# CS & IT



# ENGINEERING

Digital logic Logic GATE



Lecture No. 4



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TOPICS TO BE COVERED 02 XOR GATE

03 X-NOR GATE

04 Discussion



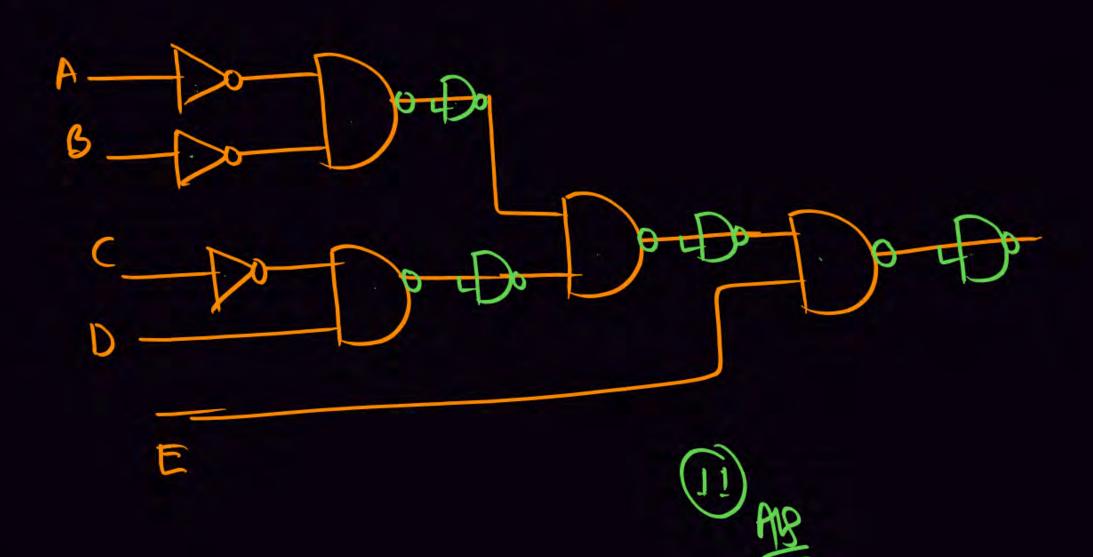
NAND

NOR

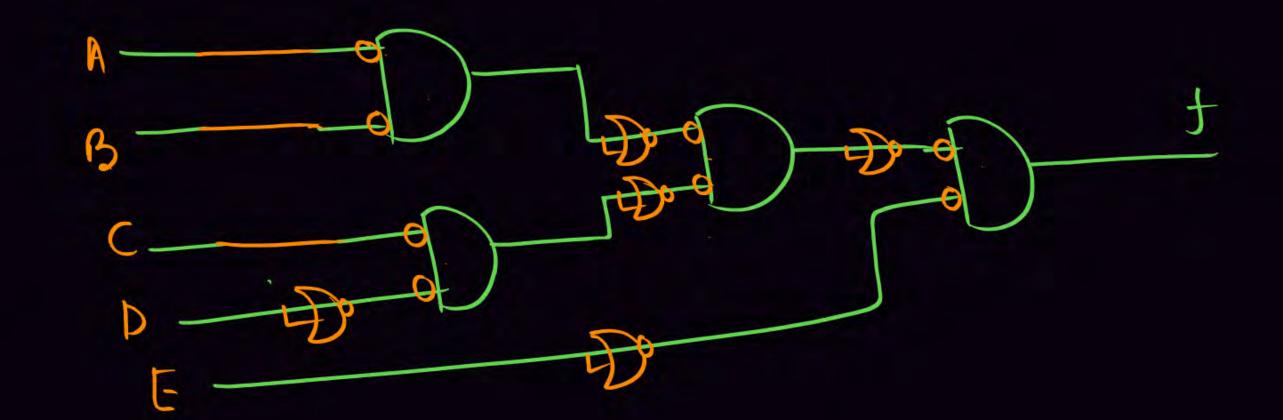
NAND=
$$(2n-2)+k$$
  
 $n=5$   $k=1$   
 $(10-2)+1$   
 $(9)$ 

$$NOR = (3n-3)-k$$
 $12-1=(1)$ 









9/

### 

$$F = A + B + C$$
 $N = 3 \quad k = 1$ 
 $NAND = (3x3 - 3) - 1$ 
 $= 5$ 

$$140R(2n-2)+k$$
  
=)(2x3-2)+1  
= 5

$$Q f = \overline{A} + B + \overline{C} + D$$

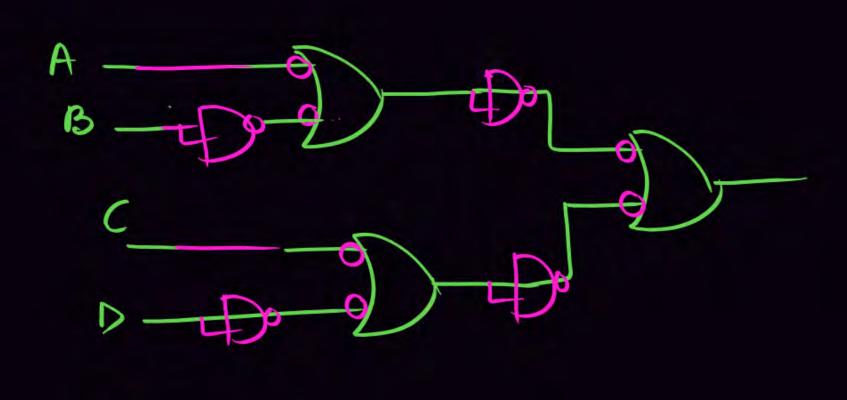
NAND = 
$$(3n-3)-k$$
  
