Electrical Engineering

Electronics and Communication Engineering

Digital Logic

Practice Sheet - 01

Discussion

Boolean Theorems and GATES

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Question **(MCQ)**

$f = (A + B)(A + C)(A + \bar{C})$ is equivalent to $\longrightarrow (A + C\cdot\bar{C})(\bar{A} + B)$

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

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

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

A. $A + BC$

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

C. 0

D. A

Question (MCQ)

A logic function is given as:

$$f(A, B, C) = B\bar{C}\left[A + B\bar{C}D + \bar{B}CD + \bar{A}B\bar{C} + \bar{A}\bar{B}\bar{C}\right]$$

is equivalent to

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

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

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

$= B\bar{C}$

A $A\bar{B}CD$

B $B\bar{C}$

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

D $AB\bar{C}D$

Question (NAT)

If we have 4-variables in a logic function, the number of non-dual logical functions possible are_____.

$n = 4$ - variables $\Longrightarrow N = 2^4 = 16$ terms $\longrightarrow (2^{16}) \longrightarrow$ boolean function

$N = 2^n$

$2^{2^3} \longrightarrow 2^8 \longrightarrow$ dual boolean function

$\longrightarrow M = 2^{16} - 2^8 = 2^8(2^8 - 1)$

$= 256 \times 255$

Question (MCQ)

A logic function
$f(A, B, C) = (A + B)(\bar{B} + C)(A + C)$, then $\bar{f}$ will be equal to

A $AB + \bar{B}C$

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

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

D $AB + AC$

Question (MCQ)

Which of the following statement is true?

A Dual function f^D is always equals to f. ✗

B NAND is self dual in nature. ✗

C NOT is self dual in nature. ✓

D Number of self dual function with 3-variables is 8.

$$\text{NAND} \xleftrightarrow[\text{dual}]{} \text{NOR}$$

$$\overline{A \cdot B} \qquad \overline{A+B}$$

$$\bar{A} \xleftrightarrow{\text{Dual}} \bar{A}$$

$2^{2^2} = 2^4 = 16 \rightarrow$ self dual function

$2^{2^3} = 2^8 = 256 \rightarrow$ total boolean function

Question **(MCQ)**

Logical function $f(A, B, C, D) = AB + \bar{A}CD + \bar{B}CD$ is equivalent to

A $AB + \bar{B}C$

B $AB + CD$

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

D $AB + B\bar{C}$

Question (MCQ)

A logical function is given as:

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

then which of the following statement is true?

$f(A,B,C) = \bar{A}\bar{B} + \bar{A}BC + \bar{A}B\bar{C} = \bar{A}\left[\bar{B} + BC + B\bar{C}\right]$

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

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

$\bar{A}\left[\bar{B} + B\right]$

$= \bar{A}$

$f(A,B,C) = \bar{A}$ ✓

$f^{D}(A,B,C) = \bar{A}$

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

B $f(A, B, C) = \bar{A} + \bar{C}$ ✗

C $f(A, B, C)$ is a self dual function ✓

D None of the above

Question **(MCQ)**

Which of the following is true?

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

B $\overline{AB\overline{CD}}=\bar{A}+\bar{B}+\bar{C}+\bar{D}$

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

D None of these

Question (MCQ)

Which of the following is true?

A We can use '1' as enable input for OR gate

B We can use '0' as enable input for AND gate

C '0' as well as '1' can be used as enable input for XNOR gate

D None of the these

Question (MCQ)

Which of the following relation is true?

