CS & IT ENGINEERING

Digital Logic
Logic Gate

Lecture No. 5

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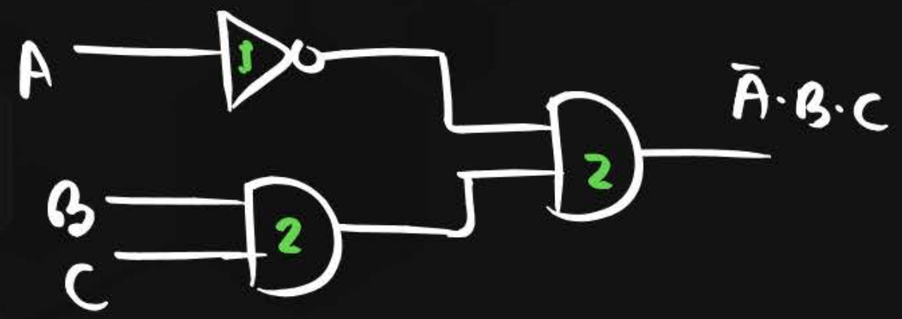
01 NAND GATE

02 NOR GATE

03 Discussion

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



$1 + 2 + 2 = 5$

$f(A,B,C) = AB + CD$

Case (1) $A \cdot B \cdot \bar{C} \cdot D \cdot E \cdots$

NAND

$\Rightarrow (2n-2)+k$

$n \rightarrow$ Total no. of Variable

$k \rightarrow$ Total no. of complement Variable.

NOR

$\Rightarrow (3n-3)-k$

$n \rightarrow$ no. of Variables

$k \rightarrow$ no. of complement Variables.

