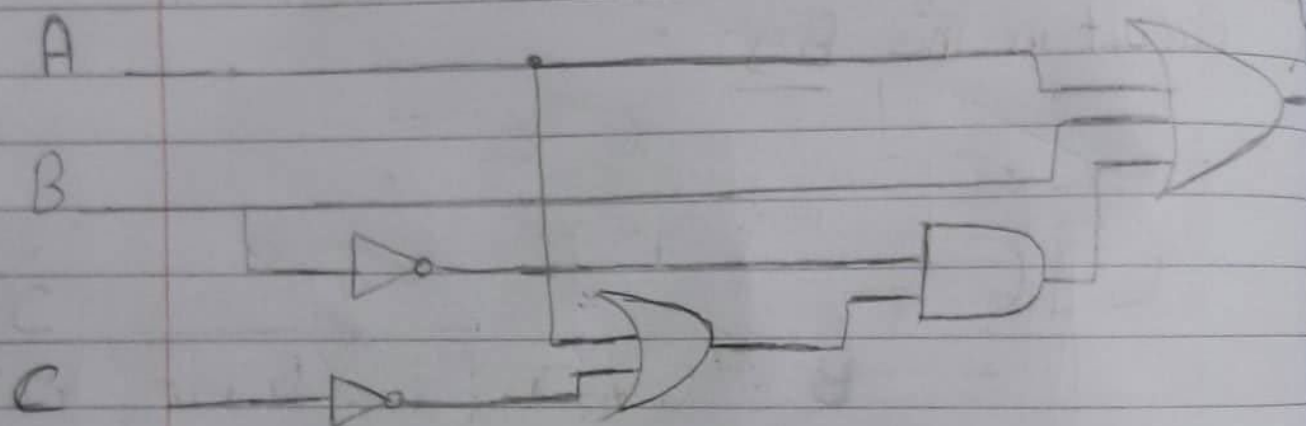


Boolean Algebra & Logic Gates

13 Draw Logic Diagram to implement The following Boolean Expression:

a) $Y = A + B + B'(A + C')$



Truth Table:

