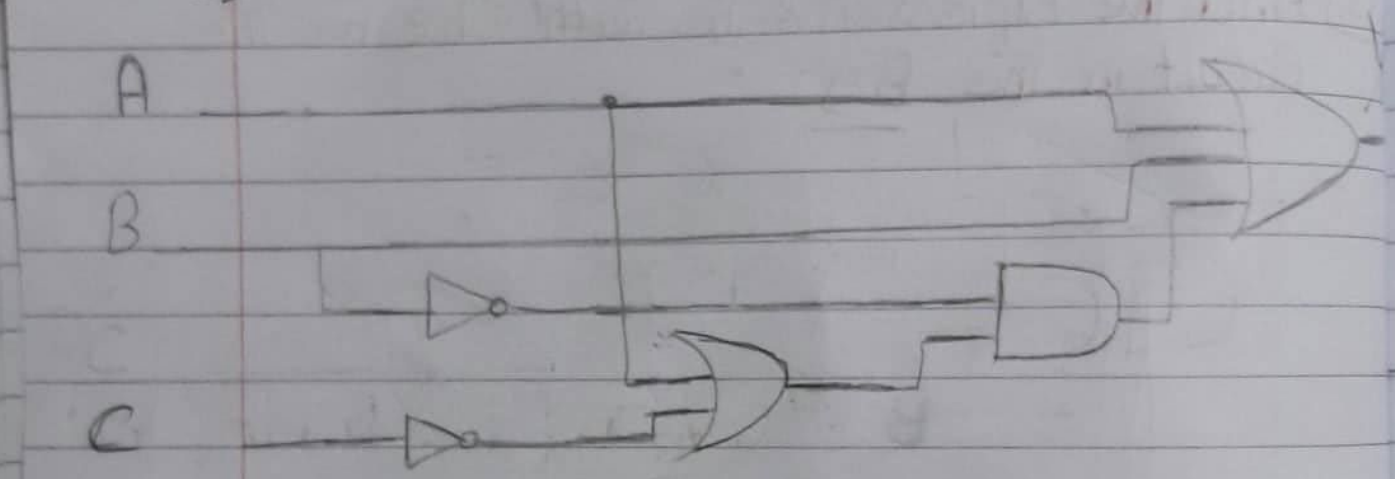
Ch 2

Boolean Algebra & Logic Gates

[13] Draw Logic Diagram to implement The following Boolean Expression:

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

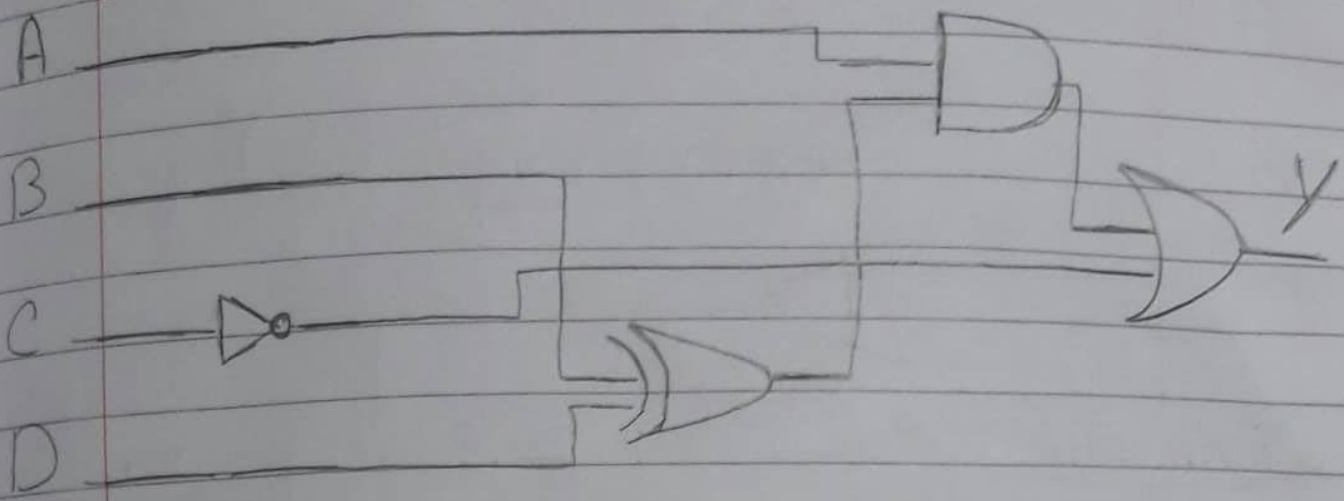


Truth Table:

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

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

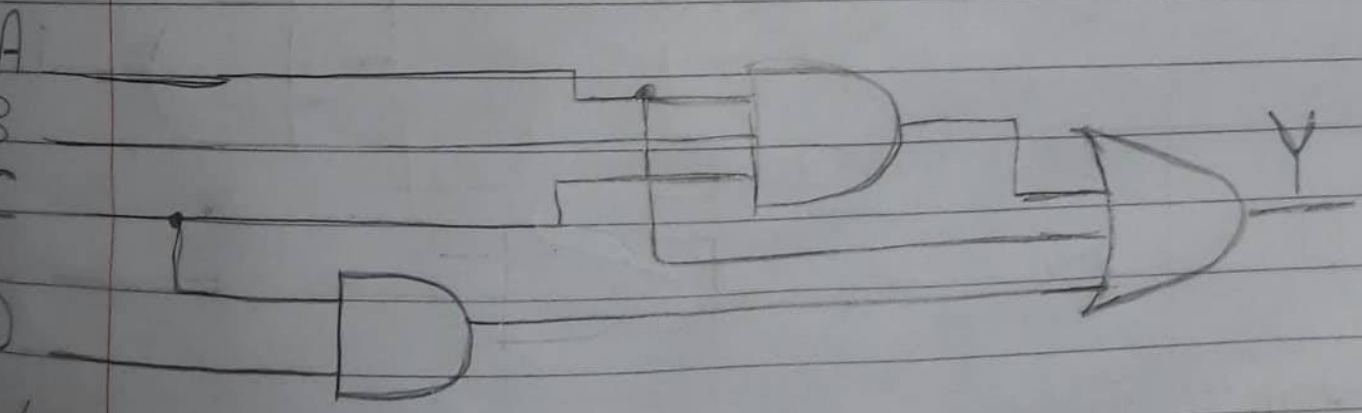


* Truth table:

4 Inputs = $2^4 = 16$

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

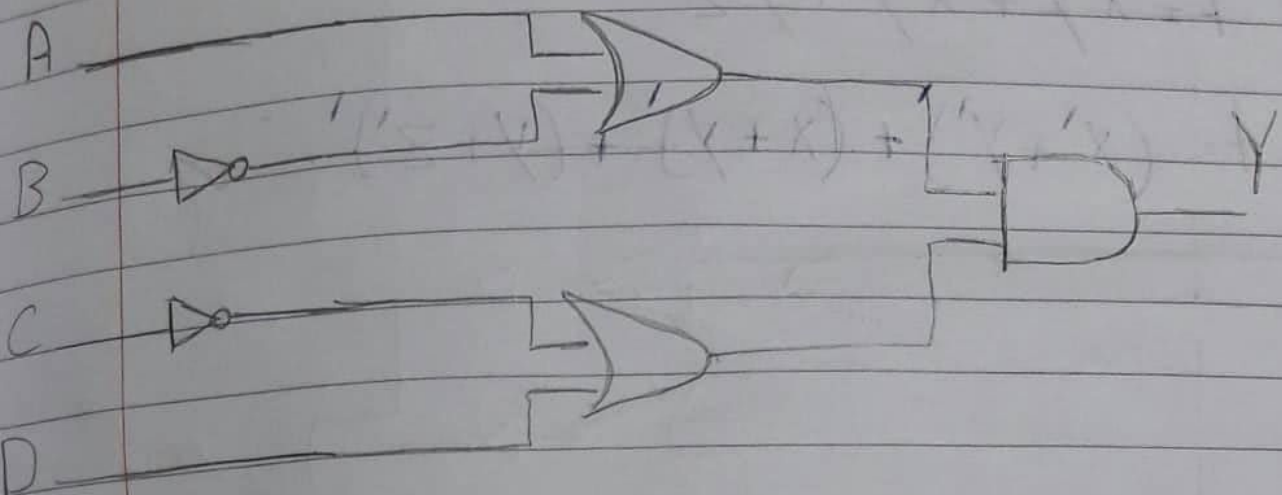
[C] $Y = A + CD + ABC$



* Truth Table 4 Inputs = 16

A	B	C	D	C·D	ABC	$Y = A + CD + ABC$

[F] $Y = [(A+B')(C'+D)]$



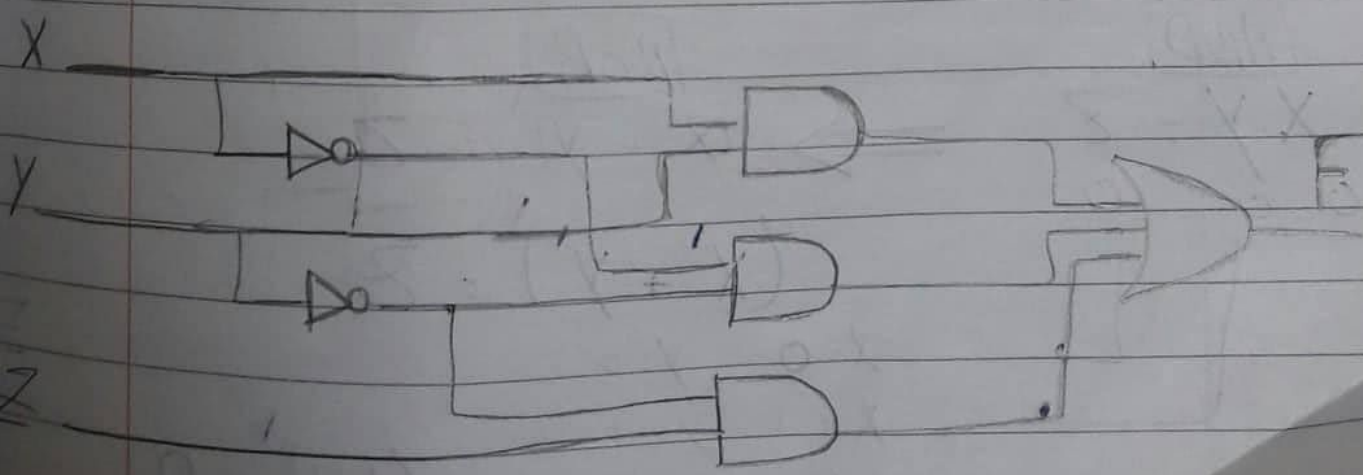
* Truth Table

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

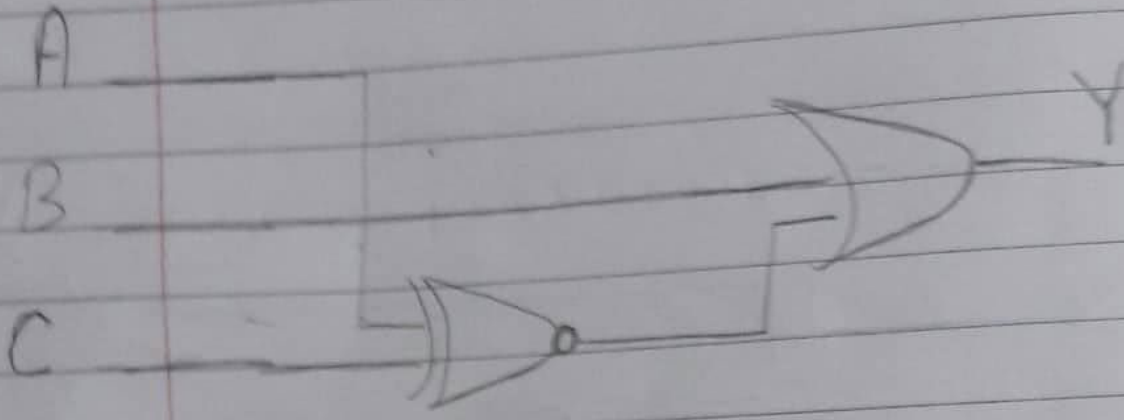
[14] Implement The Boolean Function:

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

a) With AND, OR & inverter Gates



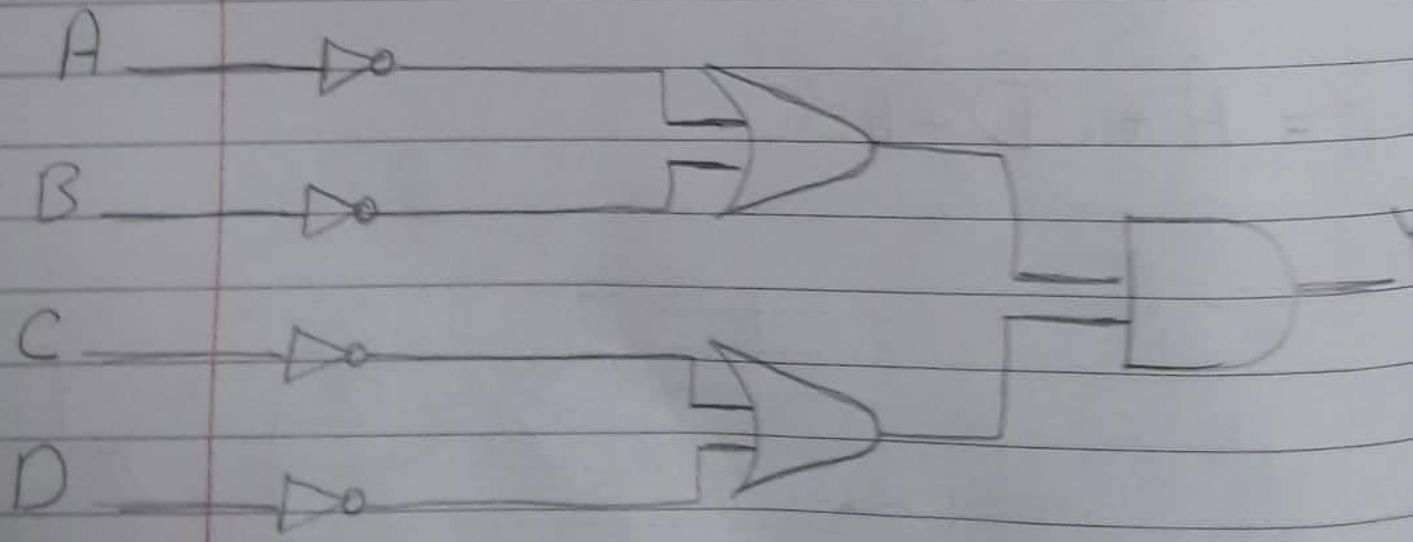
[d] $Y = (A \oplus C)' + B$



* Truth Table

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

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



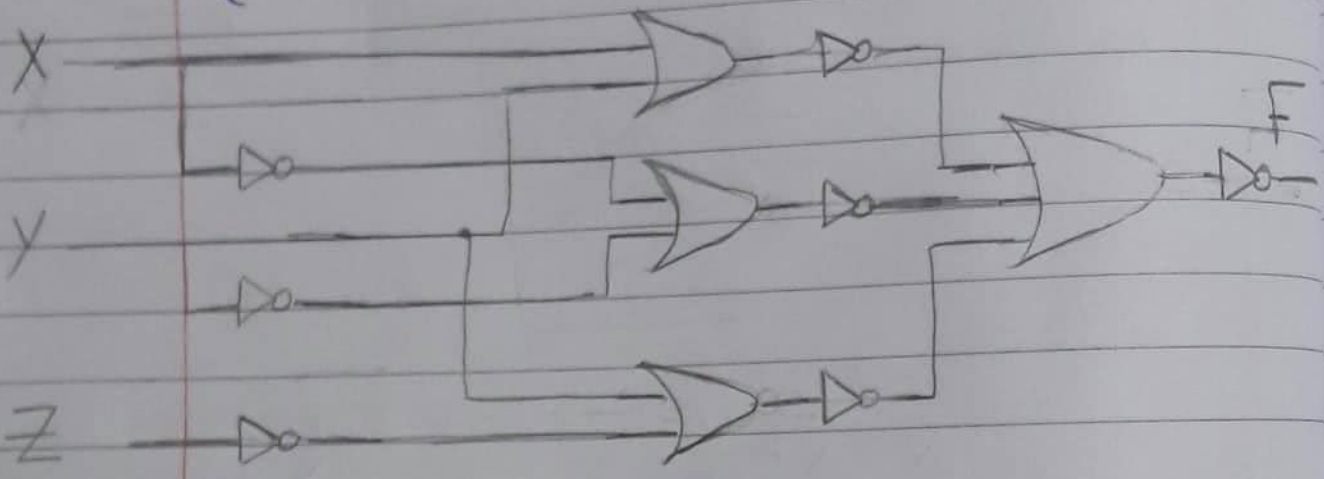
* Truth Table

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

(b) With OR & inverter Gates:

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