Ex $f = A \cdot \bar{B} \cdot C$ $n=3$, $k=1$

NAND

$(2n-2)+k$

$=(2\times3-2)+1$

$=5$ Ans

NOR $(3n-3)-k$

$(3\times3-3)-1$

$6-1$

$=5$ Ans

Ex. $f = \bar{A}B\bar{C}D$

$n = 4 \quad k = 2$

NAND

$(2n-2)+k$

$\Rightarrow (2\times4-2)+2$

$= 8$

Ans

NOR

$(3n-3)-k$

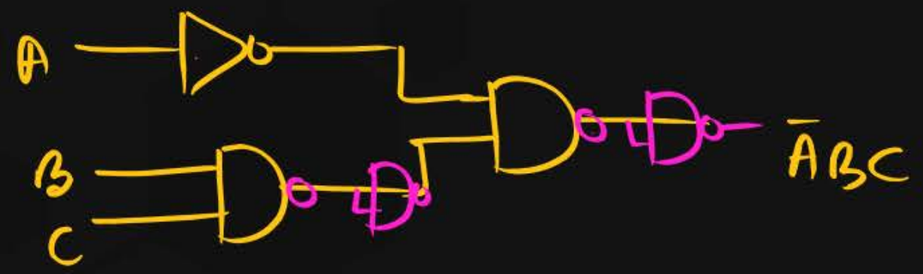
$(3\times4-3)-2$

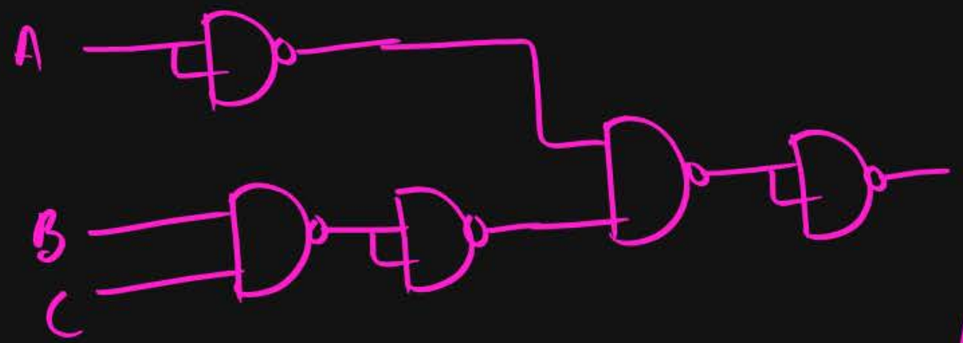
$= 7$

Ans

NAND

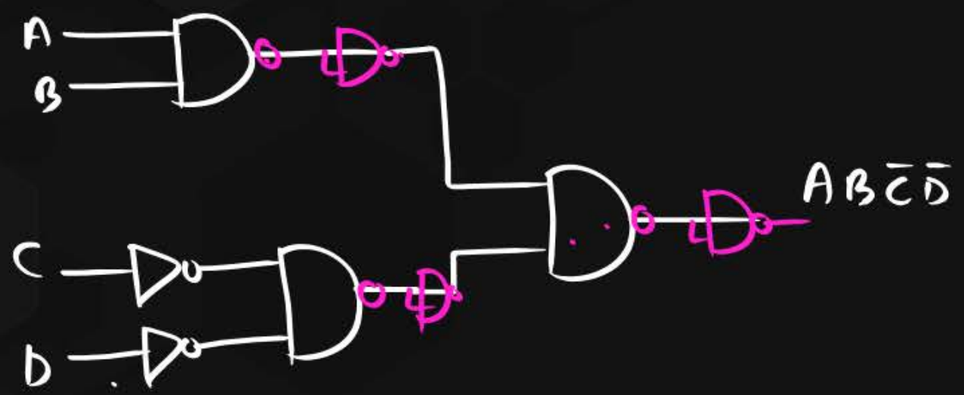
$f = \bar{A}BC$





5 AP

NAND $f = A \cdot B \cdot \bar{C} \bar{D}$

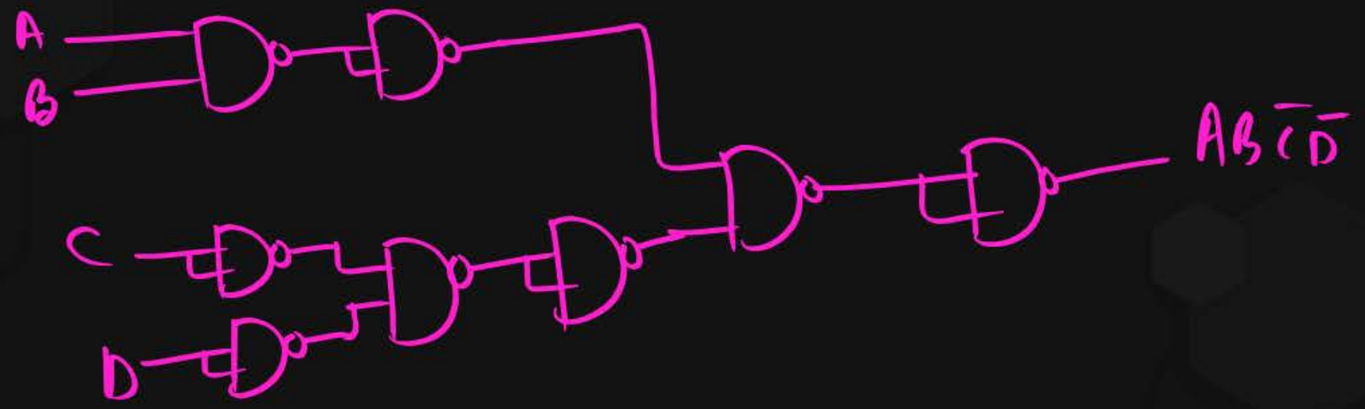


$n=4 \quad K=2$

