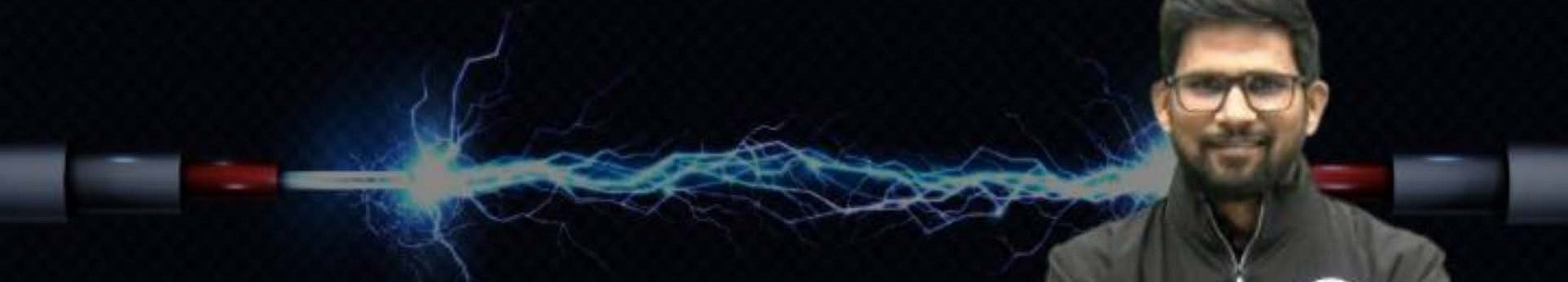


COMPUTER SCIENCE & IT

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]



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

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

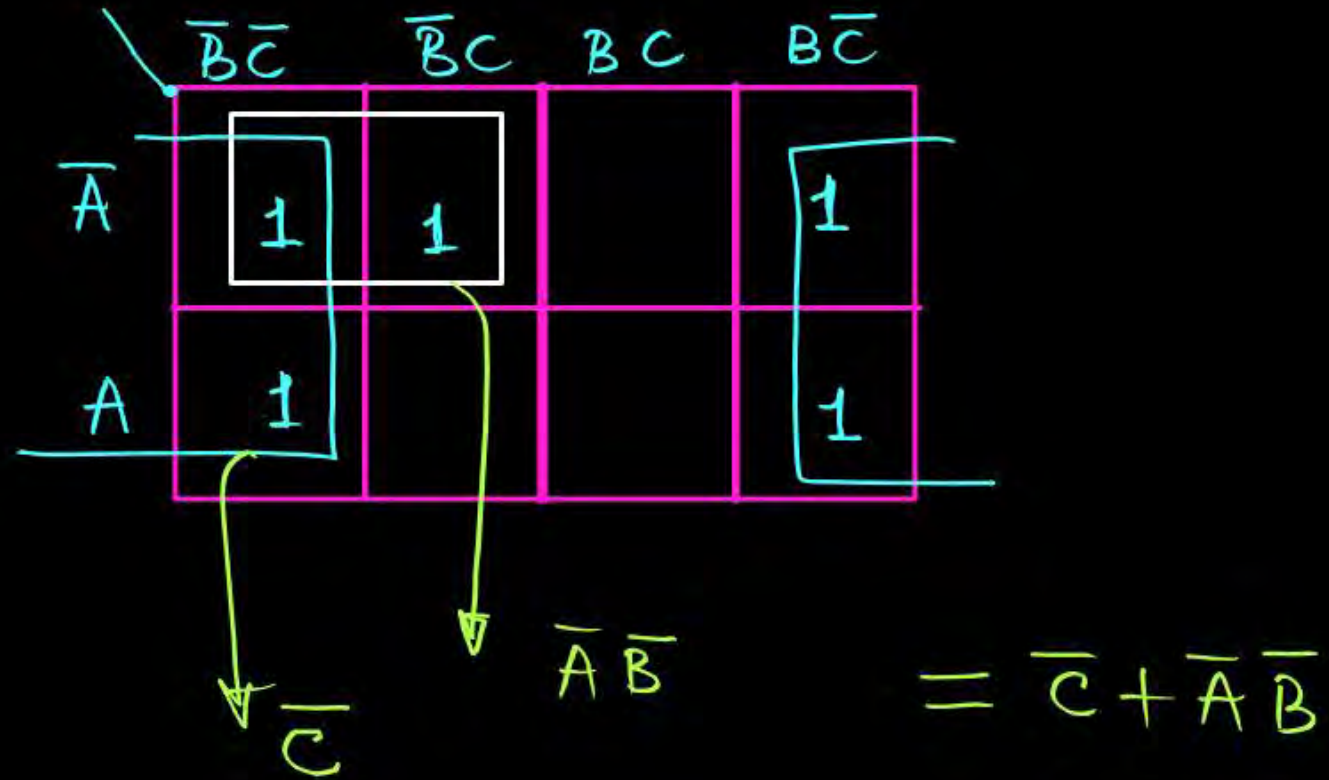
Diagram illustrating the Karnaugh map for the function $f(A, B, C) = \Sigma(0, 1, 3, 5, 7)$. The map is a 2x4 grid with columns labeled $\overline{B}\overline{C}$, $\overline{B}C$, BC , and $B\overline{C}$, and rows labeled \overline{A} and A . The cells containing 1s are at $(\overline{A}, \overline{B}\overline{C})$, $(\overline{A}, \overline{B}C)$, (\overline{A}, BC) , $(A, \overline{B}C)$, and (A, BC) . A red box highlights the first three cells of the \overline{A} row, and a blue box highlights the last two cells of the \overline{A} row and the two cells below them. Arrows point from the red box to $\overline{A}\overline{B}$ and from the blue box to C .

