

02/11/21

Tuesday

Boolean Function	Name	operator symbol
$F_0 = 0$	Null	
$F_1 = xy$	AND	$x \cdot y$
$F_2 = xy'$	Inhibition	$x/y$
$F_3 = x$	Transfer	
$F_4 = x'y$	Inhibition	$y/x$
$F_5 = y$	Transfer	
$F_6 = xy' + x'y$	Exclusive OR	$x \oplus y$
$F_7 = x + y$	OR	$x + y$
$F_8 = (x + y)'$	NOR	$\downarrow$
$F_9 = xy + x'y'$	Equivalence	$x \odot y$
$F_{10} = y'$	Complement	$y'$
$F_{11} = x + y'$	Implication	$x \subset y$
$F_{12} = x'$	Complement	$x'$
$F_{13} = x' + y$	Implication	$y \subset x$
$F_{14} = (xy)'$	NAND	$\uparrow$
$F_{15} = 1$	Identity	

$x$	$y$	$y'$	$x'$	$x/y$	$y/x$	$xy$	$x'y$	$x \odot y$ $= xy + x'y'$
				$xy'$				
0	0	1	1	0	0	0	1	1
0	1	0	1	0	1	0	0	0
1	0	1	0	1	0	0	0	0
1	1	0	0	0	0	1	0	1