=  $(3x4-3)-2$   
=  $12-3-2$   
=  $\mp$ 

NOR=
$$(2n-2)+k$$
  
= $(2x4-2)+2$   
= 8

$$Q f = \overline{A} + B + \overline{C} + D$$



NAND = 
$$(3n-3)-k$$
  
=  $(3x4-3)-2$   
=  $(7+)$ 

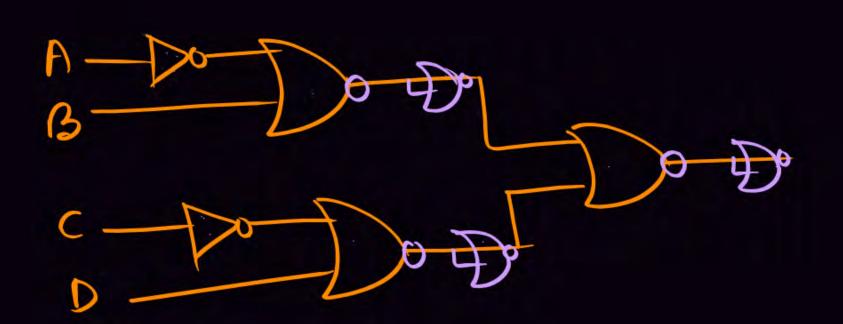


$$Q f = \bar{A} + B + \bar{C} + D$$



$$NOR = (2n-2) + K$$

$$= 8$$



#### TYPE 3 + = AB+CD





S=CHAN to.on muminiM

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

Ex f=A+BC



Minimum no. of NAND=?

$$f = A \cdot A + B \cdot C$$



$$Ex$$
  $f = \overline{AB} + CD$ 

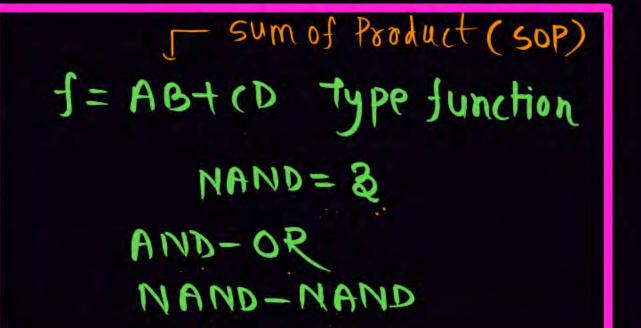
TYPE 
$$\Phi$$
  $f = (A+B) \cdot (C+D)$ 



Minimum No. of NOR=?