A $A \oplus \overline{B} = \overline{A} \odot B$

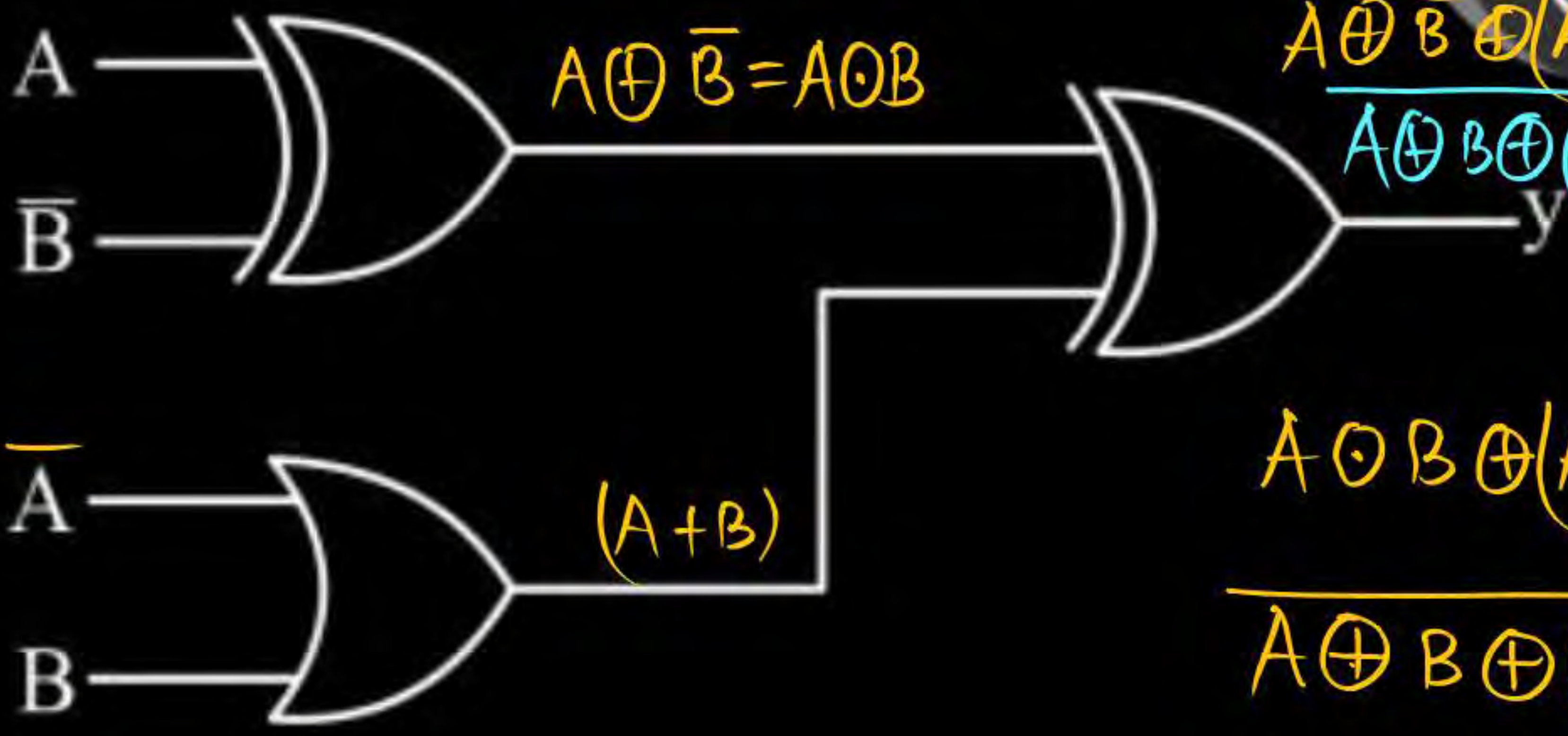
B $\overline{A \oplus \overline{B}} = A \odot B$

C $\overline{\overline{A} \odot \overline{B}} = A \oplus B$

D $\overline{\overline{A} \oplus \overline{B}} = A \oplus B$

Question (MCQ)

A logical circuit is as given below:



$A \oplus \overline{B} = A \odot B$

$\overline{A \oplus \overline{B} \oplus (\overline{A}+B)}$

$A \oplus B \oplus (\overline{A}+B)$

Output y will be

$A \oplus B \oplus (A+B) = A \cdot B$

$A \oplus B \oplus A \cdot B = (A+B)$

$(\overline{A}+B)$

$\overline{A \odot B \oplus (A+B)}$

$A \oplus B \oplus (A+B)$

A $\bar{A} + B$

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

C $A\bar{B}$

D $A + B$

$A \oplus \overline{B} \oplus (\overline{A}+B) = A \oplus B \oplus \overline{(\overline{A}+B)}$ $= \overline{AB}$ $= \overline{A} + \overline{B}$

