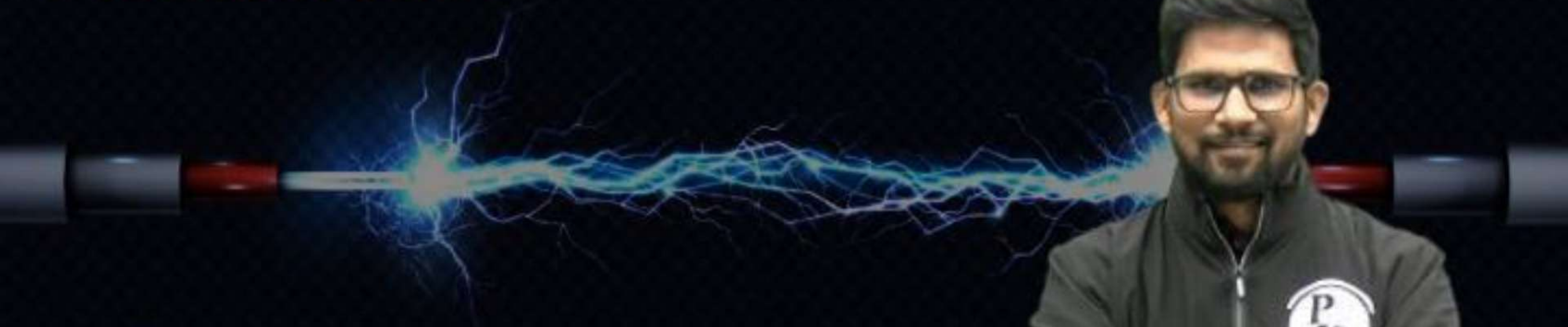




# COMPUTER SCIENCE & IT

## DIGITAL LOGIC




Lecture No. 05

Combinational Circuit



By- Chandan Gupta Sir



# Recap of Previous Lecture

K-Map







# Topics to be Covered

K-Map Cont.

# [ Question ]

$$f(A, B, C) = \Sigma(0, 1, 5, 7)$$

	$\overline{B}\overline{C}$	$\overline{B}C$	$BC$	$B\overline{C}$
$\overline{A}$	1	1		
$A$		1	1	

Annotations: A green box highlights the top-left two cells (1,1) and (1,2) with an arrow pointing to  $\overline{A}\overline{B}$ . A blue box highlights the bottom-middle two cells (2,2) and (2,3) with an arrow pointing to  $AC$ .

$$= \overline{A}\overline{B} + AC$$

	$\overline{B}\overline{C}$	$\overline{B}C$	$BC$	$B\overline{C}$
$\overline{A}$	1	1		
$A$		1	1	

Annotations: A green box highlights the top-left two cells (1,1) and (1,2) with an arrow pointing to  $\overline{A}\overline{B}$ . A blue box highlights the bottom-middle two cells (2,2) and (2,3) with an arrow pointing to  $AC$ . A red box highlights the top-middle cell (1,2) with an arrow pointing to  $\overline{B}C$  (redundant).

$$\begin{aligned} &= \overline{A}\overline{B} + AC + \overline{B}C \\ &= \overline{A}\overline{B} + AC \end{aligned}$$

Annotation: The term  $\overline{B}C$  is crossed out with a red line and labeled "redundant".

# Question

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

	$\overline{B}\overline{C}$	$\overline{B}C$	$BC$	$B\overline{C}$
$\overline{A}$	1	1	1	
$A$			1	1

$\downarrow \overline{A}\overline{B} + AB + BC$ 
 $\rightarrow AB$

	$\overline{B}\overline{C}$	$\overline{B}C$	$BC$	$B\overline{C}$
$\overline{A}$	1	1	1	
$A$			1	1

$\overline{A}\overline{B} + AB + \overline{A}C$

Note: K-Map can have more one solution but it is not necessary.