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

[Question]



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



[Question]

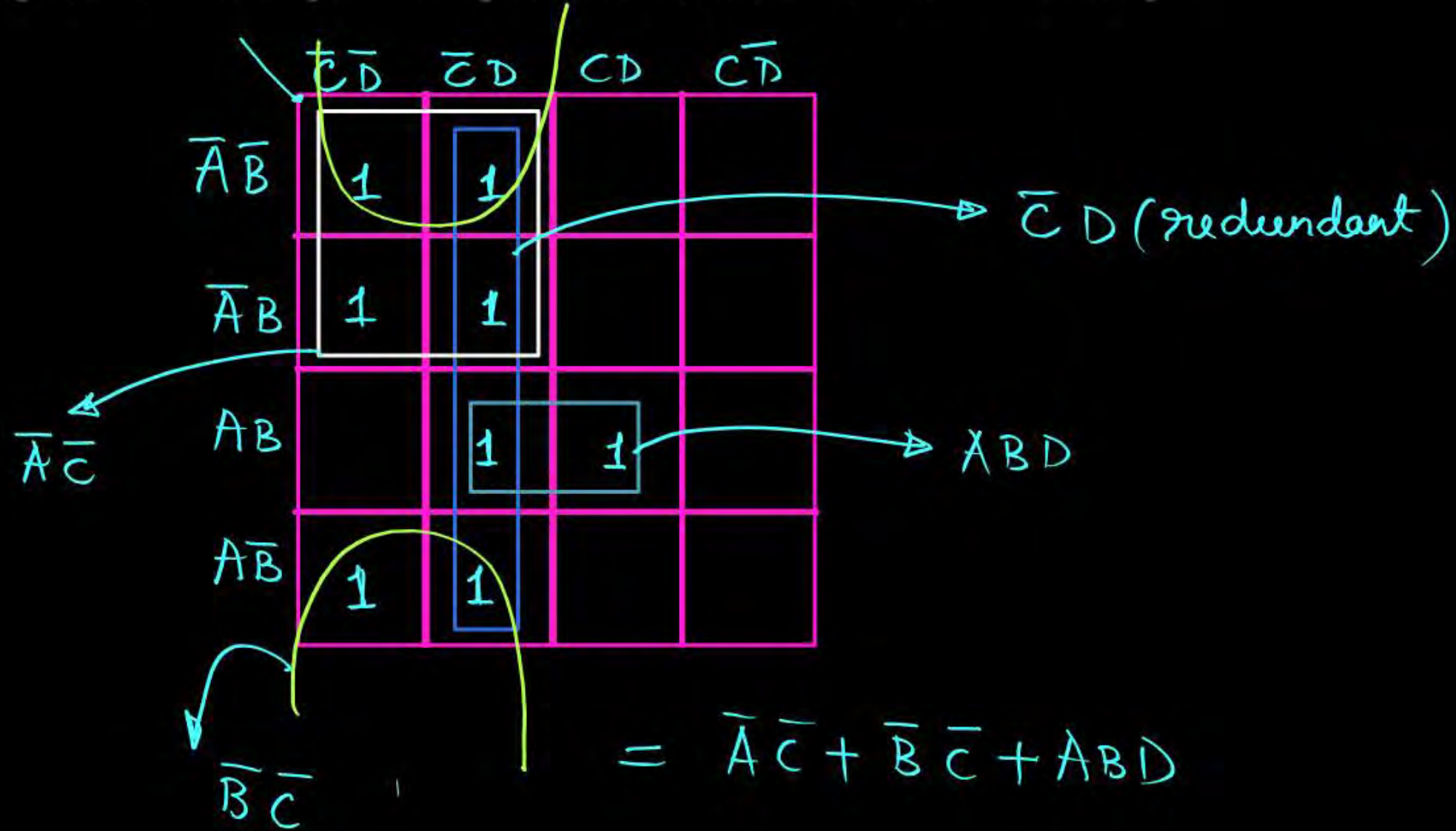
$$f(A, B, C, D) = \Sigma(0, 1, 3, 5, 7, 8, 9, 11, 13, 15)$$