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



AND

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

NOR

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

AND

XY = Z

0 0 0

NOR

$(X+Y)' = Z$

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

$X = 0 \quad Y = 0$

$X' = 1 \quad Y = 1$

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

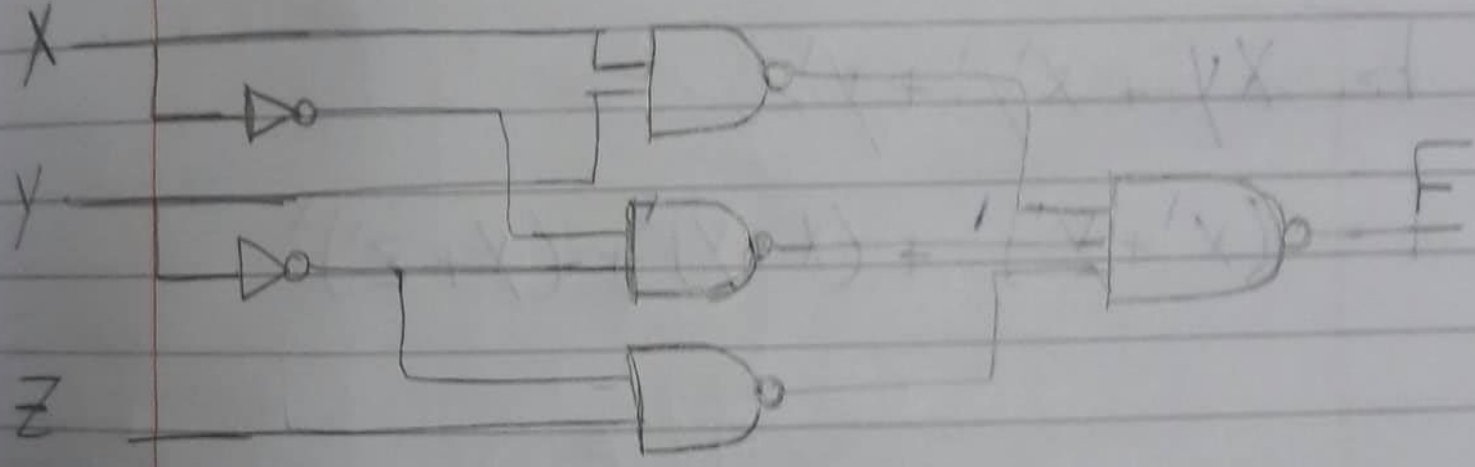
(c) NAND & inverter Gates.