$A \oplus \overline{B} = A \odot B$ $= \overline{A \oplus B \oplus (\overline{A}+B)}$

$\overline{A} \oplus B = A \odot B$ $= \overline{A} \oplus B \oplus (\overline{A}+B)$

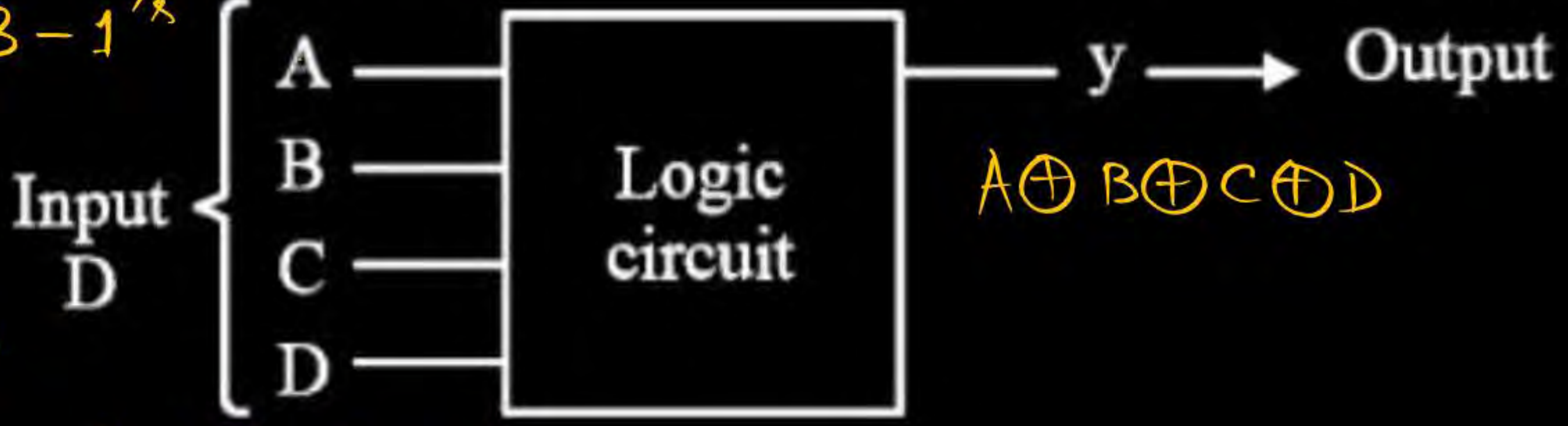
$= \overline{A} \cdot B$

Question (MCQ) (B, C)

A logic circuit has 4-input & 1-output line as shown: $A \oplus B \oplus C \oplus D$

Output y is '1' wherever number of zeroes on input side are odd, then output y can be expressed as:

1 zero + 3 - 1's $\longrightarrow$ 1



$A \oplus B \oplus C \oplus D$

A $A \odot B \odot C \odot D$

3-zeros + 1 - 1's $\downarrow$ 1

B $\overline{A \odot B \odot C} \odot D$

C $\overline{A \oplus B} \oplus C \oplus \bar{D}$

D None of these

$\overline{A \odot B \odot C} \odot D$

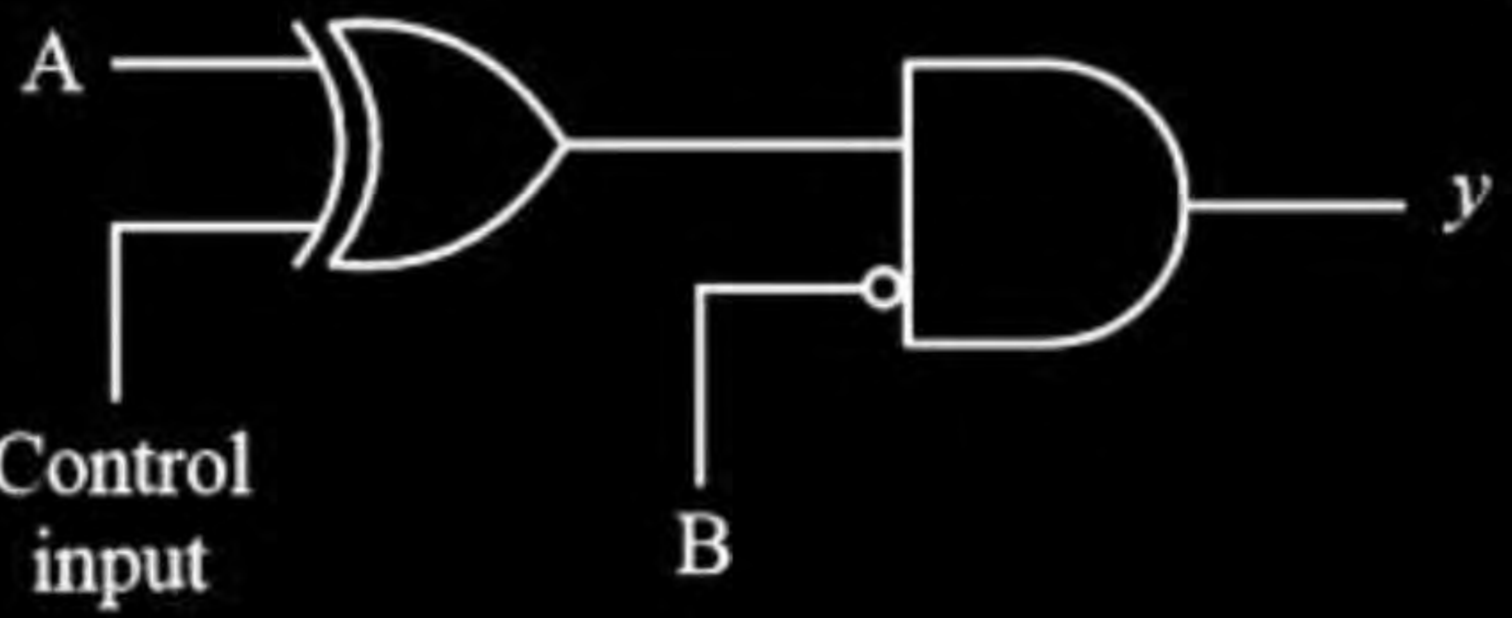
0, 1, 2, 3, 4 $\downarrow$ (1, 3)

$\overline{A \odot B \odot C \odot D}$

$= A \oplus B \oplus C \oplus D$

Question **(MCQ)**

A logic circuit is as given below:



Which of the following is true?

A Output y is $\bar{A}B$ if control input = 0

B Output y is $\overline{A+B}$ if control input = 1

C Output y is $\overline{A \cdot B}$ if control input = 0

D Output y is $\overline{\bar{A} \cdot B}$ if control input = 1

Question **(MCQ)**

A logic circuit is as given below:

Which of the following is true?

