam group banana hai and Bade se bada group banana hai.

Variable will minimize

For K-MAP try to write the function in Standard canonical form.

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

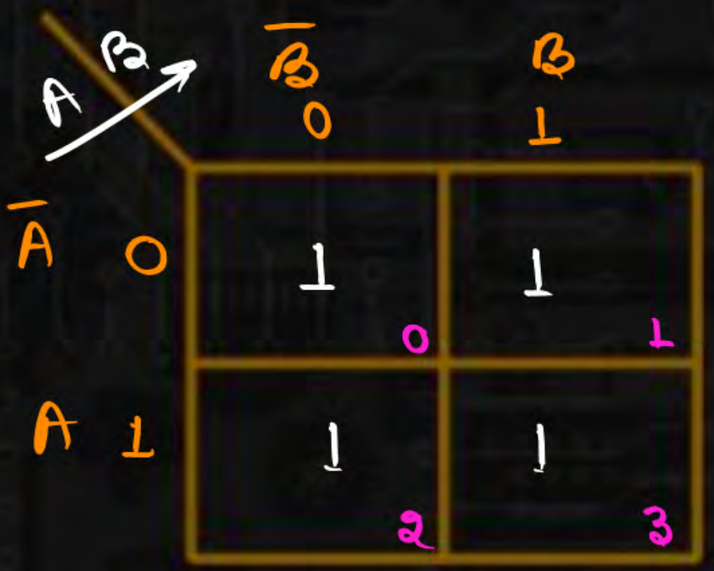


$f(A,B) = \bar{A}\bar{B}\cdot 1 + \bar{A}B\cdot 1 + A\bar{B}\cdot 0 + AB\cdot 1$

$= \bar{A} + B$

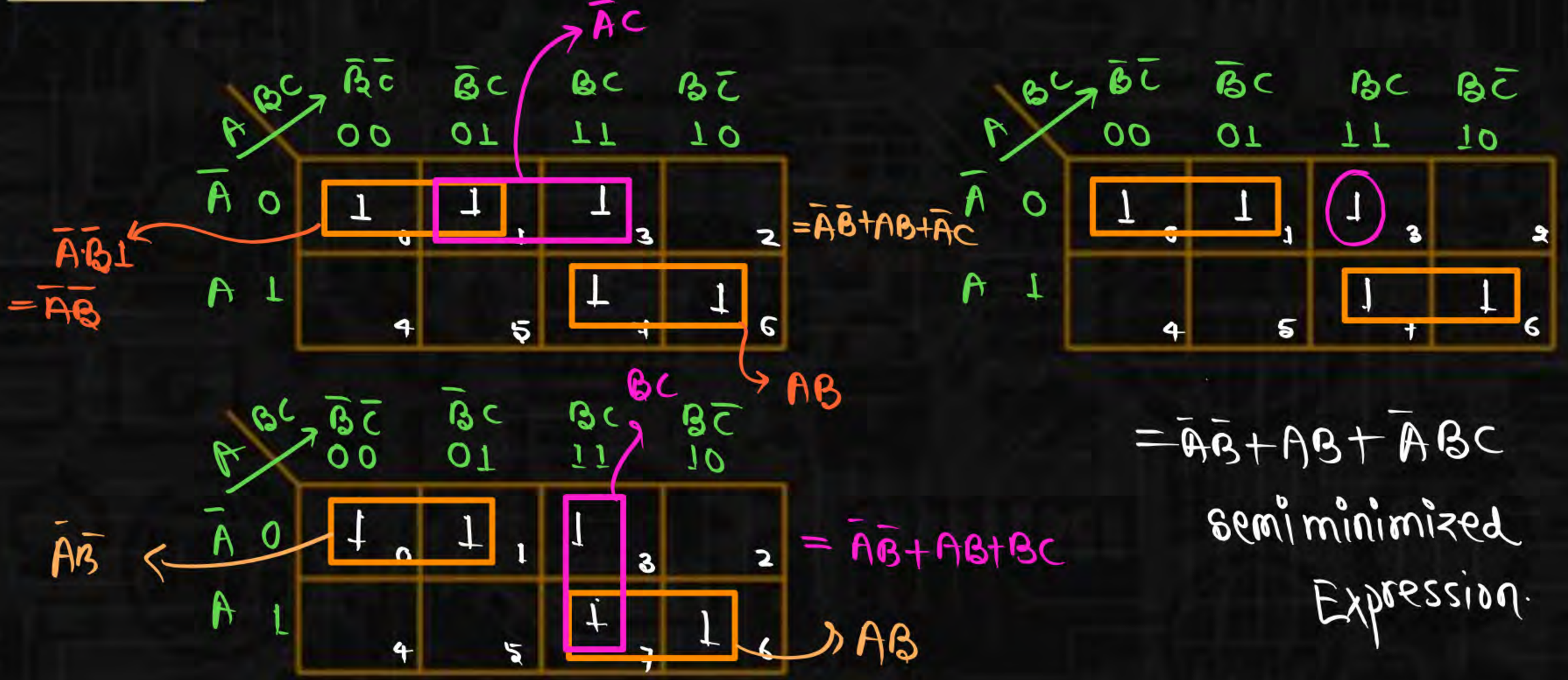
Ans

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



$= 1$ Ans

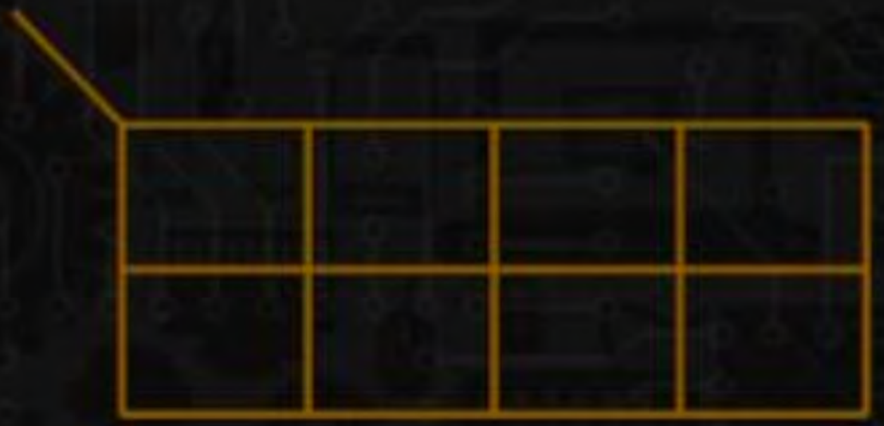
Q.3 $f(A,B,C) = \sum m\,(0, 1, 3, 6, 7)$