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

$$F = [(xy)' (x'y')' (y'z)']'$$

x y → x x $((xy)')' = xy$

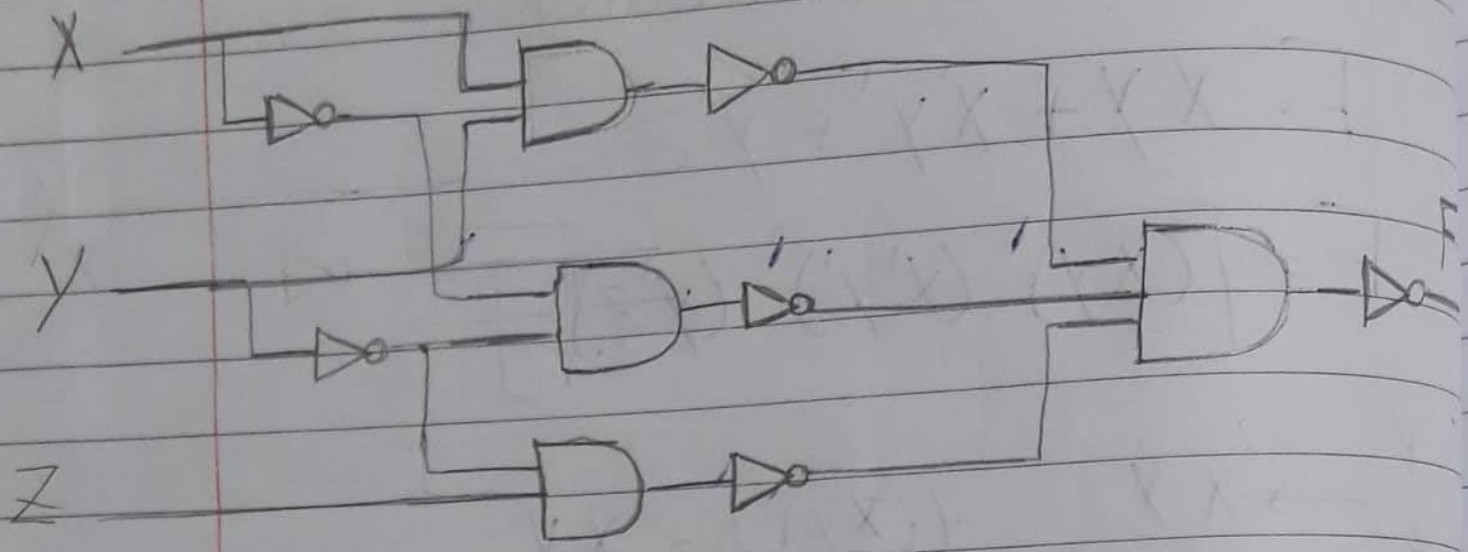
0 0 0 0



(d) With AND & inverter Gates.