$$f = \overline{A} \cdot B \cdot \overline{c} \cdot D \cdot \cdot \cdot$$
  
 $NAND = (2n-2) + k$   
 $NOR = (3n-3) - k$ 

$$f = A + B + C + D + \cdots$$
  
 $NAND = (3n-3) - K$   
 $NOR = (2n-2) + K$ 





Froduct of sum (POS)

$$f = (A+B) \cdot C(+D)$$
 Type

 $NOR = 3$ 
 $OR - AND$ 
 $NOR - NOR$ 





$$\overline{AB+AB} = ABB$$

NAND=4



TRANPOSE THEOREM

$$(A+B)(A+B) = AB+AB=ABB$$

#### **XOR GATE, X-NOR GATE**



#### XOR GATE

Symbol

Truth Table

Α	1	$A \oplus B$		
в	<b>-1</b> レ/	$\bar{A}B + A\bar{B}$		
		(A+B) (A+B)		

A	В	$Y = A \oplus B$
0	0	0
0	1	1
1	0	1
1	1	. 0

$$A = R$$

$$y = 0$$

$$A = R$$

$$y = 1$$

$$A = R$$



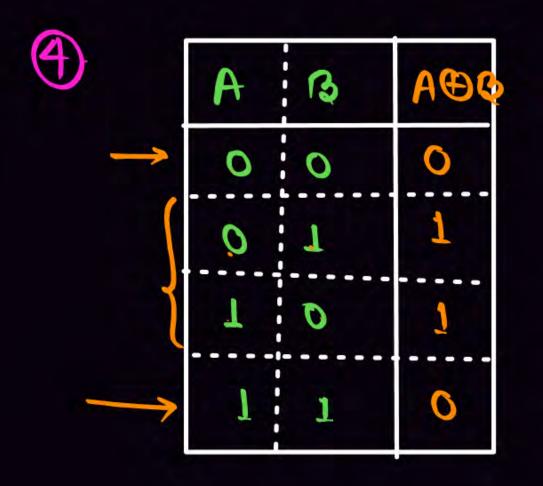
$$A = 0 \oplus A$$

$$= \int_{-\infty}^{\infty} A\Theta B = C$$



$$A \oplus 1 = \overline{A}$$



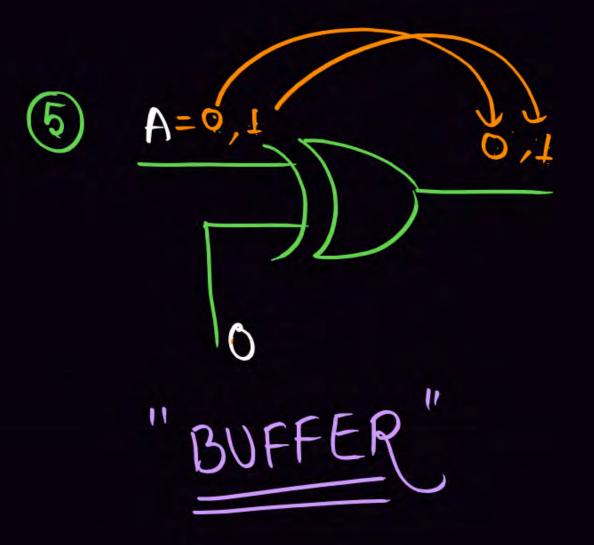


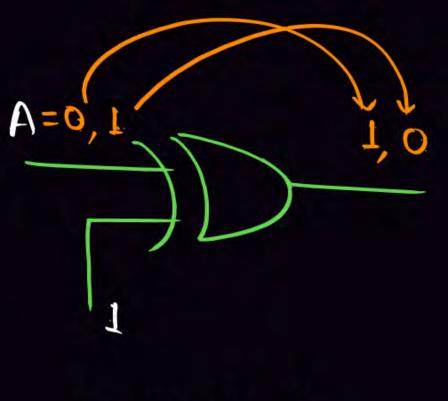
When ODDD number of i's are

Present in the input then olp of

X-OR GATE is high.