$(2n-2)+K$

$=(2\times4-2)+2$

$= 8$



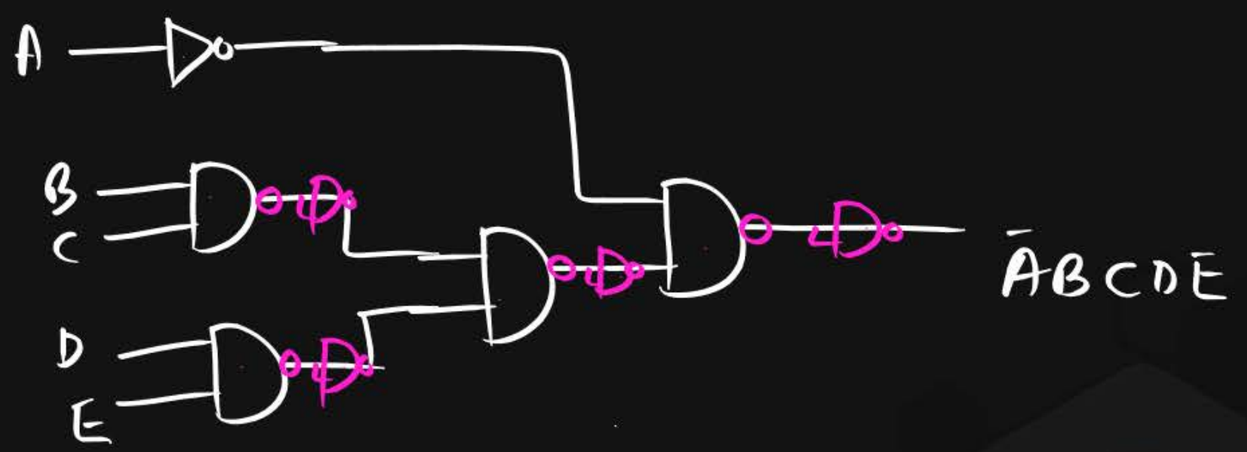
Q $f = \bar{A}BCDE$

$n = 5 \quad k = 1$

NAND $\Rightarrow (2n-2)+k$

$\Rightarrow (2\times5-2)+1$

$= 9$ Ans



Case (2) $A+B+\bar{C}+D+\bar{E}+F+\ldots\ldots$

NAND

$(3n-3)-k$

NOR

$(2n-2)+k$

Ex $f=\bar{A}+B \quad n=2 \quad k=1$

NAND $=(3n-3)-k$

$=(3\times2-3)-1$

$=2$ Ans.

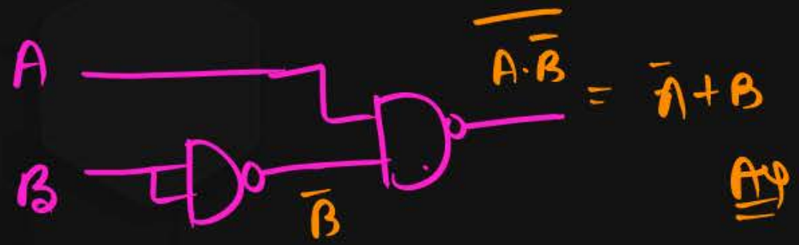
NOR $(2n-2)+k$

$(2\times2-2)+1$

3_{Ans}

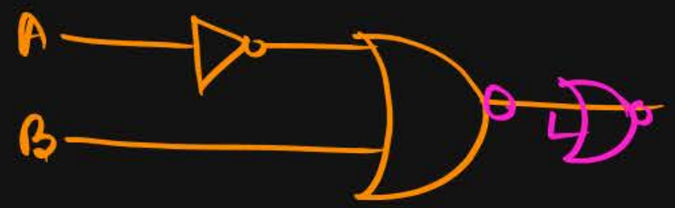
$\bar{A}+B$

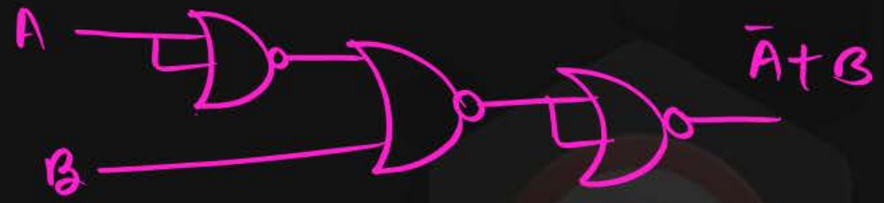
NAND = 2.