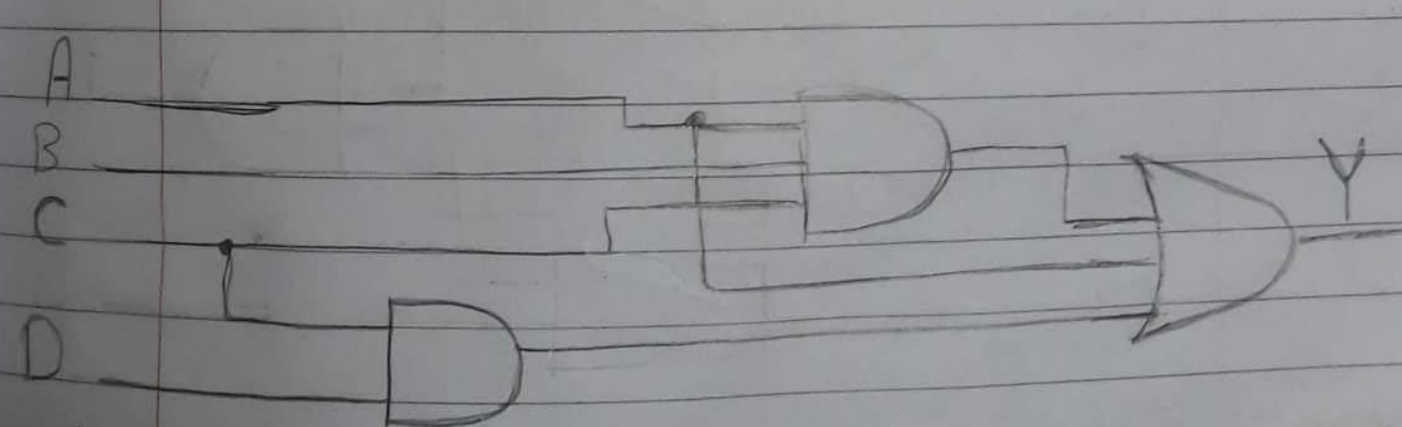
3 Inputs $2^3 = 8$

A	B	C	B'	C'	(A+C')	B'(A+C')	Y = (A+B+B'(A+C'))
0	0	0	1	1	1	1	1
0	0	0	1	1	1	1	1
0	0	1	1	0	0	0	0
0	0	1	1	0	0	0	0
0	1	0	0	1	1	0	1
0	1	0	0	1	1	0	1
0	1	1	0	0	0	0	1
0	1	1	0	0	0	0	1

A logic circuit diagram with four inputs labeled A, B, C, and D. Input A is connected to the top input of an AND gate. Input B is connected to the bottom input of the AND gate. Input C is connected to the top input of an OR gate. Input D is connected to the bottom input of the OR gate. The output of the AND gate is connected to the top input of an XOR gate. The output of the OR gate is connected to the bottom input of the XOR gate. The output of the XOR gate is labeled Y.

$$4 \text{ Inputs} = 2^4 = 16$$

C $Y = A + CD + ABC$

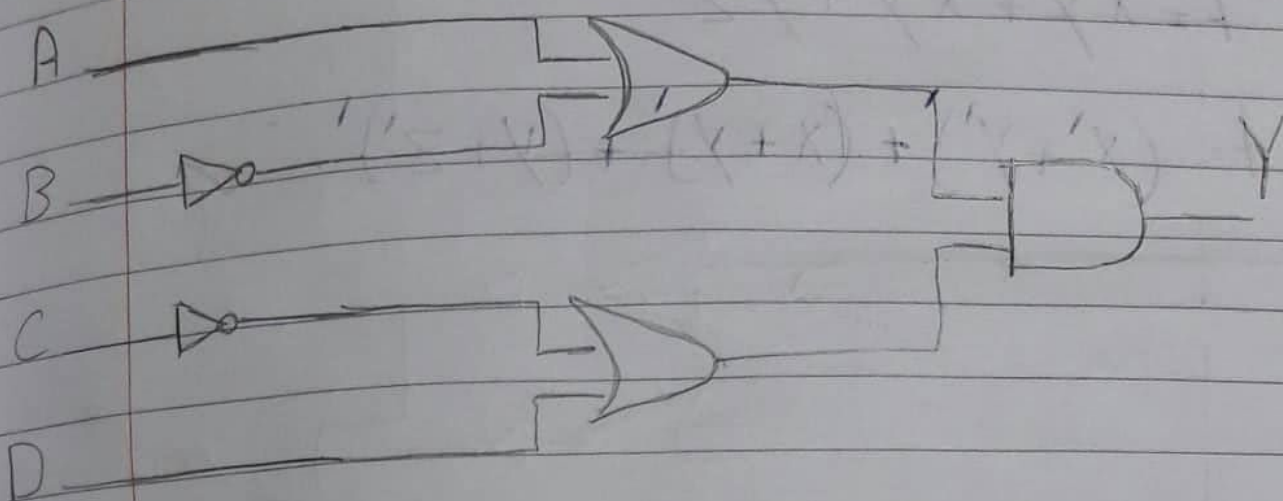


4 Inputs = 16

A	B	C	D	$C \cdot D$	ABC	$Y = A + CD + ABC$

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$$Q \quad Y = [C(A+B')](C'+D)$$