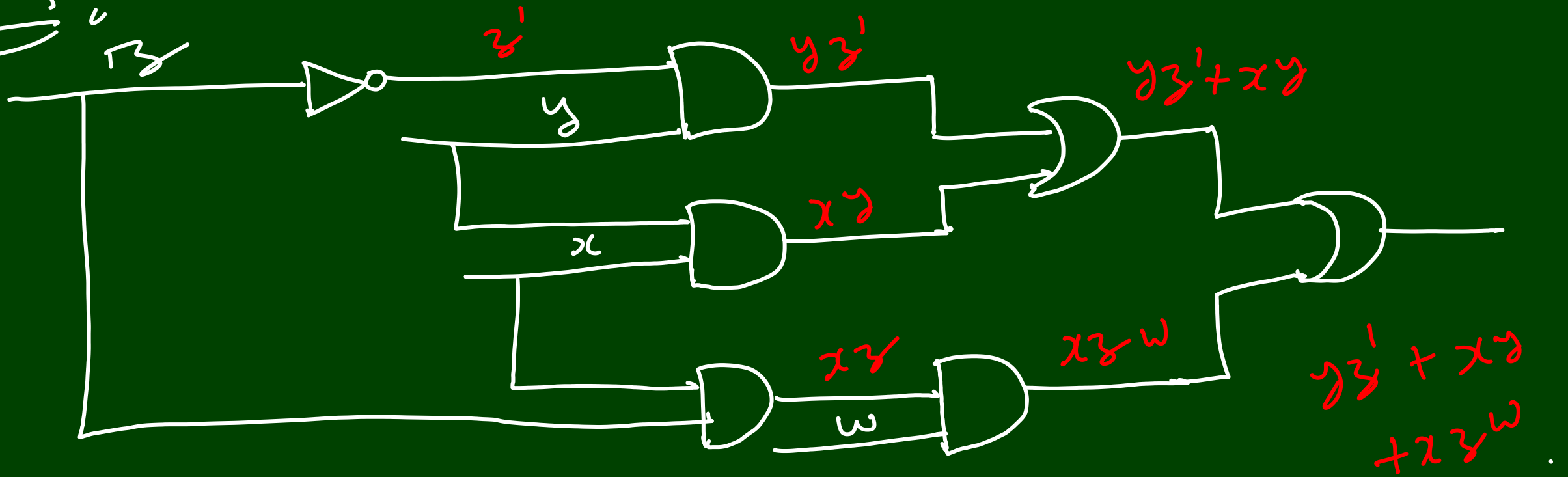
# Logic Gates:-

AND		$F = x \cdot y$	<table> <tr><td>x</td><td>y</td><td><math>x \cdot y</math></td></tr> <tr><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>0</td></tr> <tr><td>1</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>1</td></tr> </table>	x	y	$x \cdot y$	0	0	0	0	1	0	1	0	0	1	1	1
x	y	$x \cdot y$																
0	0	0																
0	1	0																
1	0	0																
1	1	1																
OR		$F = x + y$	<table> <tr><td>x</td><td>y</td><td><math>x + y</math></td></tr> <tr><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>1</td></tr> </table>	x	y	$x + y$	0	0	0	0	1	1	1	0	1	1	1	1
x	y	$x + y$																
0	0	0																
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Inverter		$F = x'$	<table> <tr><td>x</td><td><math>x'</math></td></tr> <tr><td>0</td><td>1</td></tr> <tr><td>1</td><td>0</td></tr> </table>	x	$x'$	0	1	1	0									
x	$x'$																	
0	1																	
1	0																	
Buffer		$F = x$																
NAND		$F = (x \cdot y)'$																
NOR		$F = (x + y)'$																
XOR (Exclusive OR)		$F = x'y + xy'$	<table> <tr><td>x</td><td>y</td><td><math>x \oplus y</math></td></tr> <tr><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>0</td></tr> </table>	x	y	$x \oplus y$	0	0	0	0	1	1	1	0	1	1	1	0
x	y	$x \oplus y$																
0	0	0																
0	1	1																
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1	1	0																
Exclusive NOR		$F = x \odot y$ $= x'y + xy'$	<table> <tr><td>x</td><td>y</td><td><math>x \odot y</math></td></tr> <tr><td>0</td><td>0</td><td>1</td></tr> <tr><td>0</td><td>1</td><td>0</td></tr> <tr><td>1</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>1</td></tr> </table>	x	y	$x \odot y$	0	0	1	0	1	0	1	0	0	1	1	1
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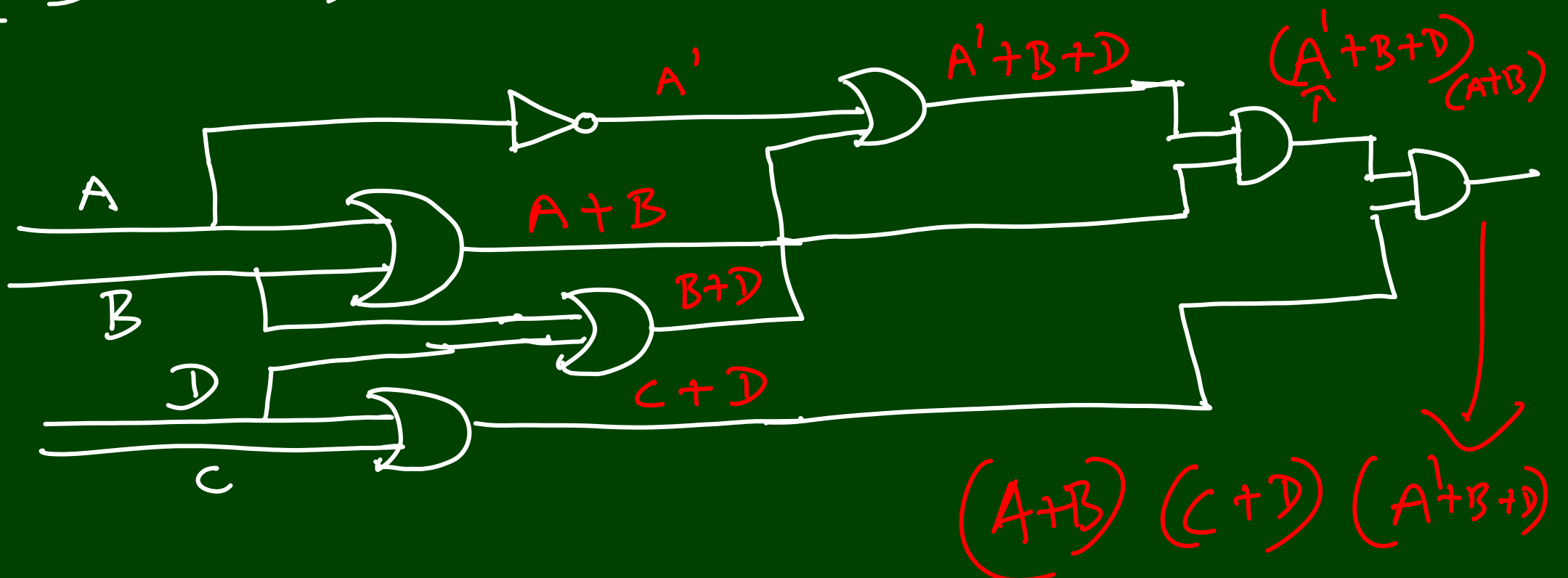
① Construct the logic circuit for the following Boolean functions

- $y z' + x y + x z w$
- $(A+B)(C+D)(A'+B+D)$
- $(AB + A'B')(C'D + C'D')$

Sol:-



②  $(A+B)(C+D)(A'+B+D)$



$$y z' + x y + x z w$$

$$y(z' + x) + x z w$$

$$x(y + zw) + y z'$$

$$\underline{(A+B)} \underline{(C+D)} \underline{(A'+B+D)}$$

$$= (A+B) (A'+B+D) (C+D) \text{ [Commutative]}$$

$$\checkmark = \left( \underbrace{(A \cdot (A'+D)) + B} \right) (C+D) \text{ [Distributive]}$$

$$= \left( \underbrace{(A \cdot A' + A \cdot D)} + B \right) (C+D) \text{ [Distributive]}$$

$$= \left( \underbrace{(0 + AD)} + B \right) (C+D) \text{ [Complement]}$$

$$= (AD+B) (C+D) \text{ [Identity]}$$

$$= \boxed{ADC + AD} + BC + BD \text{ [Distributive]}$$

$$= AD + BC + BD \text{ [Absorption]}$$

$$= AD + B(C+D) \text{ [Distributive]}$$

$$(A+B) (A'+B+D)$$

$$= (A+B) ((A'+D)+B)$$

$$= (B+A) (B+(A'+D))$$

$$= B + (A \cdot (A'+D))$$

$$x + (y - z)$$

$$= (x + y)$$

$$\cdot (x + z)$$

$$x = B$$

$$y = A$$

$$z = A' + D$$