

# EE, EC, CS & IT ENGINEERING



Digital Logic

K-map Basic  
DPP Solution 2

Minimization  
Discussion



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## TOPICS TO BE COVERED

01 Questions

02 Discussion

Q.1

For the given Boolean function  $f(A, B, C) = \sum_m(0, 1, 5, 6)$   
 Simplified output will be

- A.  $A\bar{B} + B\bar{C} + ABC\bar{C}$
- B.  $\bar{A}\bar{B} + \bar{B}\bar{C} + ABC\bar{C}$
- C.  $A\bar{B} + \bar{B}\bar{C} + \bar{A}\bar{B}C$
- D.  $\bar{A}\bar{B} + \bar{B}\bar{C} + AB\bar{C}$

		$\bar{B}^c$	$\bar{B}\bar{C}$	$\bar{B}C$	$B^c$	$B\bar{C}$
		00	01	11	10	
$\bar{A}$	0	1	1			
	1			1	1	

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

**Q.2**

For the given Boolean function

$$f(A, B, C) = \sum_m(1, 3, 6, 7) + \sum_d(0, 2)$$

simplified output will be

- A.  $A + B$
- B.  $B + C$
- C.  $\bar{A} + B$
- D.  $\bar{A}C + AB$

A Karnaugh map for three variables A, B, and C. The columns are labeled  $\bar{B}\bar{C}$ ,  $\bar{B}C$ ,  $BC$ , and  $B\bar{C}$ . The rows are labeled  $\bar{A}0$  and  $\bar{A}1$ . The map shows minterms 1, 3, 6, and 7 highlighted with pink boxes. The term  $d(0, 2)$  is highlighted with a cyan circle.

		$\bar{B}\bar{C}$	$\bar{B}C$	$BC$	$B\bar{C}$
		00	01	11	10
$\bar{A}$	0	X	1	1	X
	1	.	.	1	1

$$\bar{A} + B$$

Q.3

What is the other canonical form of the given function

$$f(A, B, C) = \sum_m (0, 1, 2, 3, 4, 5, 6, 7) = \prod_M ( )$$

= 1

- A.  $f(A, B, C) = \prod_M (0, 1, 2, 3, 4, 5, 6, 7)$  ✗
- B.  $f(A, B, C) = \prod_M (0, 2, 4, 7)$  ✗
- C.  $f(A, B, C) = \prod_M (1, 2, 4, 7)$  ✗
- D. Does not exist

Q.4

The product of all the **maxterms** of a given Boolean function is always equal to \_\_\_\_\_?

A.

0

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

B.

1

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

C.

2

$$A[1 + \bar{B} + B] \cdot \bar{A}[1 - \bar{B} + B]$$

$$\bar{A} \cdot A = 0$$

D.

Complement of the function

A	B	Maxterm
0	0	$A+B$
0	1	$A+\bar{B}$
1	0	$\bar{A}+B$
1	1	$\bar{A}+\bar{B}$

A	B	f
0	0	0
0	1	1
1	0	1
1	1	0

$\bar{A}B$   
 $AB$

$$\begin{aligned} f &= (\overbrace{A+B}^{\square}) \cdot (\overbrace{\bar{A}+\bar{B}}^{\square}) \\ &= \underline{\bar{A}B + A\bar{B}} \end{aligned}$$