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

$$= D + \overline{B}\overline{C}$$

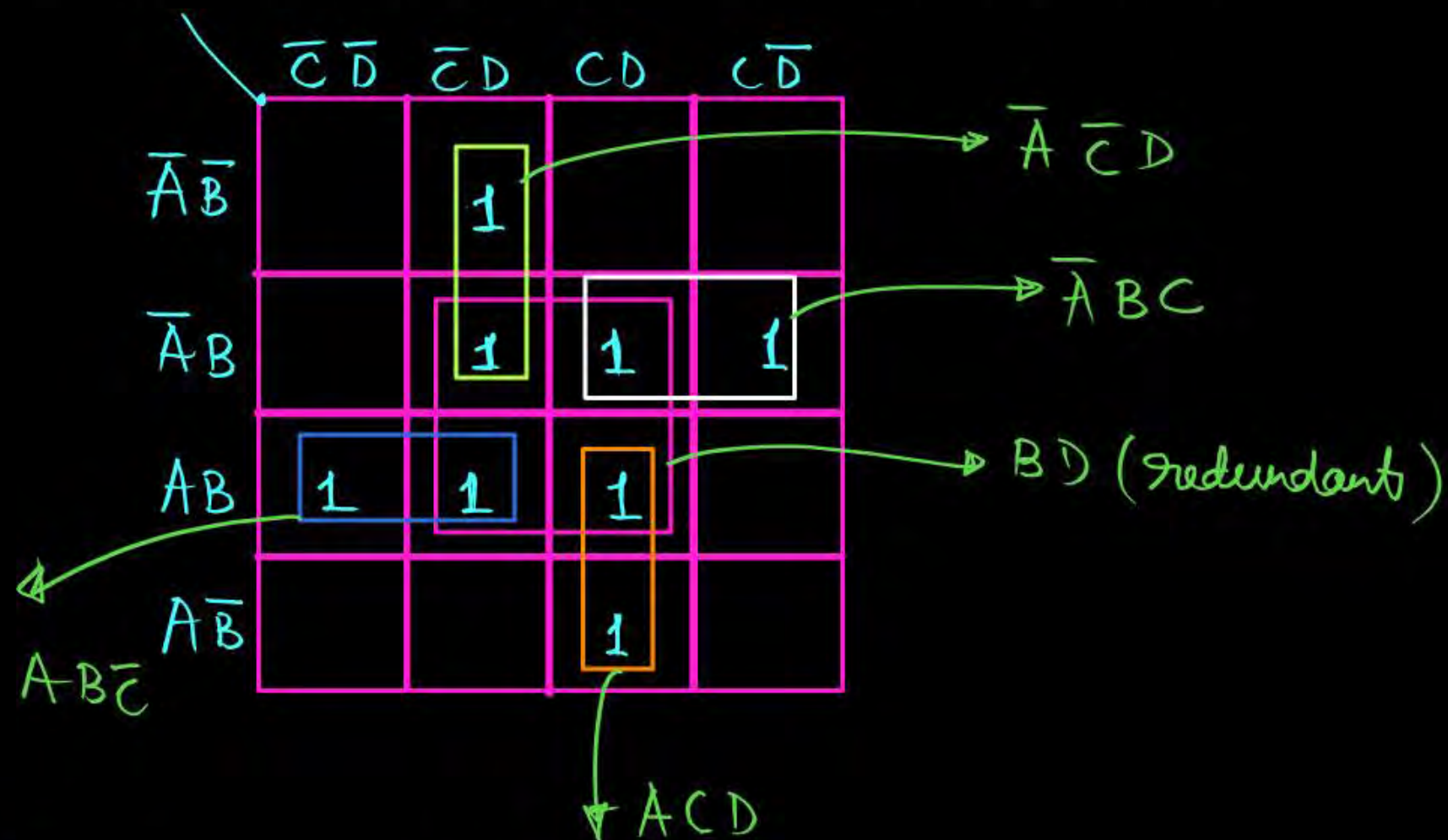
[Question]

