



COMPUTER SCIENCE & IT

DIGITAL LOGIC




Lecture No. 07

Combinational Circuit



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Recap of Previous Lecture

Question Discussion



Topics to be Covered

K-Map Cont.

[Question]

$$\begin{array}{cc} A & \bar{C} \\ 1 & 0 & 0 \rightarrow 4 \\ 1 & 1 & 0 \rightarrow 6 \end{array}$$

$$\begin{array}{cc} B & C \\ 0 & 1 & 1 \rightarrow 3 \\ 1 & 1 & 1 \rightarrow 7 \end{array}$$

$$\begin{array}{ccc} A & \bar{B} & C \\ 1 & 0 & 1 \rightarrow 5 \end{array}$$



$$f(A, B, C) = A\bar{C} + A\bar{B}C + BC = \sum(3, 4, 5, 6, 7) = \bar{A}BC + A\bar{B}\bar{C} + A\bar{B}C + A\bar{B}\bar{C} + ABC$$

Then its minimized expression will be

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

(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

$$= A + BC$$

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

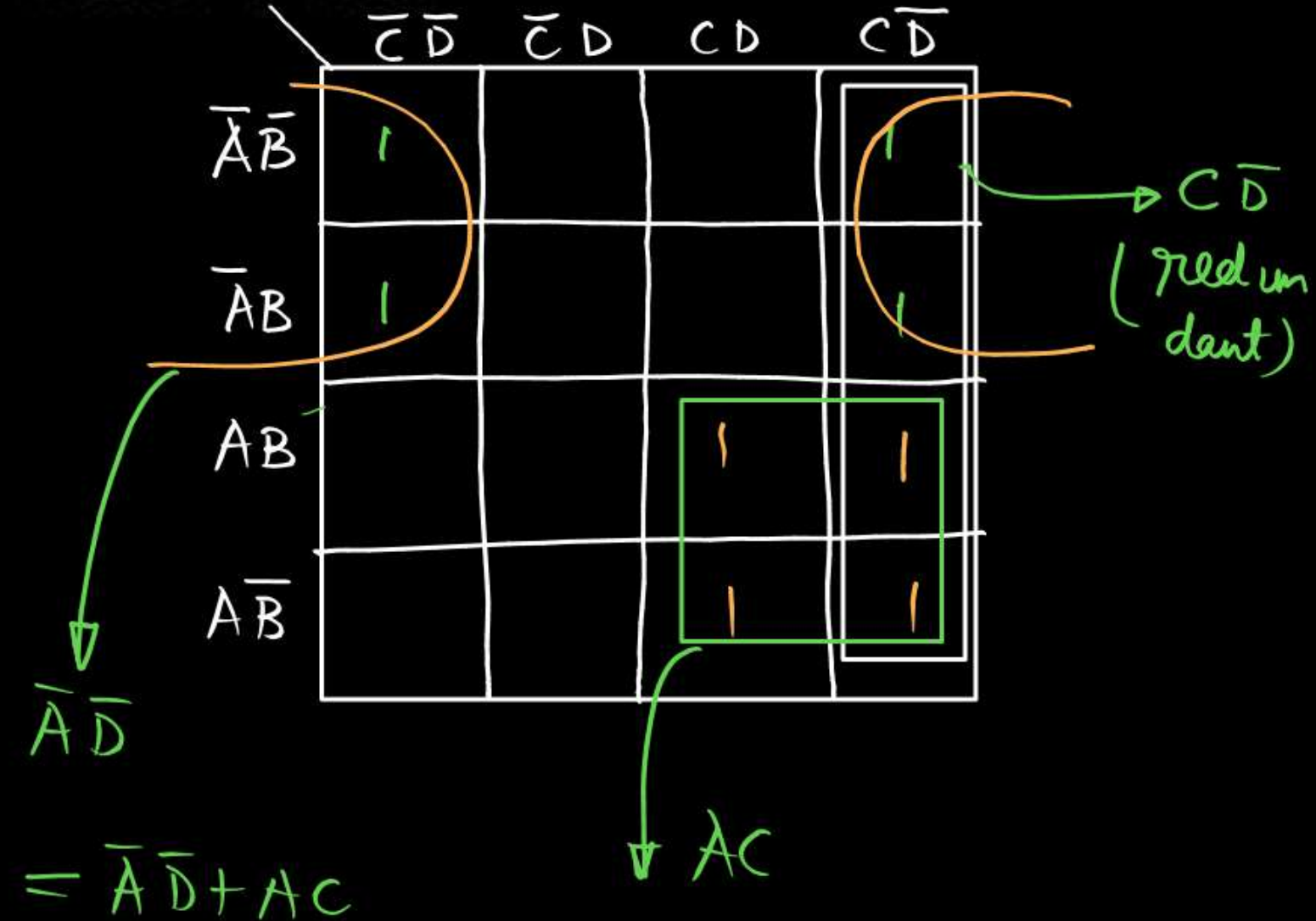
[Question]