**Q.5**

The simplified SOP form of the k-map is

- A.  $Y$
- B.  $\bar{X}$
- C.  $\bar{X}\bar{Y}$
- D.  $X + \bar{Y}$

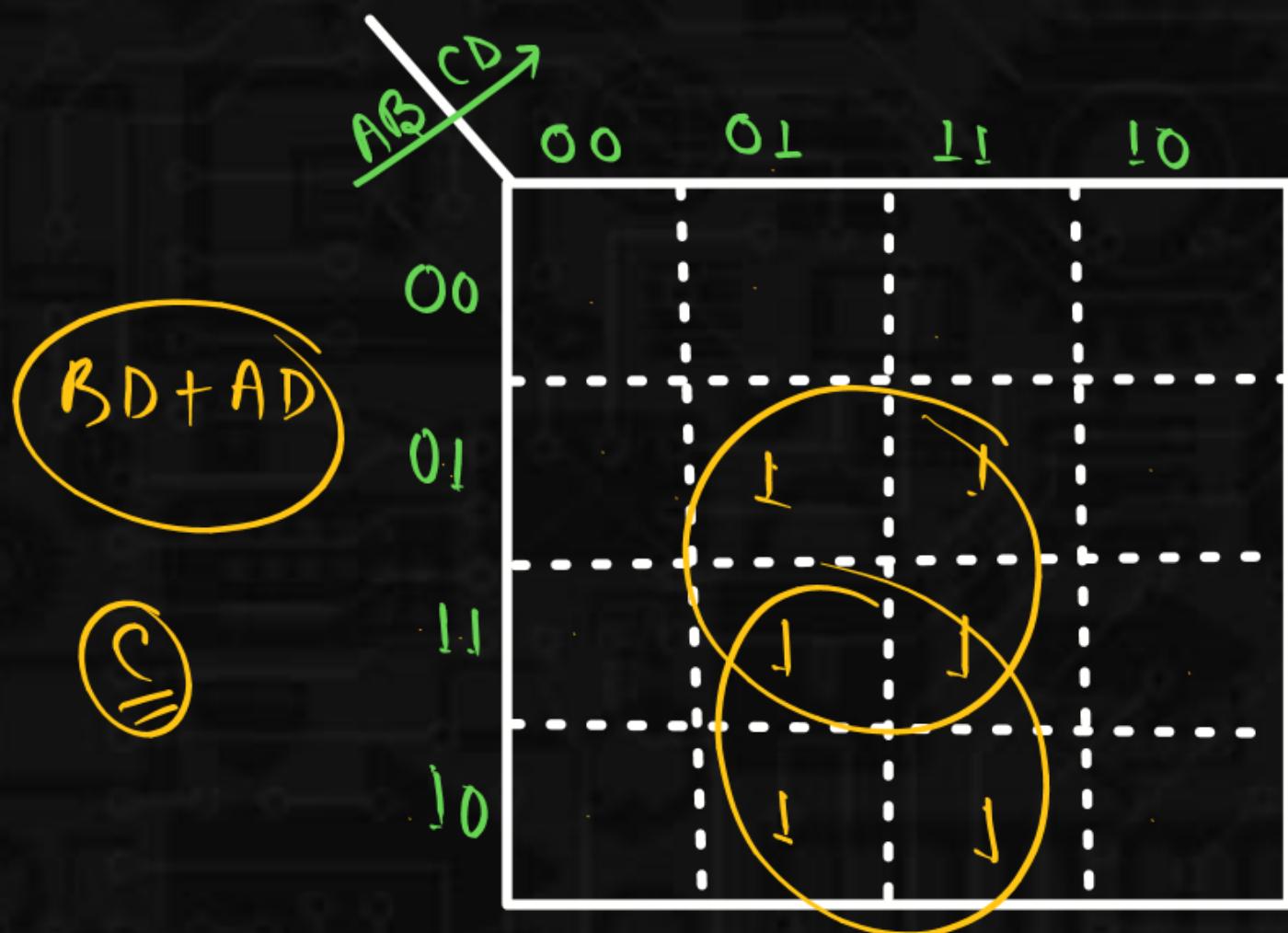
wx \ yz	00	01	11	10
00	1	1	x	1
01	0	0	0	0
11	0	0	0	0
10	1	x	x	1

$\bar{X}$   
Ans

**Q.6**

The Boolean function  $f(A, B, C, D) = \sum_m(5, 7, 9, 11, 13, 15)$   
is independent of variables

- A.
- B.
- C.
- D. B and C



Q.7

The simplified Boolean function is

- A.  $A \oplus B \oplus C$
- B.  $A \oplus B \square C$
- C.  $A \square B \square C$
- D.  $\cancel{A \Theta (B \oplus C)}$