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



[Question]

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



$$= A\overline{B}\overline{C} + \overline{A}BC + ACD + \overline{A}\overline{C}D$$

[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
$\bar{C}D$				
CD	1			1
$C\bar{D}$	1			1

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

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

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

[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	

Annotations:
 - A blue arc connects the two '1's in the $\bar{C}\bar{D}$ row, labeled $\bar{A}\bar{D}$.
 - A pink box highlights the '1's in the $C\bar{D}$ row, labeled $BC\bar{D}$.
 - The minimized expression is shown as $= BC\bar{D} + \bar{A}\bar{D}$.

The minimized expression of above K-map is :

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

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

(b)

$\bar{A}\bar{D} + BC\bar{D}$

(d)

None of these

[Question]

$$\begin{array}{l} 100 \rightarrow 4 \\ 110 \rightarrow 6 \end{array}$$

$$= \Sigma (3, 4, 5, 6, 7)$$

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

$$\begin{array}{l} 101 \rightarrow 5 \\ 011 \rightarrow 3 \\ 111 \rightarrow 7 \end{array}$$

Then its minimized expression will be

(a) $(A + B)(A + C) = (A + BC)$

(b) $A \odot C + BC$

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

(d) None of these

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

$$= A + BC = (A + B)(A + C)$$

[Question]