# [ Question ]



$$f(A, B, C) = \Sigma(2, 3, 4, 5) + d\Sigma(1, 7)$$

	$\bar{B}\bar{C}$	$\bar{B}C$	$BC$	$B\bar{C}$
$\bar{A}$		X	1	1
$A$	1	1	X	

$\bar{A}B$  (points to the top-right 1s)  
 $A\bar{B}$  (points to the bottom-left 1s)  
 $C$  (redundant) (points to the 1s in the  $C$  column)

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

	$\bar{B}\bar{C}$	$\bar{B}C$	$BC$	$B\bar{C}$
$\bar{A}$		X	1	1
$A$	1	1	X	



# [ Question ]

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

	$\bar{B}\bar{C}$	$\bar{B}C$	$BC$	$B\bar{C}$
$\bar{A}$	1	1	X	1
A		1	1	X

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

	$\bar{B}\bar{C}$	$\bar{B}C$	$BC$	$B\bar{C}$
$\bar{A}$	1	1	X	1
A		1	1	X

B  
(Redundant)

# [ Question ]

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

	$\overline{B}\overline{C}$	$\overline{B}C$	$BC$	$B\overline{C}$
$\overline{A}$	1	1	1	
$A$		1	1	

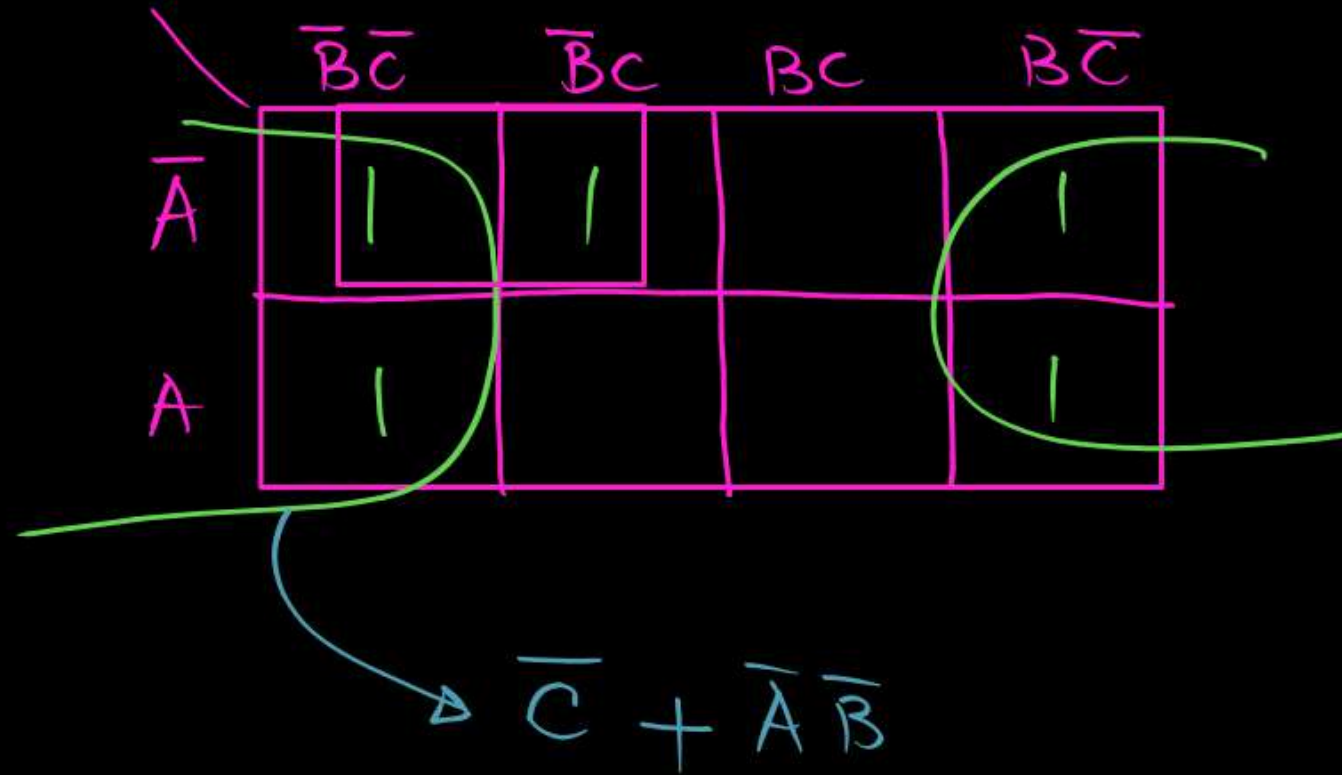
$\downarrow \overline{A}\overline{B}$        $\rightarrow C$