A Output is $\bar{A}$ if n is even

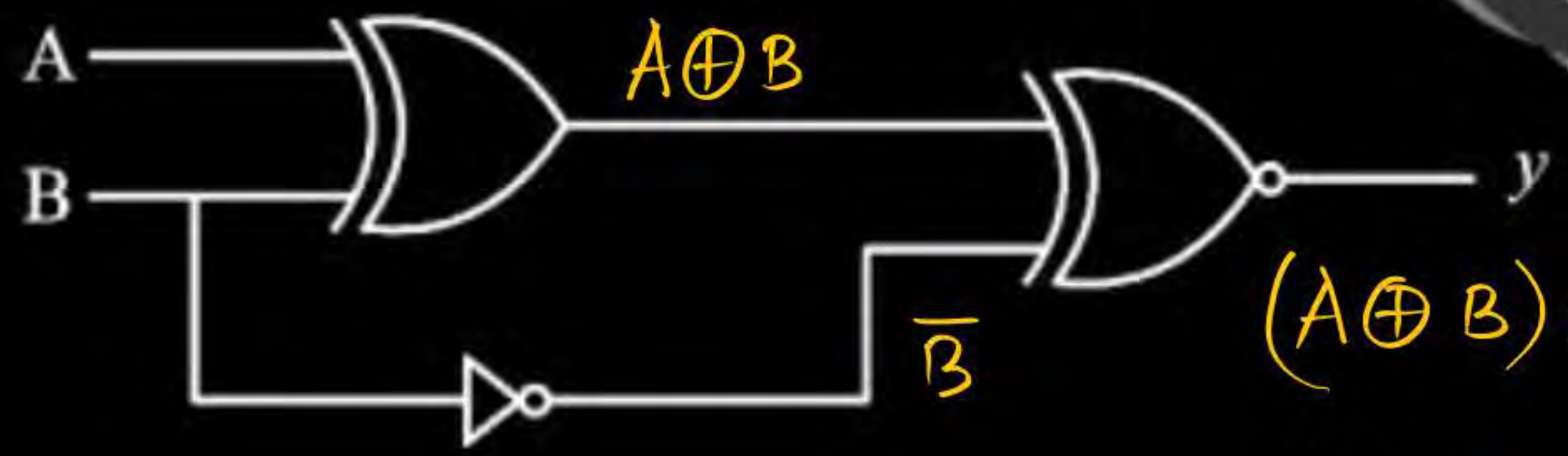
B Output is A if n is even

C Output is $\bar{A}$ if n is odd

D Output is A if n is odd

Question **(MCQ)**

A logical circuit is as given below:



Output y is

A A

B $\overline{B}$

C $\overline{A}$

D B

$(A \oplus B) \odot \overline{B}$

$A \oplus B \odot \overline{B}$

$A \oplus 0$

$= A$

Question **(NAT)**

A logical expression is given as:

$$f(A,B,C,D)=\bar{A}+\boxed{AB[ABC+\bar{B}C+AB\bar{C}+C\bar{D}]}$$

$\rightarrow AB$

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

The minimum number of 2-input NAND gate required to implement above logic function will be 2.