		BC	00	01	11	10	
		A	0	1	0	1	0
0	1	0	1	0	1	0	
		1	0	1	0	1	

$$\begin{aligned}
 & \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + A\bar{B}C + AB\bar{C} \\
 & = \bar{A}(\bar{B}\bar{C} + BC) + A(\bar{B}C + B\bar{C}) \\
 & = \bar{A}(\overline{B \oplus C}) + A(B \oplus C) \quad B \oplus C = X \\
 & = \bar{A}X + AX = A \Theta X = \underline{A \Theta (B \oplus C)}
 \end{aligned}$$

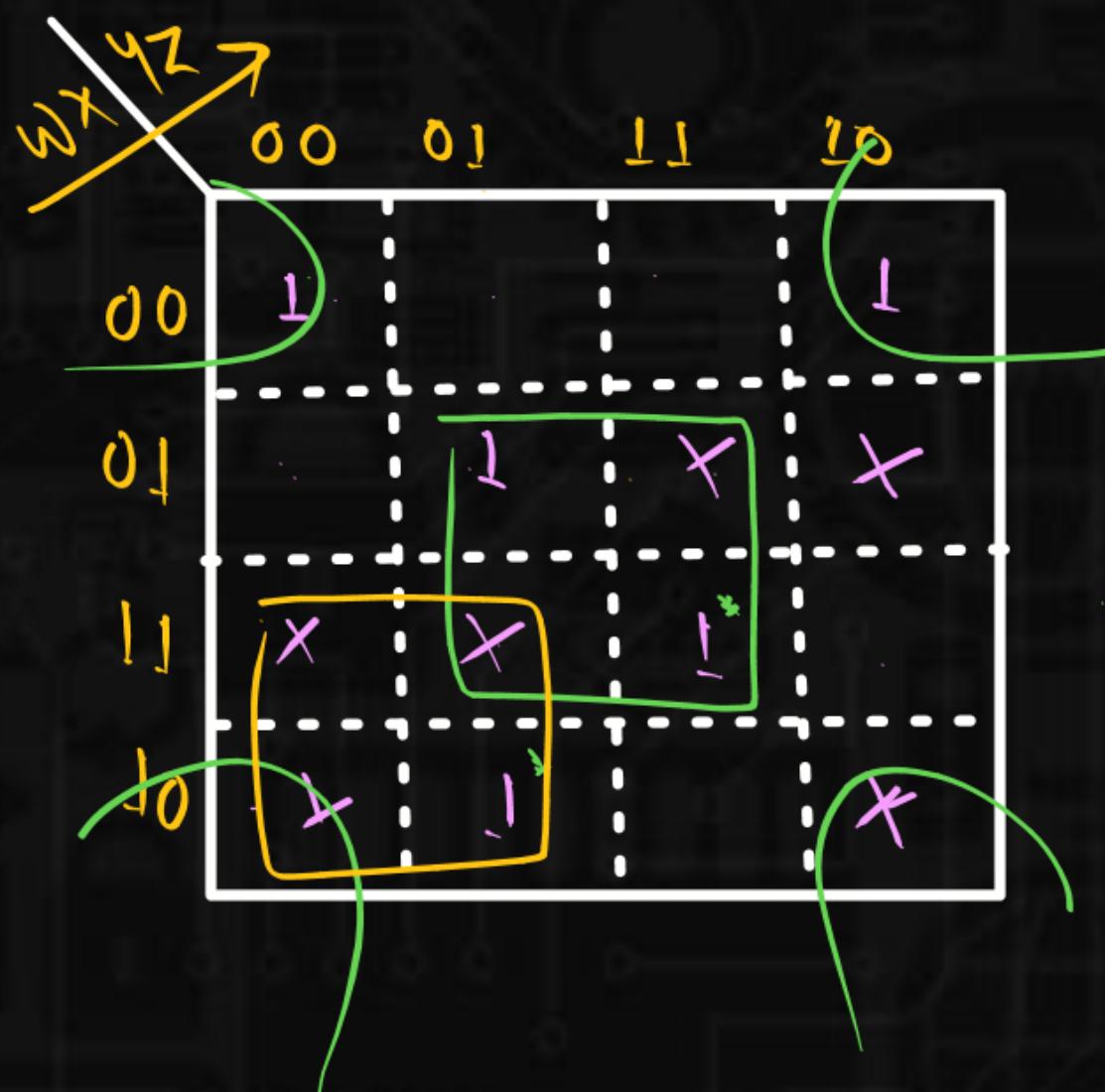
Q.8

The simplified Boolean expression

$$f(w, x, y, z) = \sum_m(0, 2, 5, 9, 15) + \sum_d(6, 7, 8, 10, 12, 13)$$

- A.  $\bar{x}\bar{z} + w\bar{y} + xz$
- B.  $\bar{x}\bar{z} + w\bar{y} + x\bar{z}$