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



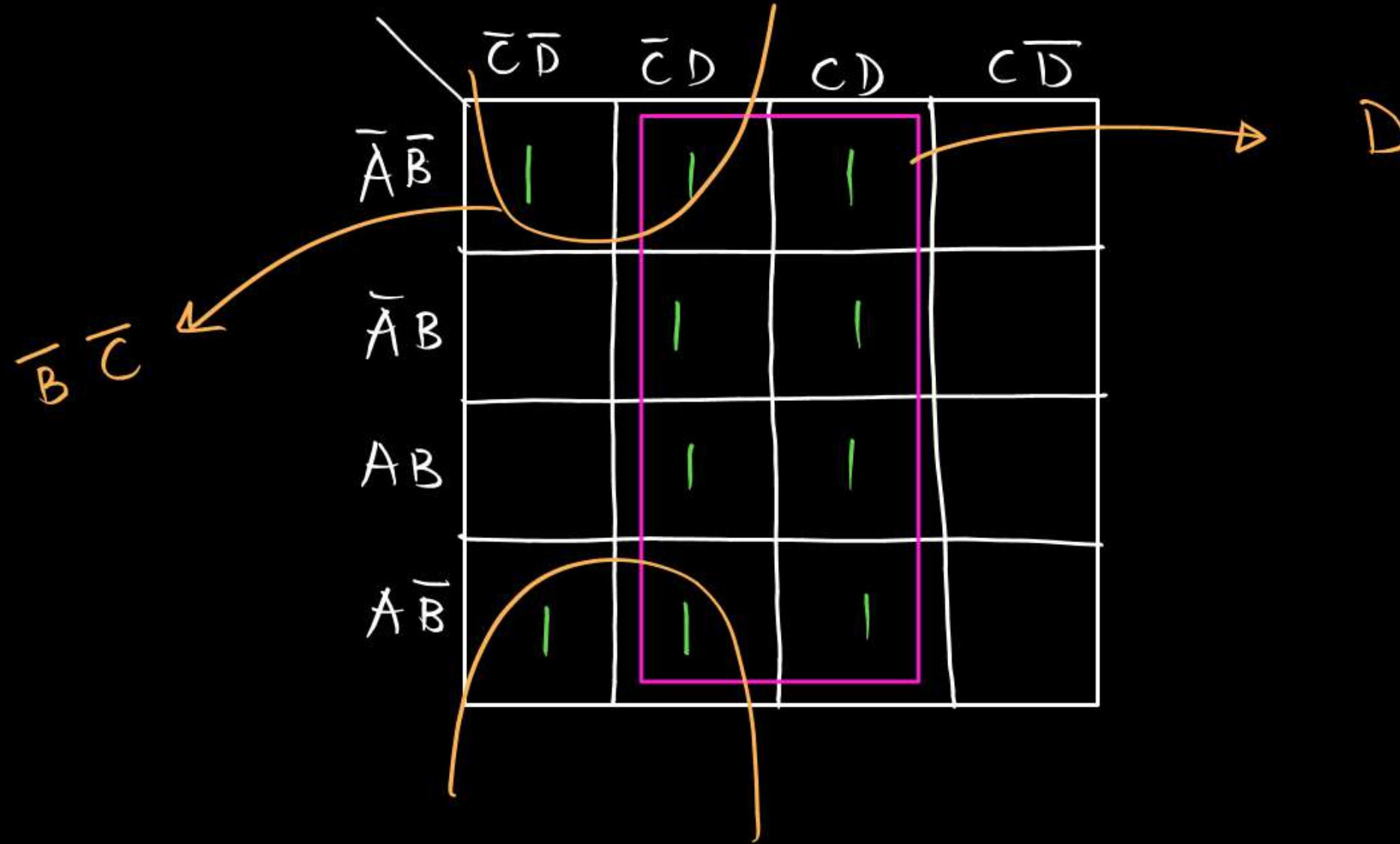
# [ Question ]