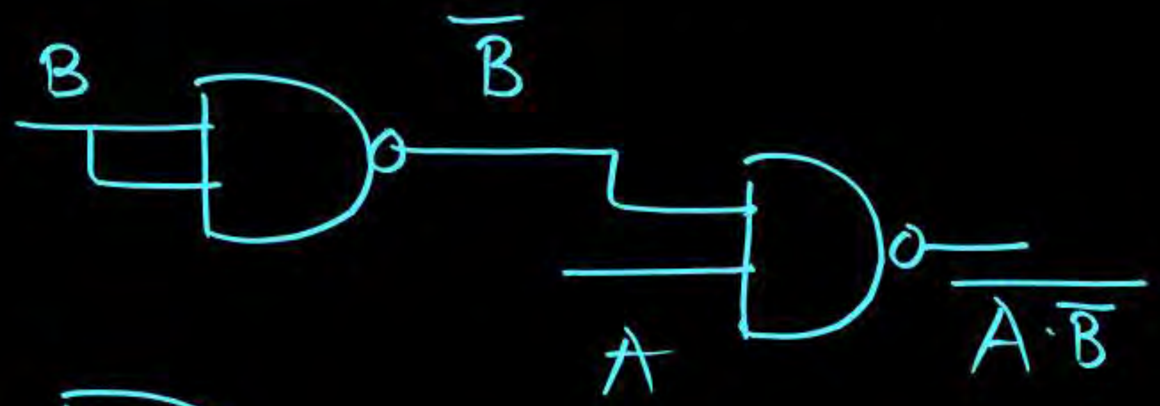
$= \bar{A}+(A\cdot B)$

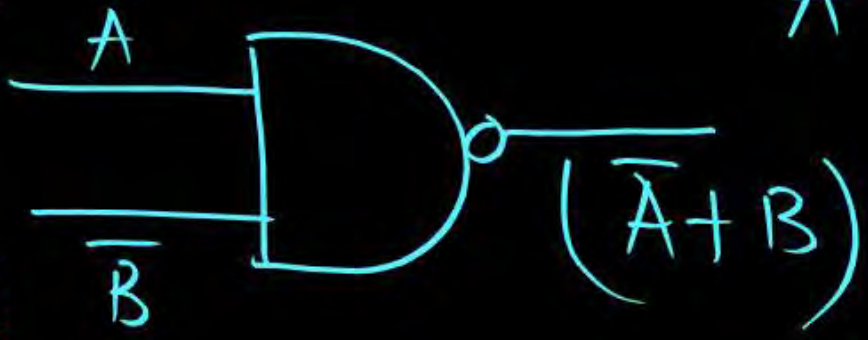
$=(\bar{A}+A)(\bar{A}+B)$

$f=\bar{A}+B$

$\bar{f}=\overline{\bar{A}+B}=A\cdot\bar{B}$

$f=\overline{\underline{\underline{A}}\cdot\underline{\underline{\bar{B}}}}=\overline{A\cdot P}$





Question **(NAT)**

A logical expression is given as:

$f(A, B, C) = (\bar{A} + B)(A + \bar{B})$, the minimum number of 2-input NAND gate required to implement above logical function is 5.

$= A \odot B$

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

Question **(NAT)**

A logical expression is given as:

$f(A, B, C) = \bar{A} + A(BC)$ then minimum number of 2-input NAND gate required to implement above logical function is __2__.

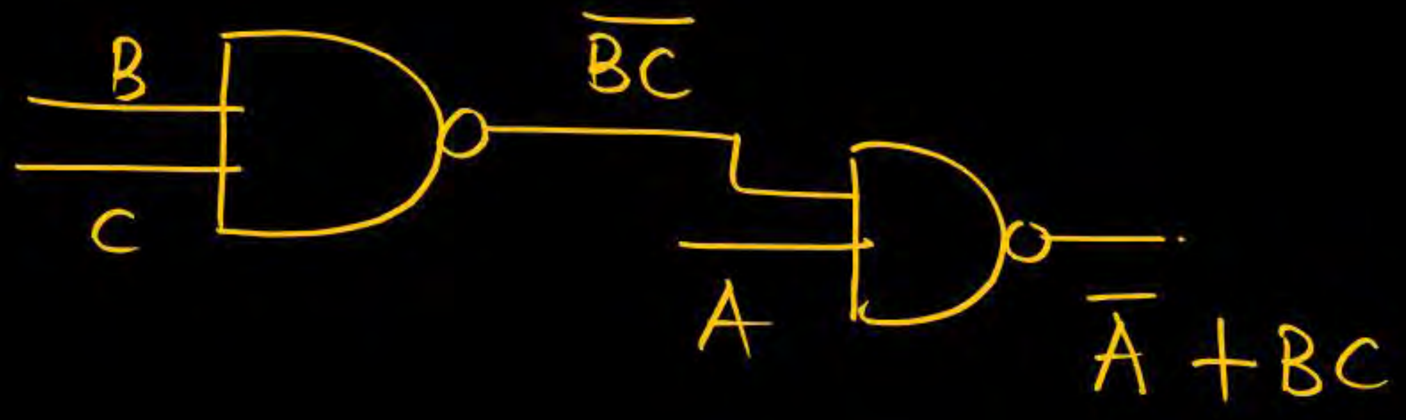
$= (\bar{A} + A) \cdot (\bar{A} + (BC))$

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

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

$\bar{f} = A \cdot (\overline{BC}) = \overline{\underline{\underline{A \cdot P}}} \Rightarrow 1 \text{ NAND}$

$P = \overline{BC} \rightarrow 1 \text{ NAND}$



Question **(NAT)**

A logical function is given as:

$f(A, B) = A \oplus (A \cdot \bar{B})$ If we implement this logical function using 2-input NAND gate, the minimum number of NAND gate required is 2 .

$$f(A \oplus A) \cdot (A \oplus \bar{B})$$

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

$$= 0 + A(\bar{A} + B)$$

$$= A \cdot B$$

$f_1 = A \cdot \bar{B} \rightarrow 3$

1NAND

2NAND

Thank you

GW Soldiers !