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

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]



$$= \overline{B}\overline{D} + \overline{A}B + BD$$

A K-map is given as :

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

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

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

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

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

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

[Question]



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

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

$$f_1 = \overline{A}C + B\overline{C}$$

Then its minimized expression will be

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

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

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

(d) None of these

$$\overline{f_1} + AB\overline{C}$$

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

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

$$f_1$$

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

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

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

[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

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

f

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

[Question]

A K-map is given as :

$f(A, B, C)$

$$= \bar{A}\bar{B}\cdot\bar{C} + A\bar{B}\cdot 1 + AB\cdot C$$

The solution of the K-map will be :

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

- (b) $\bar{A}\bar{B} + AC$
 (d) None of these

$$f(A, B) = \Sigma(1, 2) \\ = \bar{A}B + A\bar{B}$$

$$f(0, 1) = 1 \\ f(0, 0) = 0$$

	\bar{B}	B
\bar{A}		1
A	1	

$$= \bar{A}\bar{B}\cdot 0 + \bar{A}B\cdot 1 + A\bar{B}\cdot 1 + AB\cdot 0 \\ = \bar{A}B + A\bar{B}$$

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

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



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

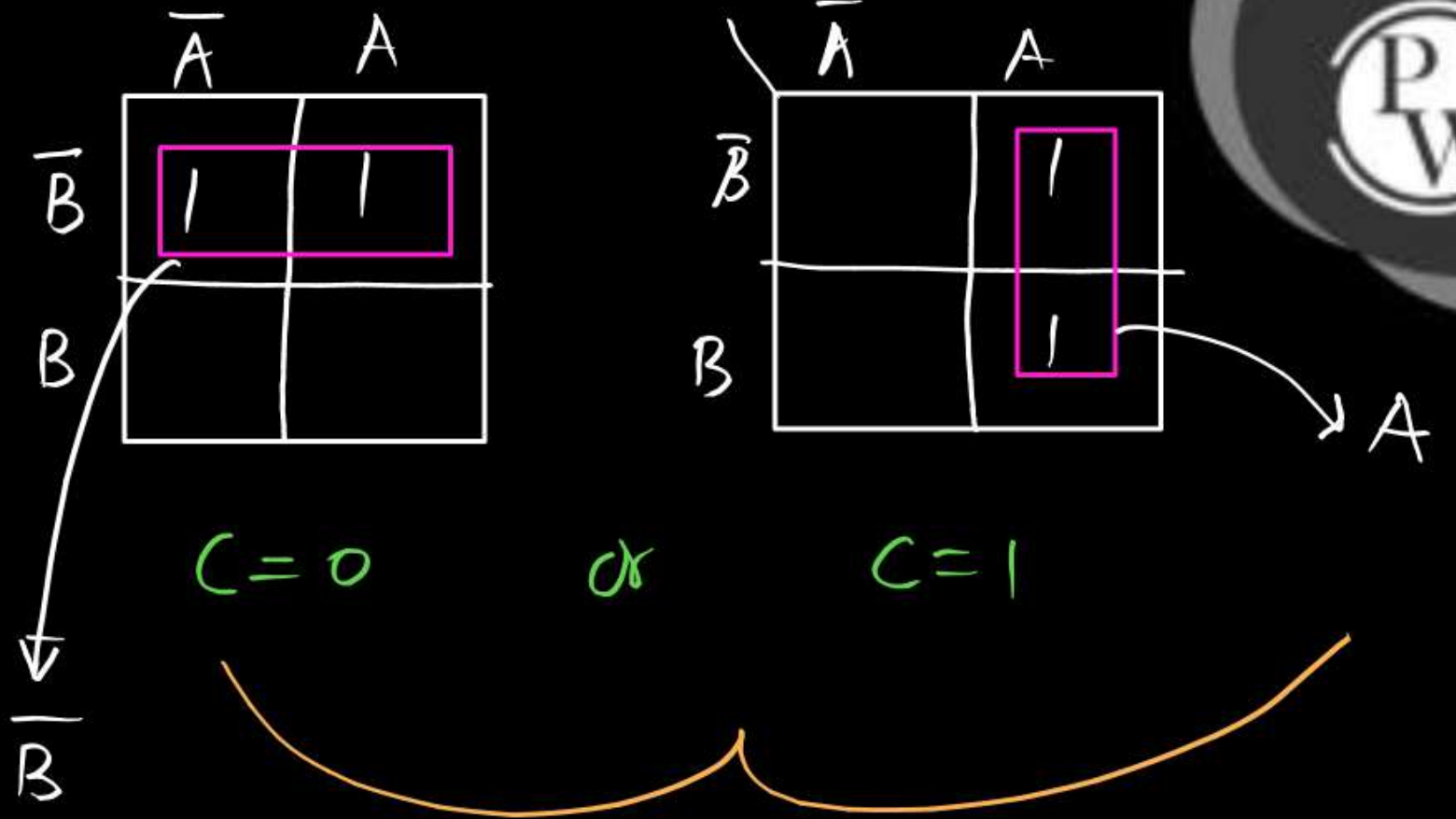
	\bar{A}	A
\bar{B}	\bar{C}	1
B		C

$$f(0, 0, C) = \bar{C} + 0 + 0 = \bar{C}$$

$$f(1, 0, C) = 1$$

$$f(0, 1, C) = 0$$

$$f(1, 1, C) = C$$



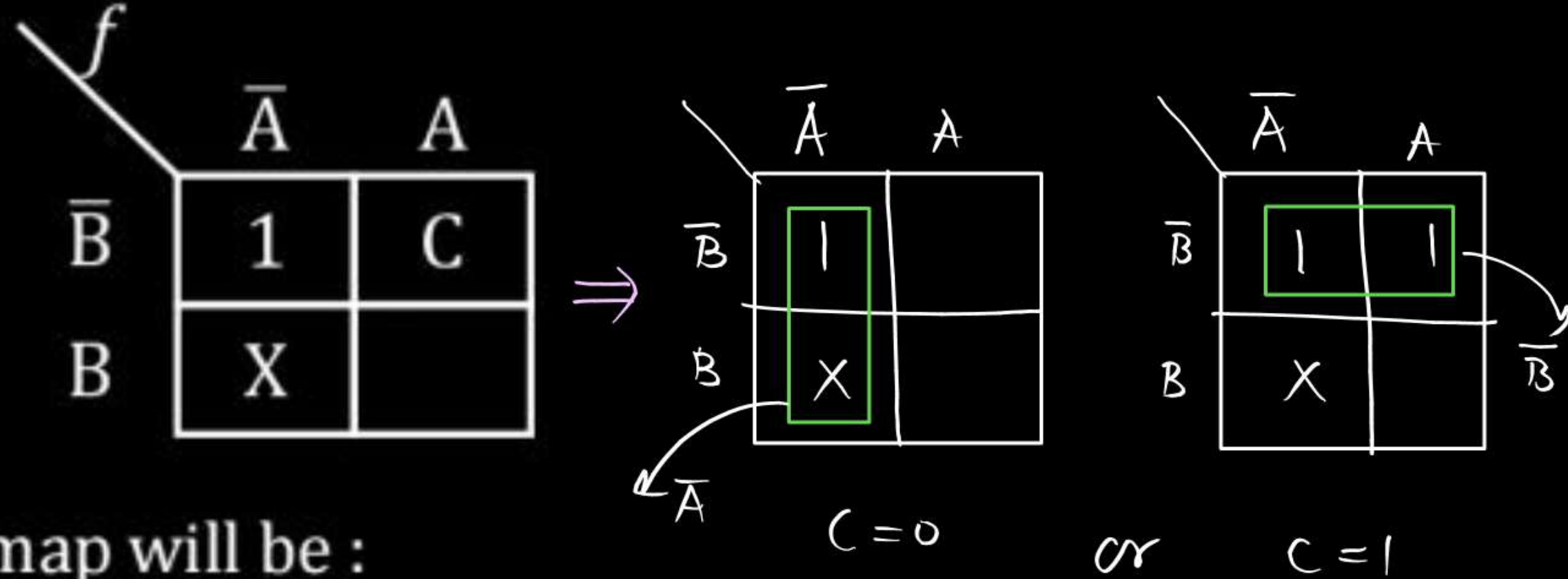
\Rightarrow

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

[Question]



A K-map is given as :



The solution of the K-map will be :

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

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

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

✓ (c) $\bar{A}\bar{C} + \bar{B}C$

(d) None of these

Q.

	\bar{B}	B
\bar{A}	\bar{C}	D
A	1	C

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

$+ A\bar{B}\cdot 1 + AB\cdot C$

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

	\bar{B}	B
\bar{A}	1	
A	1	

$C=0 \& D=0$ or $C=0 \& D=1$

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

	\bar{B}	B
\bar{A}		
A	1	1

$C=1 \& D=0$ or $C=1 \& D=1$

$$A + B$$