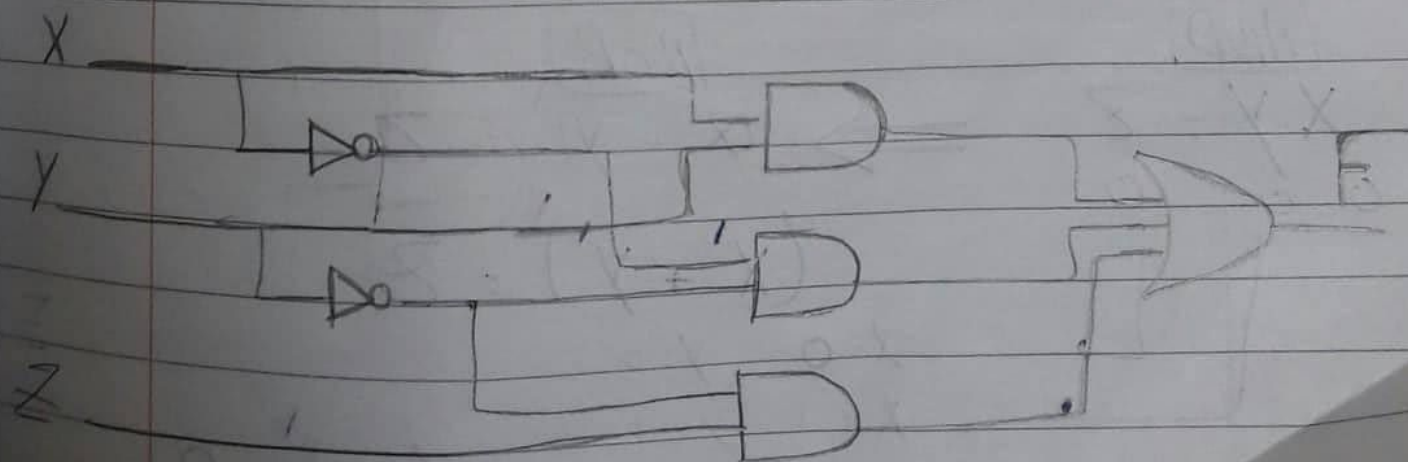
* Truth Table

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

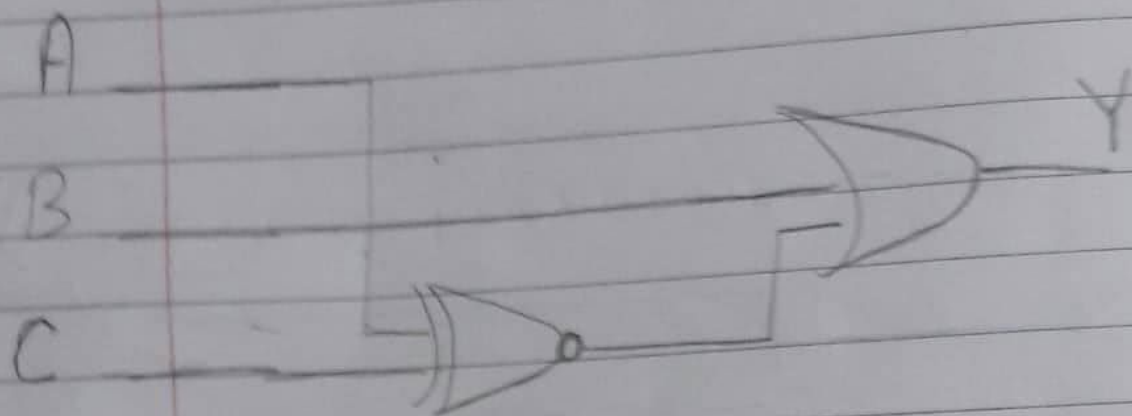
14] Implement The Boolean Function:

$$F = XY + X'Y' + Y'Z$$

a) With AND, OR & inverter Gates



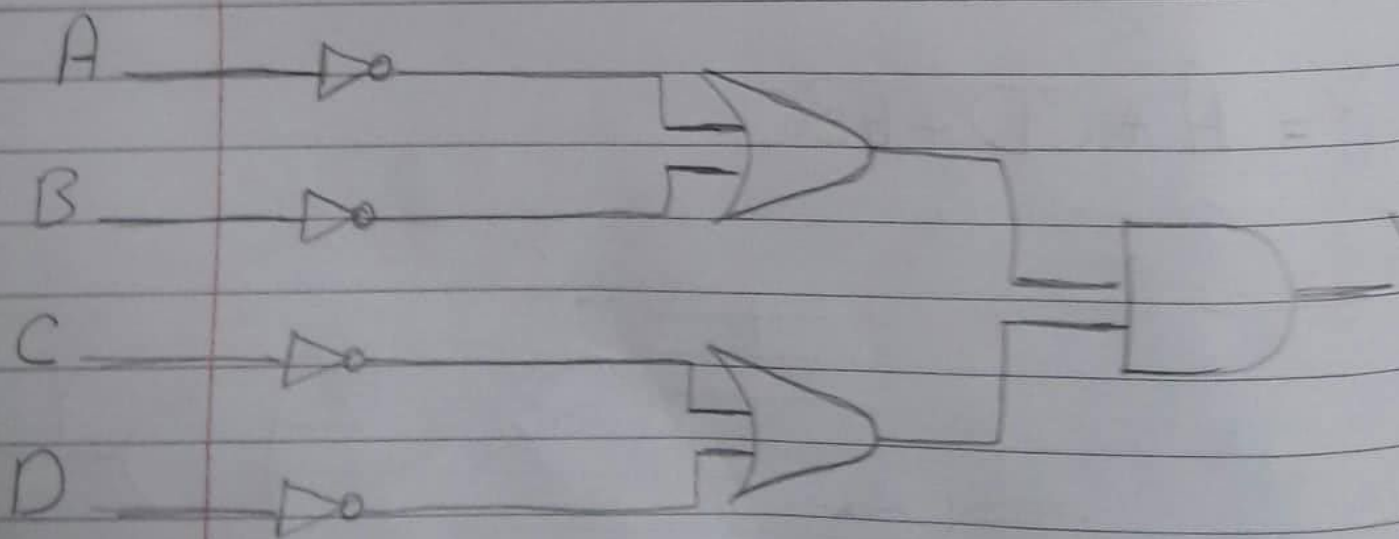
$$[d] Y = (A \oplus C)' + B$$



* Truth Table

A	B	C	$(A \oplus C)'$	$Y = (A \oplus C)' + B$
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$$[e] Y = (A' + B')(C' + D')$$