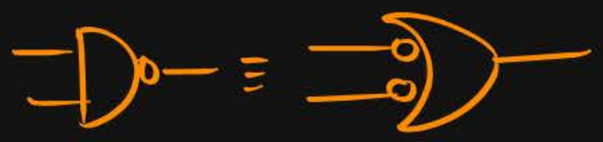
Ans

$\bar{A}+B$





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

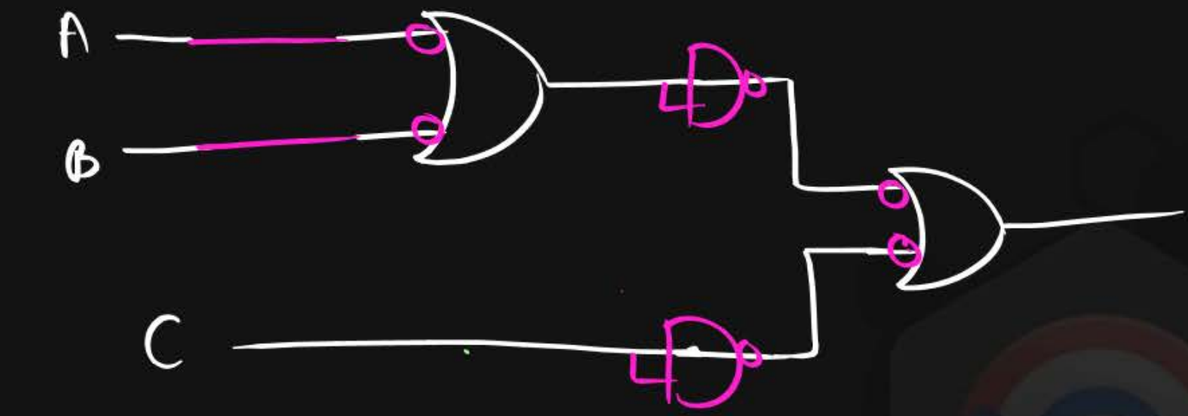


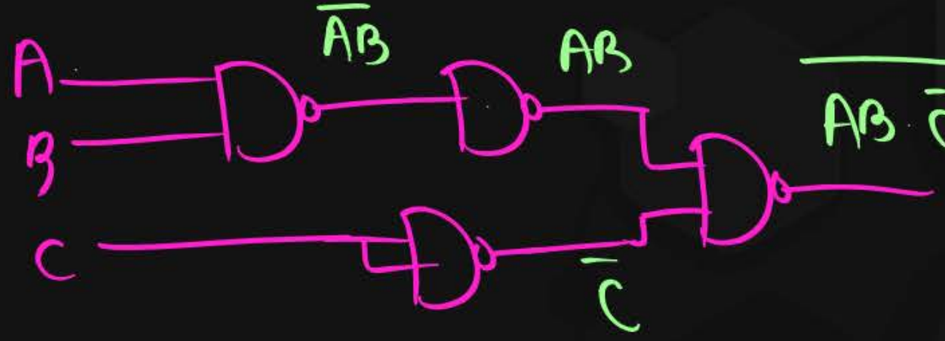
NAND $n=3$ $k=2$

$\Rightarrow (3n-3)-k$

$=(3\times3-3)-2$

$=4$ Ans





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

Ans

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

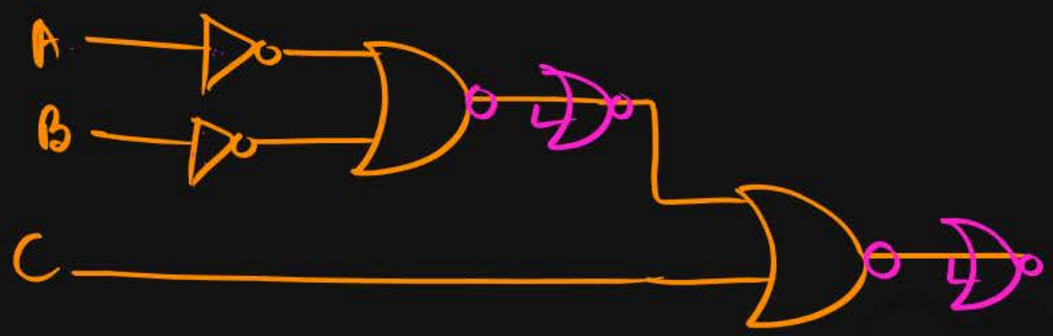
NOR

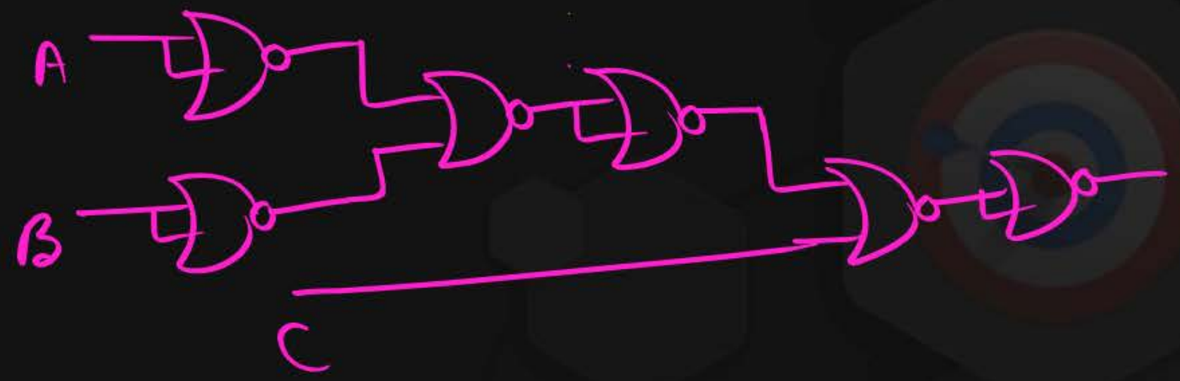
$(2n-2)+K$

$(2\times3-2)+2$

6