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

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

$$= \bar{B}\bar{C}\bar{D} + \bar{A}\bar{C}D + \bar{B}\bar{C}D + A\bar{C}\bar{D} + ACD + BCD$$

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

[Question]



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

Then the K-map implementing above logical function will be :

(a)

		f	
		\bar{A}	A
\bar{B}	\bar{C}		
	C		
B	1		C

(b)

		f	
		\bar{A}	A
\bar{B}	\bar{C}		1
	C		
B	1		C

$$f(1, 0, c) = 1$$

$$f(1, 1, c) = c$$

(c)

		f	
		\bar{A}	A
\bar{B}	\bar{C}		1
	C		
B	1		\bar{C}

(d)

		f	
		\bar{A}	A
\bar{B}	\bar{C}		
	C		
B	\bar{C}		1

[Question]



K-map of $f(A, B, C, D)$ is given as :

H.W.

Solve by both methods.

f		\bar{A}	A
		\bar{B}	B
	\bar{B}	1	C
	B	\bar{D}	

Then $f(A, B, C, D)$ will be :

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

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

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

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

[Question]

If the function W, X, Y, Z are as :

$$W = R + \bar{P}Q + \bar{R}S$$

$$X = PQ\bar{R}\bar{S} + P\bar{Q}\bar{R}\bar{S} + \bar{P}\bar{Q}\bar{R}\bar{S}$$

$$Y = RS + \overline{PR + PQ + \bar{P}\bar{Q}}$$

H.W.

$$Z = R + S + \overline{PQ + \bar{P}\bar{Q}\bar{R} + P\bar{Q}\bar{S}}$$

Then which of the following is/are correct?

(a) $W = \bar{X}$

(b) $W = \bar{Z}$

(c) $\bar{W} = \bar{Z}$

(d) $\bar{X} = Z$



2 Minute Summary



K-Map

Thank you

GW
Soldiers !