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



# [ Question ]

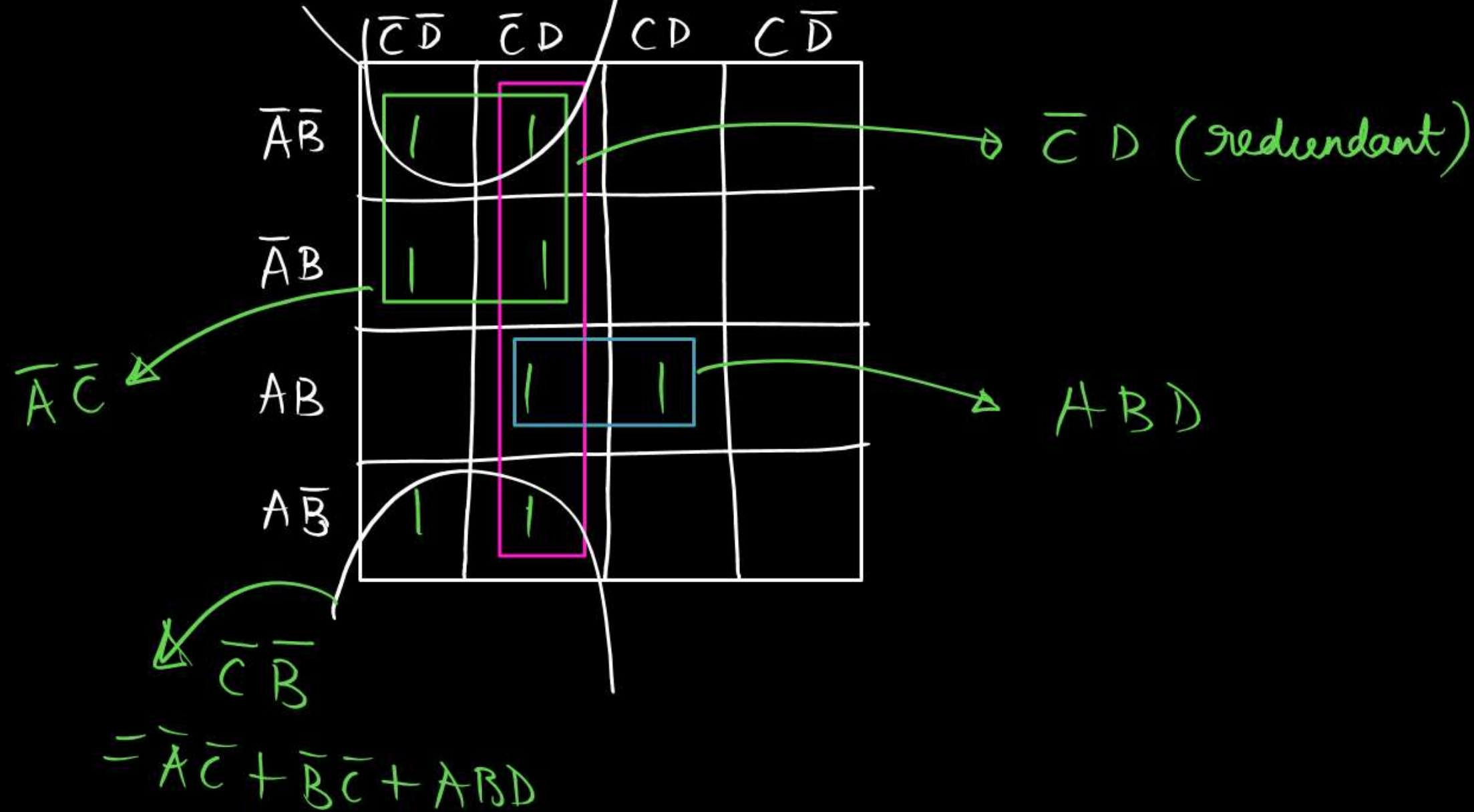
$$f(A, B, C, D) = \Sigma(0, 1, 3, 5, 7, 8, 9, 11, 13, 15)$$