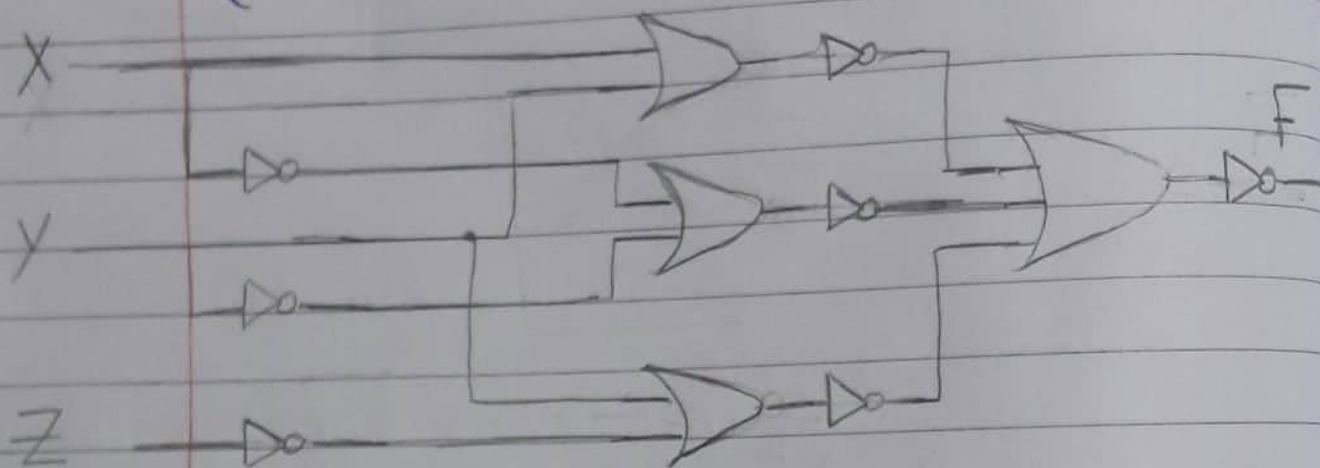
* Truth Table

A	B	C	D	A'	B'	C'	D'	$(A' + B')$	$(C' + D')$	$Y = (A' + B')(C' + D')$
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⑥ With OR & inverter Gates.

$$F = xy + x'y' + y'z$$

$$F = (x' + y')' + (x + y)' + (y + z)'$$



AND

NOR

X	Y	Z = XY
0	0	0
0	1	0
1	0	0
1	1	1

X	Y	Z = (X + Y)'
0	0	1
0	1	0
1	0	0
1	1	0

AND

NOR

$$XY = Z$$

$$\Rightarrow (X + Y)' = Z$$

$$(X' + Y') = Z$$

$$X=0 \quad Y=0$$

$$X'=1 \quad Y'=1$$

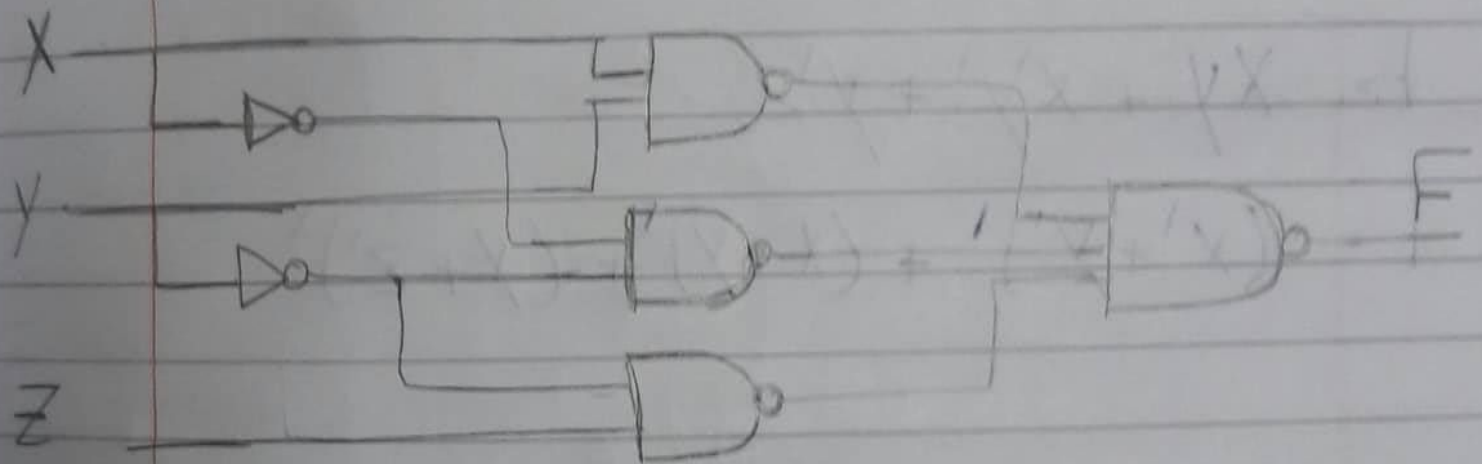
$$(1+1)=1 \Rightarrow (1+1)'=0$$

④ NAND & inverter Gates.