- C.  $x\bar{z} + w\bar{y} + \bar{x}z$
- D.  $\bar{x}\bar{z} + \bar{w}\bar{y} + xz$

$$\begin{aligned}\bar{x}\bar{z} + w\bar{y} \\ + xz\end{aligned}$$



Q.9

The minimum number of NAND gate required to simplify k-map

A. 4

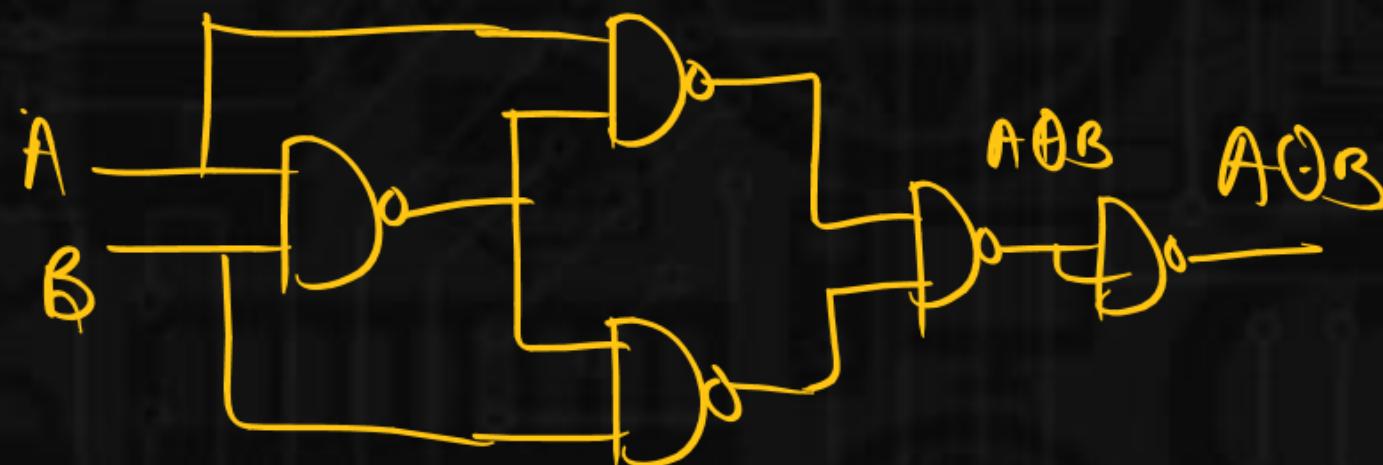
B. 5

C. 3

D. 9

A \ BC	00	01	11	10
0	1	1	0	0
1	0	0	1	1

$$\begin{aligned} &\bar{A}\bar{B} + AB \\ &\underline{\underline{AOB}} \end{aligned}$$



**Q.10**

The simplified expression of k-map is independent of variables

A.

A

B.

B

C.

C

D.

A, B and C

		BC	00	01	11	10
		A	0	1	1	1
			0	1	1	1
0	0		1	1	1	1
0	1		1	1	1	1

= f



THANK YOU GW  
SOLDIERS !