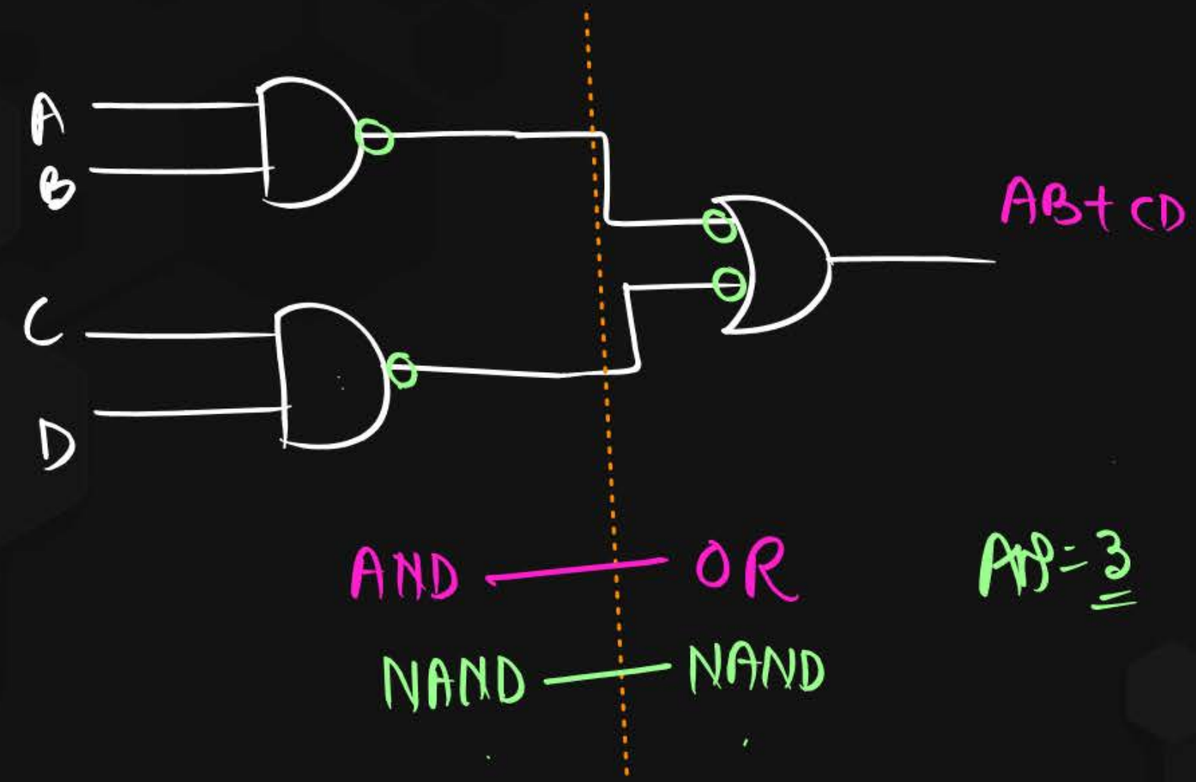
Ans





Case(3) $f = AB + CD$ ⟶ SOP Sum of product

Type function



AOI

AND-OR-Inverter

AP = 3

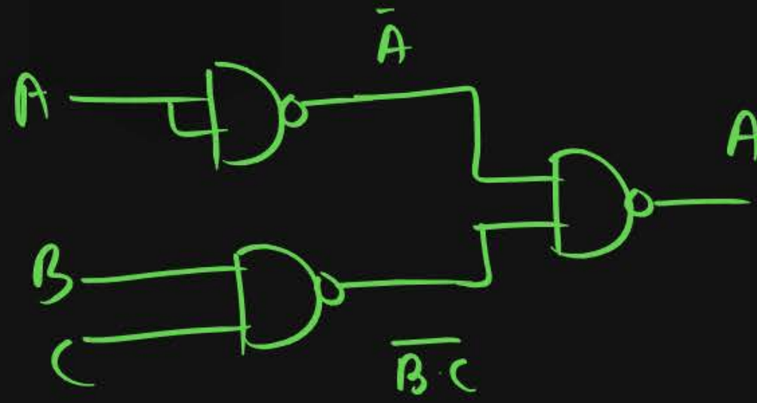
₹100

NOTE → Whenever in the problem minimum number of NAND GATE are asked, then write the function in SOP form and Implement it by using AOI which is a AND-OR Implementation and this is exactly equal to NAND-NAND Implementation.

Q $A+BC$ NAND?

$A \cdot A + BC$

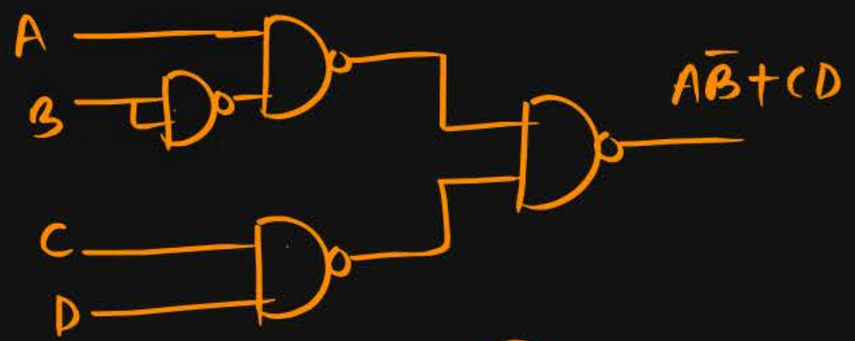
$\overline{\bar{A} \cdot \overline{BC}} = A+BC$