$$F = XY + X'Y' + Y'Z$$

$$F = [(XY)' (X'Y')' (Y'Z)']'$$

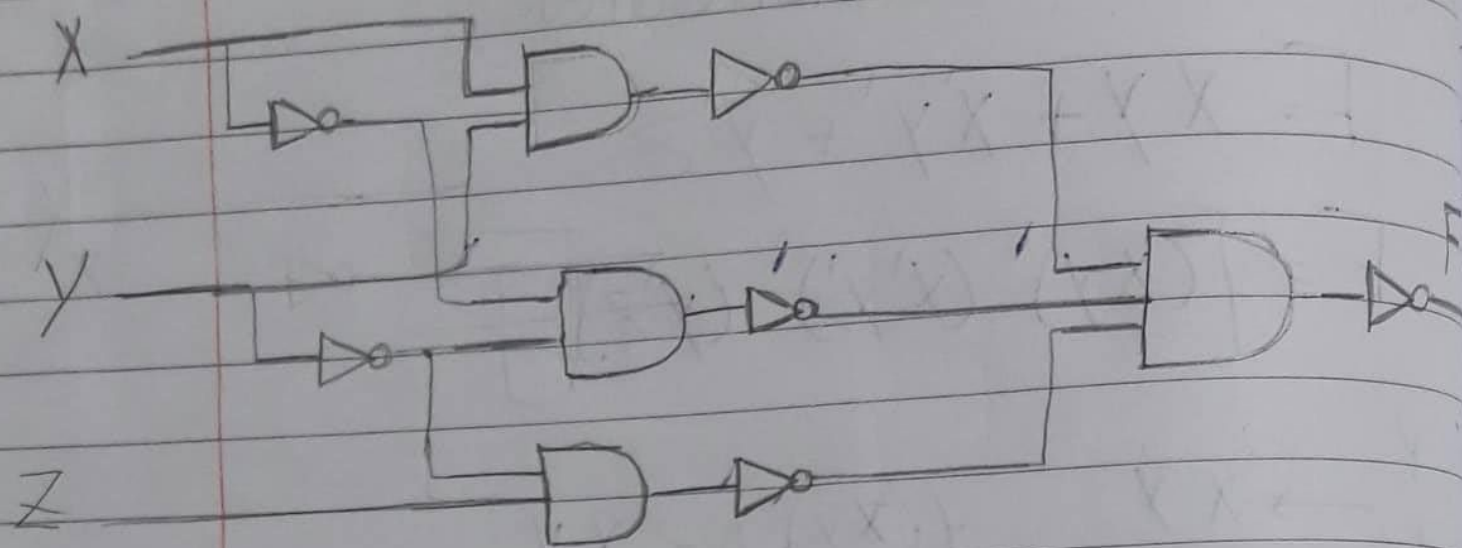
$$\begin{array}{cc} X & Y \\ \downarrow & \downarrow \\ 0 & 0 \end{array} \rightarrow \begin{array}{c} XY \\ 0 \end{array} \quad ((XY)')' = XY$$



⑤ With AND & inverter Gates.