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

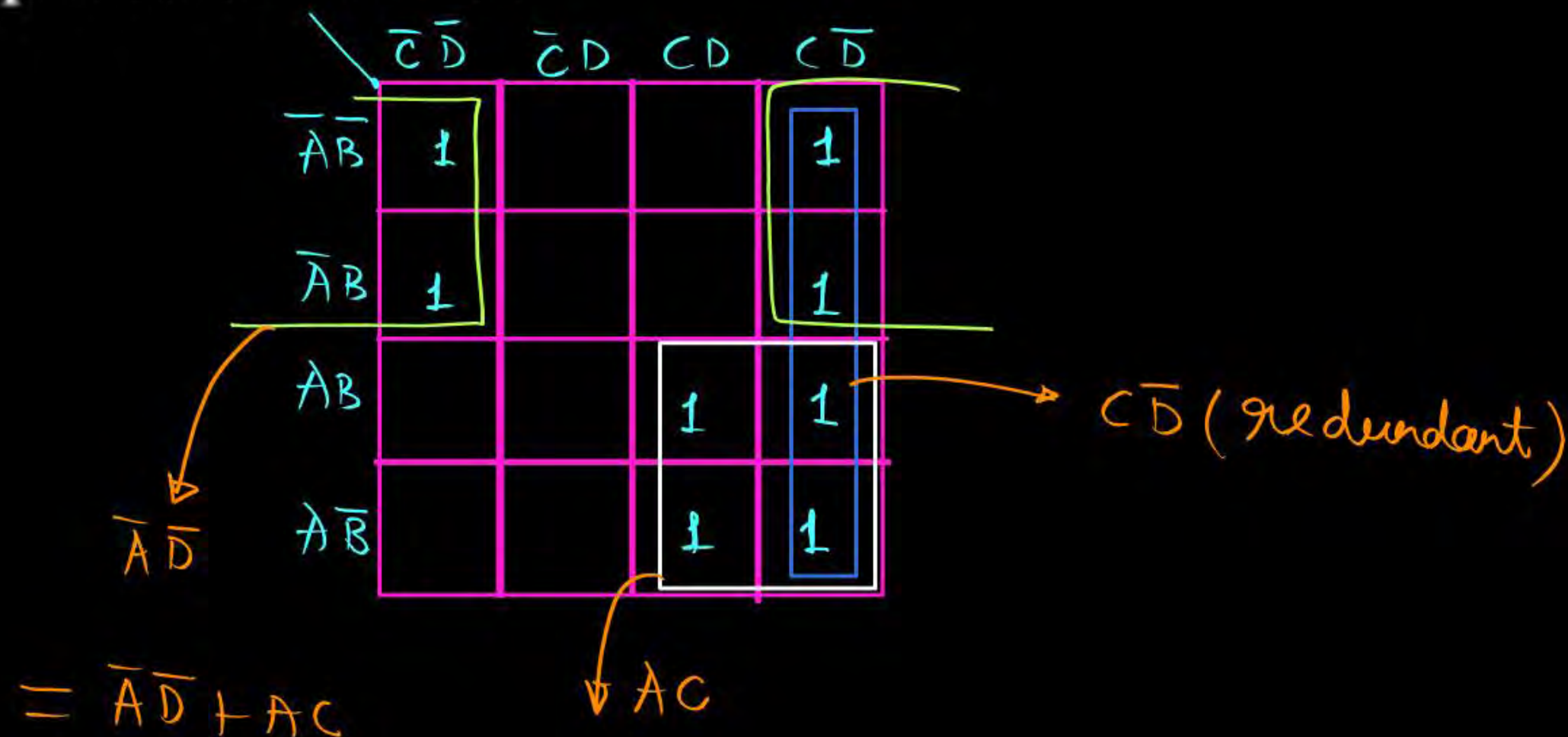
Then its minimized expression will be

(a) $\bar{A}\bar{D} + AC$

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

(c) $BC + AC$

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



[Question]

$$f_1(A, B, C) = \bar{A}C + B\bar{C}$$



$$f(A, B, C) = \overline{\bar{A}C + B\bar{C}} + AB\bar{C} = \overline{f_1(A, B, C)} + AB\bar{C}$$

Then its minimized expression will be

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

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

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

(d) None of these

f_1

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

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

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

$$\overline{f_1} + AB\bar{C} = f$$

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

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

[Question]

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

Then its minimized solution will be

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

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

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

(d) None of these

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

Annotations:
 - A green box highlights the first two columns ($\bar{C}\bar{D}$ and $\bar{C}D$), with an arrow pointing to $\bar{C}\bar{D}$ below the table.
 - A green box highlights the last two columns (CD and $C\bar{D}$), with an arrow pointing to $\bar{A}C$ to the right of the table.

[**Question**] MSQ



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

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

	$\bar{A}\bar{B}$	$\bar{A}B$	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

(c)

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

	$\bar{A}\bar{B}$	$\bar{A}B$	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

(d) X

	$\bar{A}\bar{B}$	$\bar{A}B$	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

(a) X

H.W.

Q.

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

H.W.

Q.

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

H.W.

Q.

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

H.W.

Q.

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

H.W.

Q.

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



2 Minute Summary

→ K-Map

Thank you

GW
Soldiers !