Q $f = \overline{A\bar{B}+CD}$

3 NAND

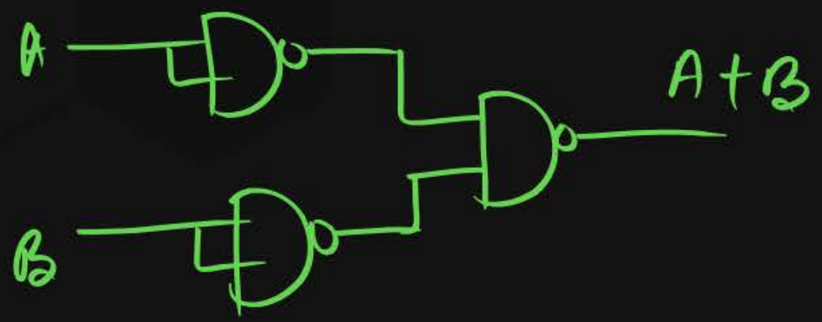
1 NAND



④ Ans

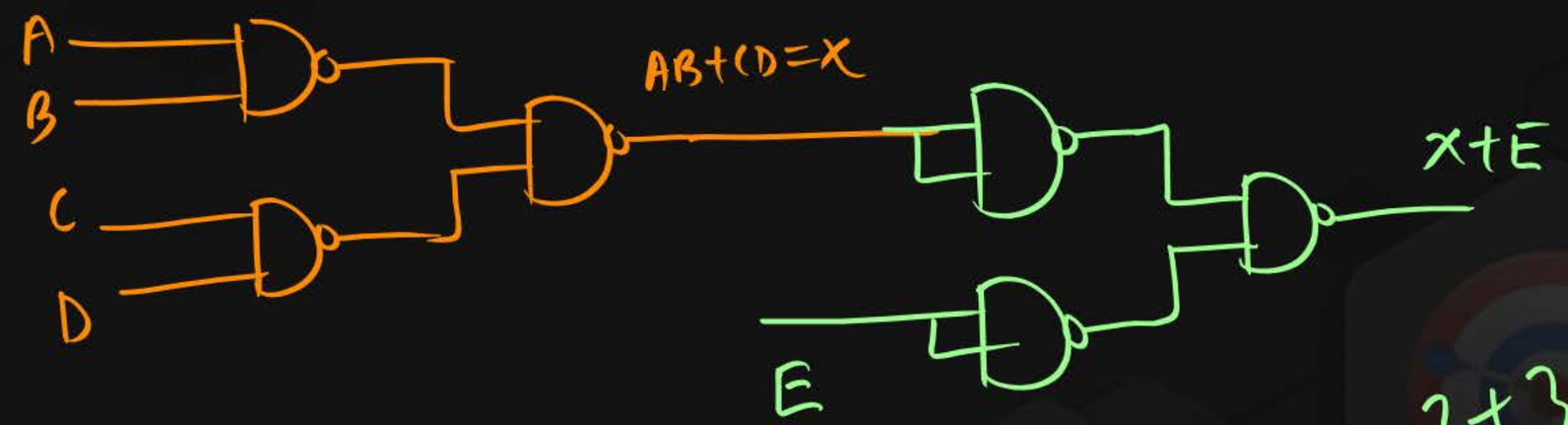
Q $f = A + B$

$= A \cdot A + B \cdot B$



Q $f = AB + CD + E$ NAND = ?