$$F = XY + X'Y' + Y'Z$$

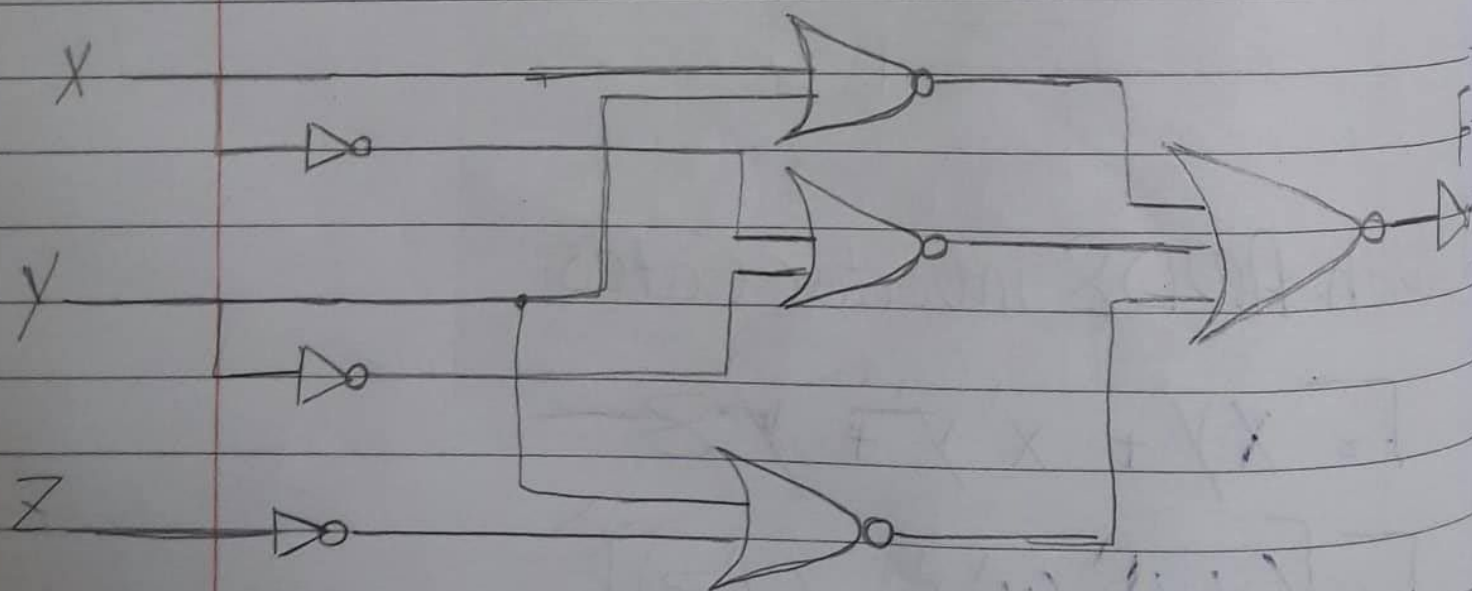
$$F = [(XY)' (X'Y')' (Y'Z)']'$$



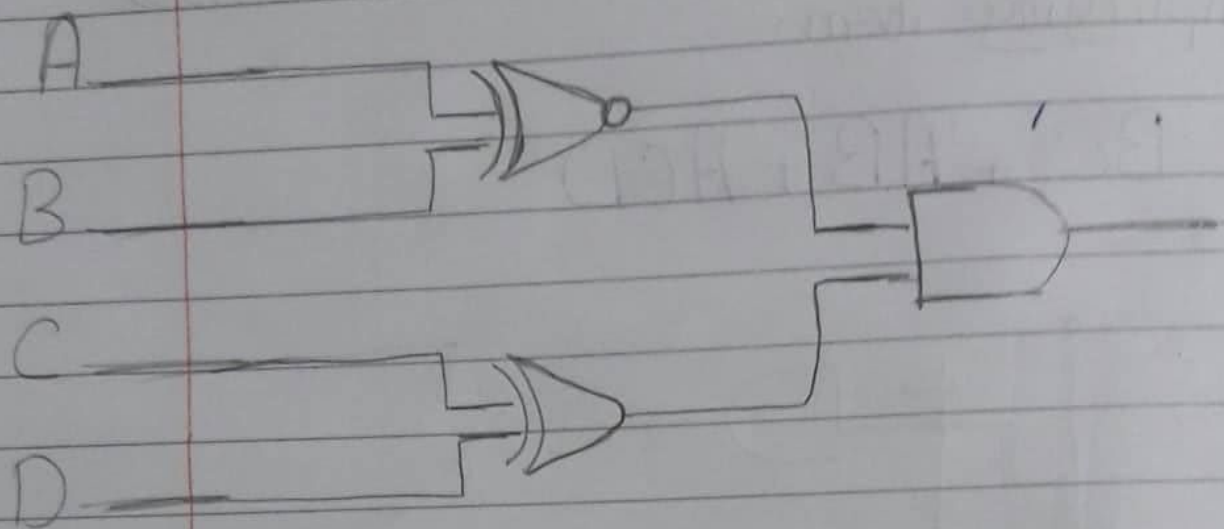
© With Nor & inverter Gates:

$$F = xy + x'y' + y'z$$

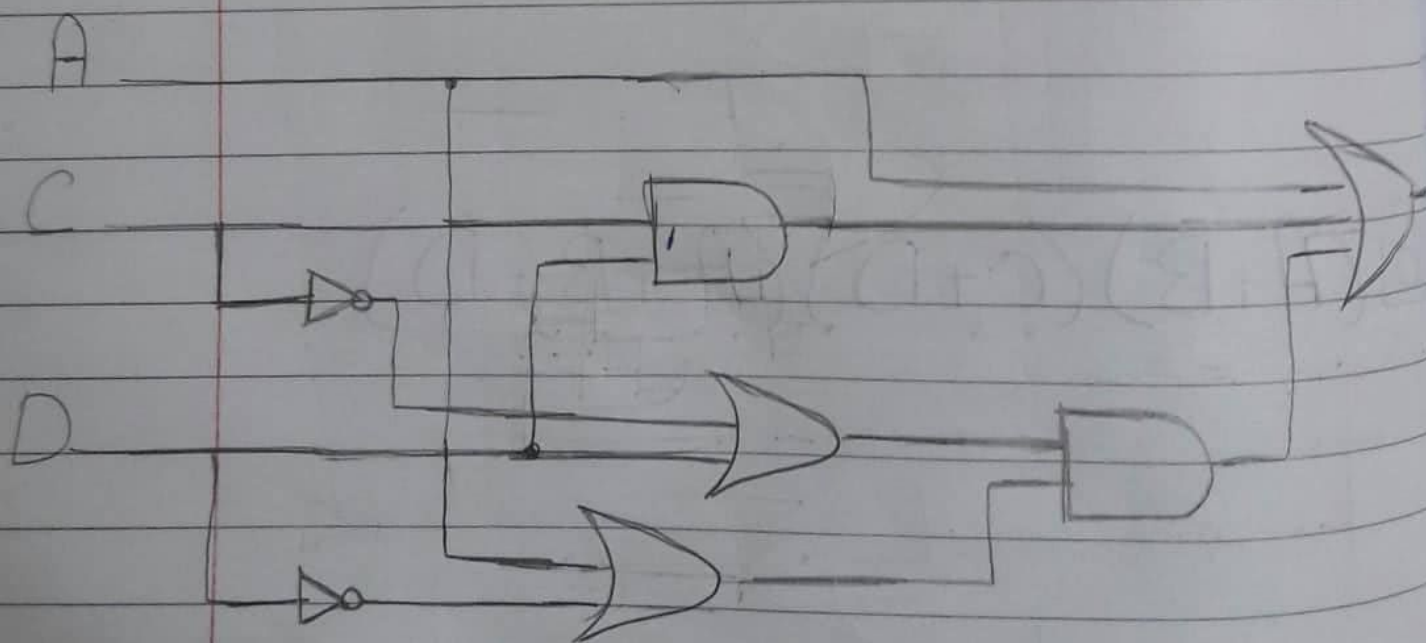
$$F = (x' + y')' + (x + y)' + (y + z')'$$



$$\boxed{C} (AB + A'B')(CD' + C'D)$$



$$\boxed{d} A + CD + (A + D')(C' + D)$$



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27 Write The Boolean Expression (Equation) & Draw The Logic Diagram of The Circuit Whose outputs are Defined by The Following Truth Table.

F_1	F_2	a	b	c
1	0	0	0	0
0	0	0	0	1
0	1	0	1	0
1	1	0	1	1
0	1	1	0	0
0	1	1	0	1
1	1	1	1	0
1	0	1	1	1

$$F_1 = a'b'c' + \underline{a'bc} + ab'c' + abc$$

$$F_2 = a'bc' + \underline{a'bc} + ab'c' + ab'c + \underline{abc}$$