Q.4

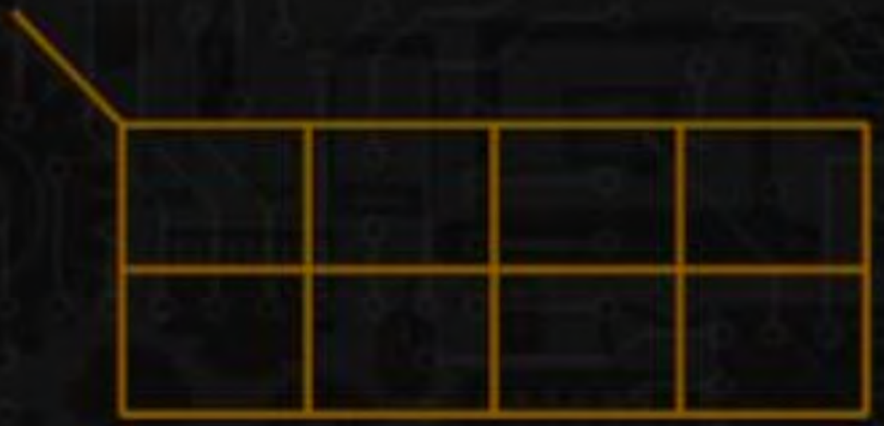
HW.

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



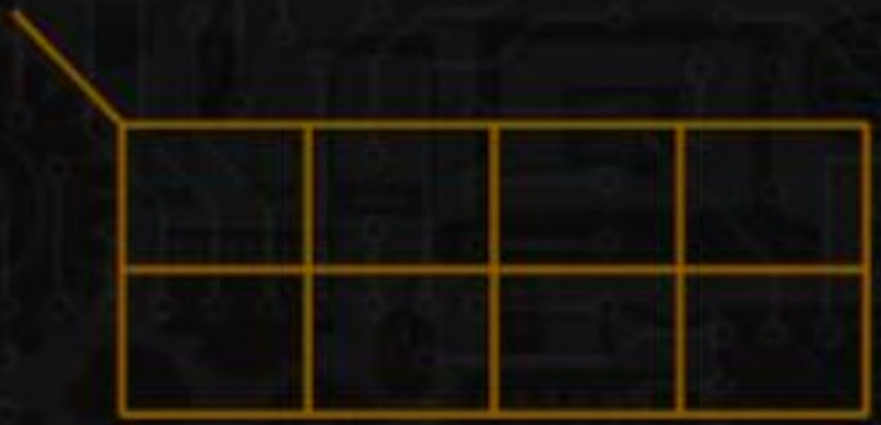
HW.

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



HW

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



Hw

Q.7 $f(A,B,C,D) = \sum (0, 2, 4, 6, 10, 11, 13, 15)$

Q.8 HW $f(A,B,C,D) = \sum m\,(0,1,2,4,6,9,10,11,12,13,15)$

HW

Q.9 $f(A,B,C,D) = \sum m\,(1,5,6,7,11,12,13,15)$

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


t.me/CJSIR
THANK YOU GW
SOLDIERS !