$f = X + E$ $X = AB + CD$

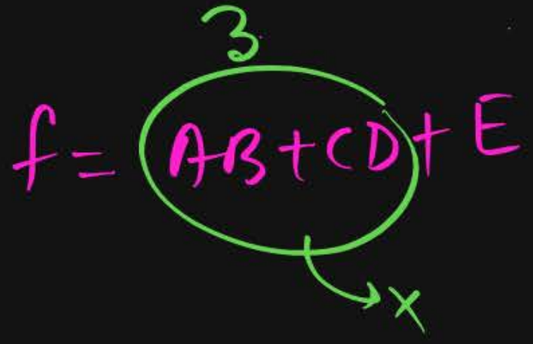


3+3=6

$X = AB + CD$

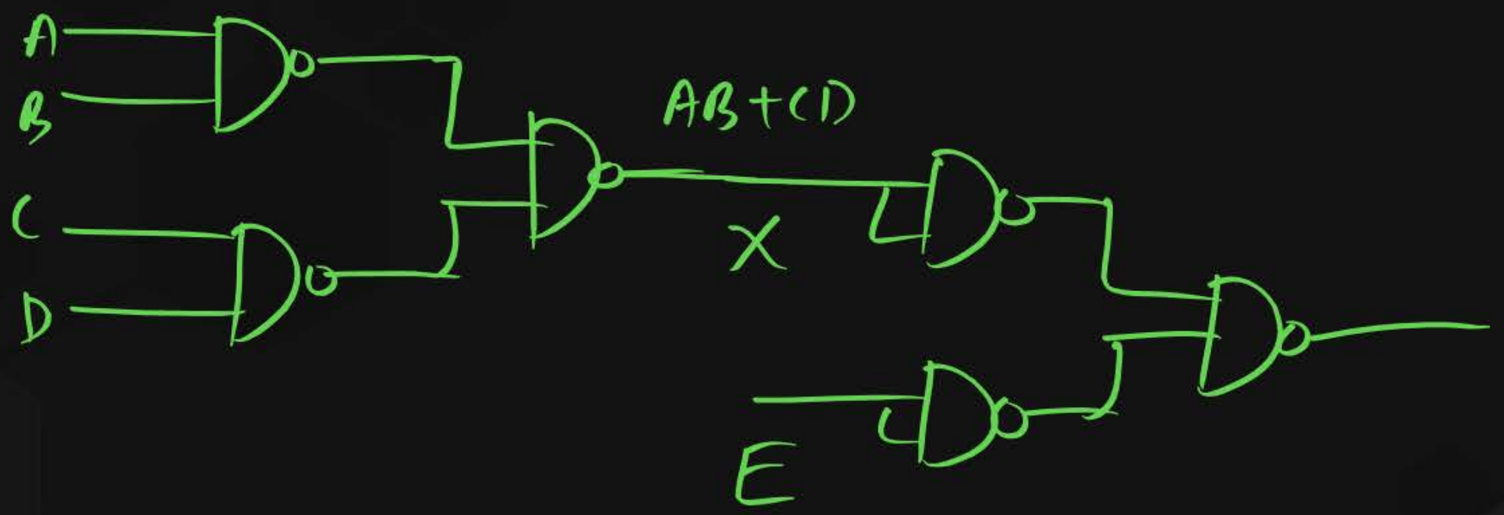
└ 3

$3 + 3 = 6$

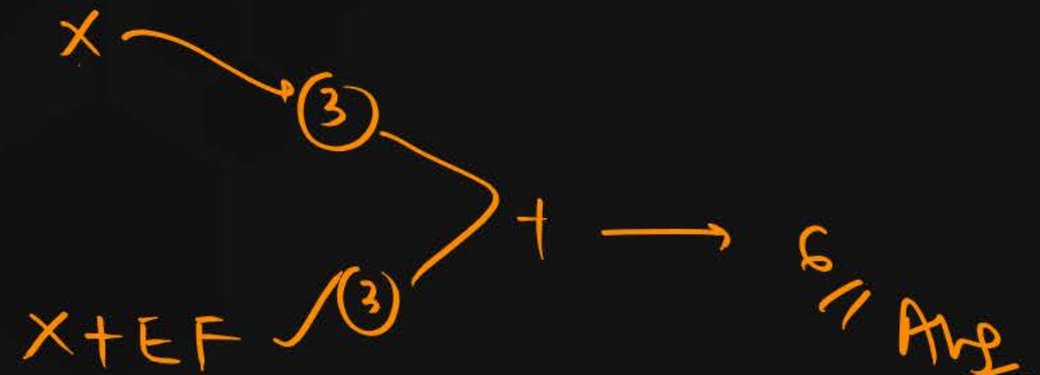


$= X + E \rightarrow 3 + 3 = 6$