INVERTER

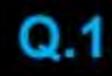
#### © A⊕B⊕C

Recimal	A	B	C	ABBBC
$o \rightarrow$	0	0	0	0
1)	0	0	1	1
(2)	0	1	0	1
3->	0	1	1	0
(A)>	1	0	0	J
5→	1	0	1	0
6->	T	1	0	0
A)	Ţ	1	1	1

'n' inpuls -> Total combination=2n

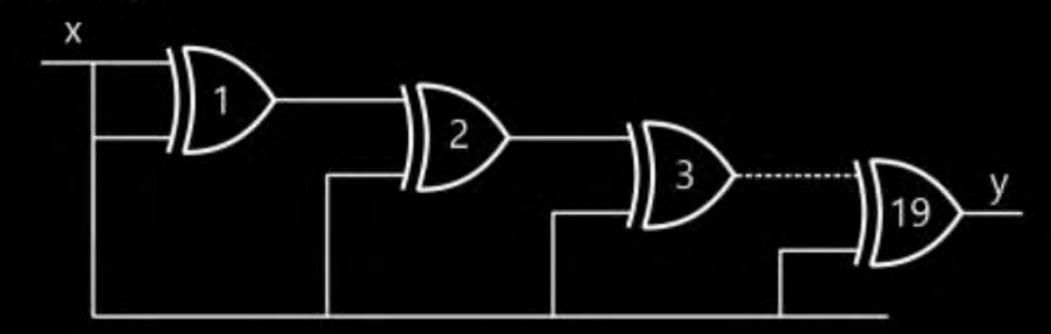


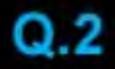






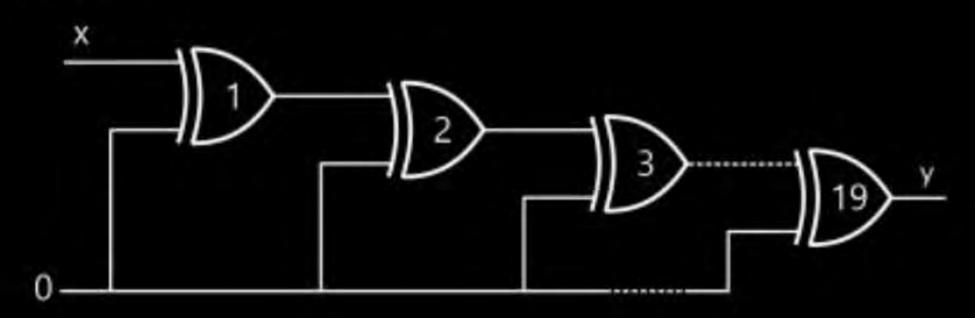
Find the output y.

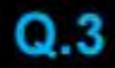






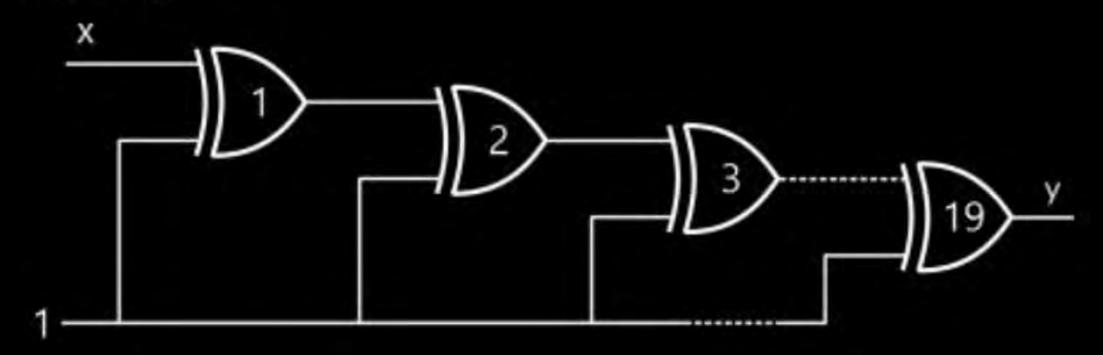
#### Find the output y.

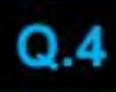






#### Find the output y.

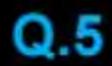






The Boolean function given below:  $f(A, B) = A \oplus B \oplus AB$ which statement is/are correct?

- A It is a OR GATE
- B It is a NAND GATE
- It requires 3 NAND gate to implement the function
- It required 2 NAND gates to implement the function





Minimized expression will be  $Y = A \oplus (A + B)$ 

- $A \oplus B$
- B A⊙B
- C Ā·B
- D A + B



## Thank you

# Seldiers!