# [ Question ]



$$f(A, B, C, D) = \Sigma(0, 1, 4, 5, 8, 9, 13, 15)$$





# [ Question ]



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

	$\bar{C}\bar{D}$	$\bar{C}D$	$CD$	$C\bar{D}$
$\bar{A}\bar{B}$		1		
$\bar{A}B$		1	1	1
$AB$	1	1	1	
$A\bar{B}$			1	

$$= \bar{A}\bar{C}D + \bar{A}BC + AB\bar{C} + ACD$$

# [ Question ]

A K-map is given as :

$f$	$\bar{A}\bar{B}$	$\bar{A}B$	$AB$	$A\bar{B}$
$\bar{C}\bar{D}$	1			1
$\bar{C}D$				
$CD$	1			1
$C\bar{D}$	1			1

Handwritten annotations on the K-map:

- A green bracket groups the 1s in the first and third rows, labeled  $\bar{B}\bar{D}$ .
- A green bracket groups the 1s in the third and fourth rows, labeled  $C\bar{B}$ .
- A green bracket groups the 1s in the first and third columns, labeled  $\bar{B}$ .

Minimized expression of  $f(A, B, C, D)$  will be :

- (a)  $\bar{B}(C + \bar{D})$
- (b)  $\bar{A}\bar{B}C + A\bar{B}C + \bar{B}\bar{C}D$
- (c)  $\bar{A}\bar{B} + \bar{C}\bar{D}$
- (d) None of these

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

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

# [ Question ]

A K-map is given as :

$f$

	$\bar{A}\bar{B}$	$\bar{A}B$	$AB$	$A\bar{B}$
$\bar{C}\bar{D}$	1	1		
$\bar{C}D$		X		
$CD$		X		
$C\bar{D}$	1	1	1	

The minimized expression of above K-map is :

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

(b)  $\bar{A}\bar{D} + BC\bar{D}$

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

(d) None of these



# [ Question ]



A K-map is given as :

$f$	$\bar{A}\bar{B}$	$\bar{A}B$	$AB$	$A\bar{B}$
$\bar{C}\bar{D}$	1	1		1
$\bar{C}D$	X	1	1	X
$CD$		1	1	
$C\bar{D}$	1	1	X	X

H.W.

Then which of the following is/are minimized form of above K-map ?

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

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

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

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

H.W.

Q.1.

	$\bar{C}\bar{D}$	$\bar{C}D$	$CD$	$C\bar{D}$
$\bar{A}\bar{B}$				
$\bar{A}B$	1	1	X	1
$AB$	1	X		1
$A\bar{B}$	1			



H.W.

Q.

	$\bar{C}\bar{D}$	$\bar{C}D$	$CD$	$C\bar{D}$
$\bar{A}\bar{B}$	1	1	X	
$\bar{A}B$		1	1	X
$AB$	X	X	1	1
$A\bar{B}$	1	1		





H.W.

Q.

	$\bar{C}\bar{D}$	$\bar{C}D$	$CD$	$C\bar{D}$
$\bar{A}\bar{B}$		X	1	
$\bar{A}B$	1	1	1	X
$AB$	X	X	1	X
$A\bar{B}$	1			1



H.W.

Q.

	$\bar{C}\bar{D}$	$\bar{C}D$	$CD$	$C\bar{D}$
$\bar{A}\bar{B}$	1		1	1
$\bar{A}B$	X	1	1	1
$AB$		1	1	X
$A\bar{B}$	1	X	X	X



## 2 Minute Summary

→ K-Map Cont.



**Thank you**

**GW**  
*Soldiers !*