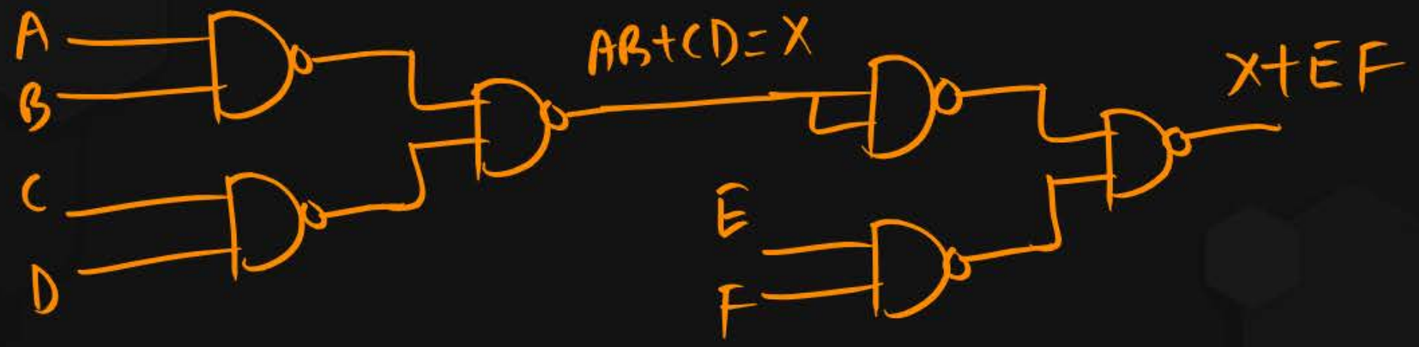
$X+E$



Q. $AB + CD + EF$



6 || Ans



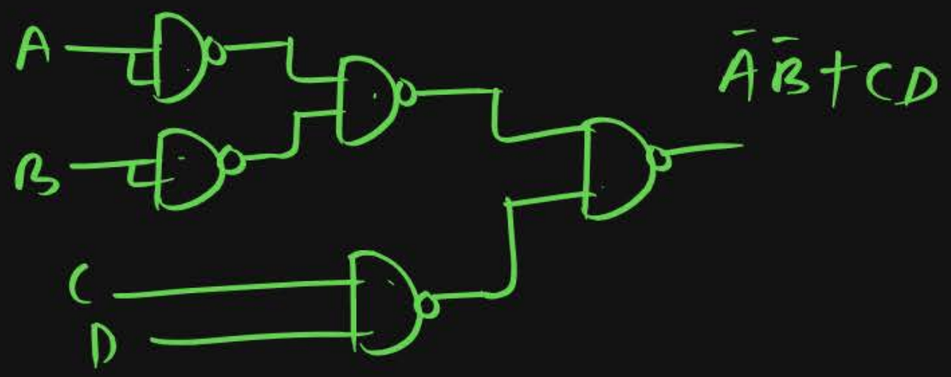
Q $\bar{A}\bar{B}+CD$

0 0 1 1

3

NAND=?

5



Thank you

GW

Soldiers !