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

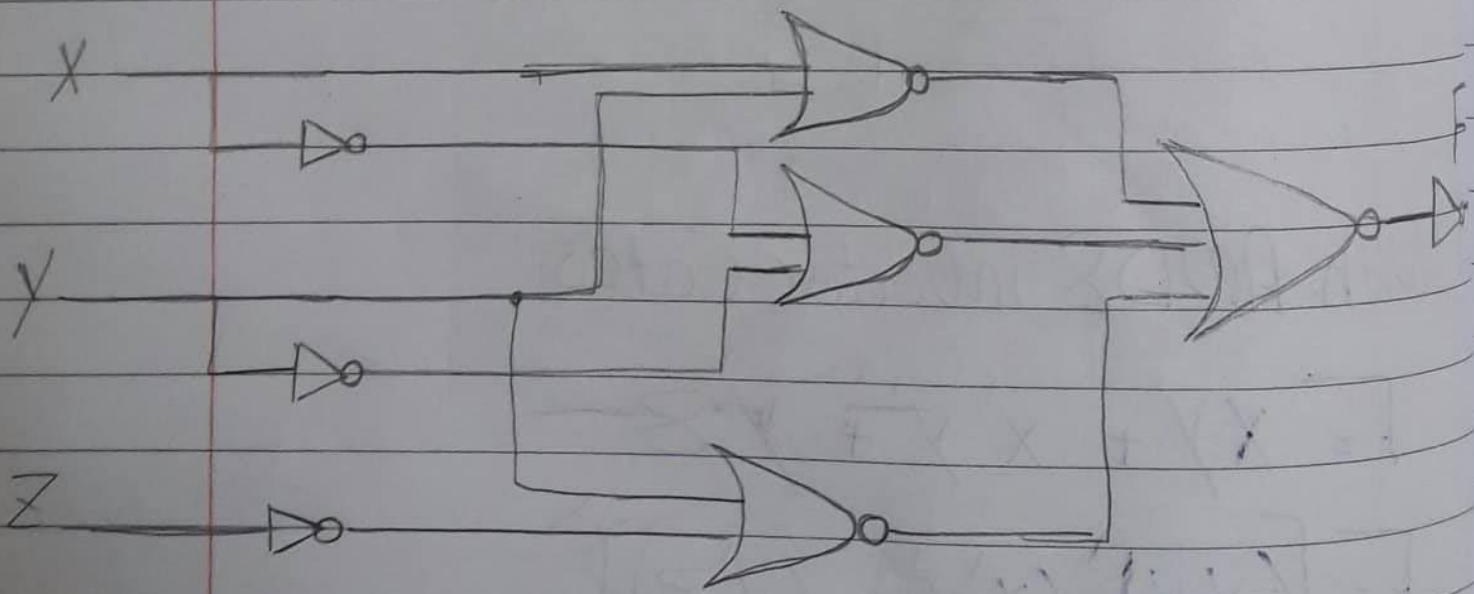
$$F = [(xy)' (x'y')' (y'z)']'$$



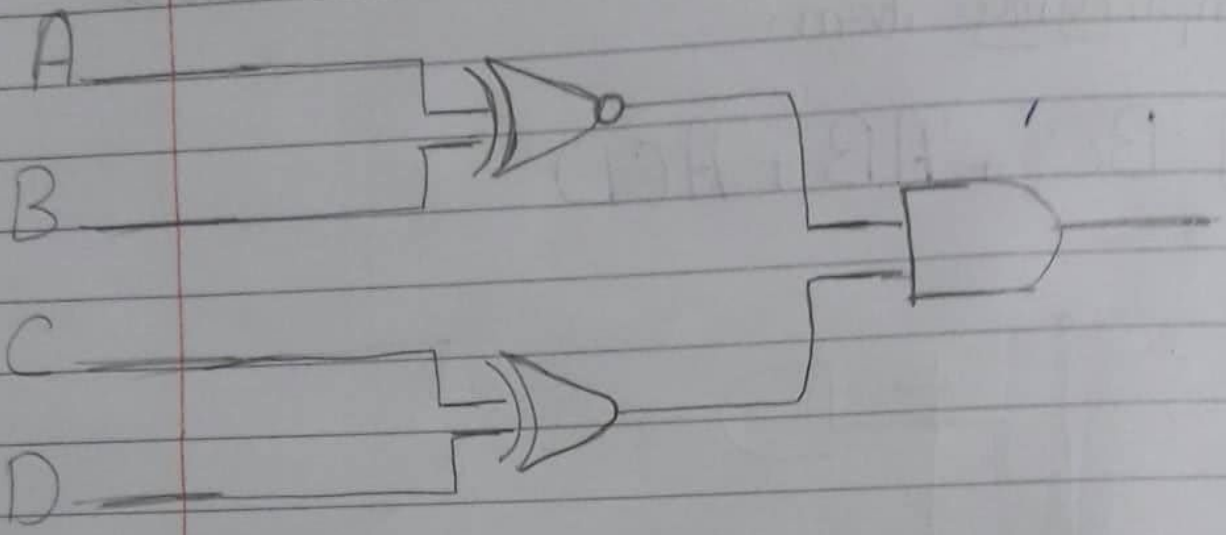
(c) With Nor & inverter Gates:

$$\overline{F} = Xy + x'y' + y'z$$

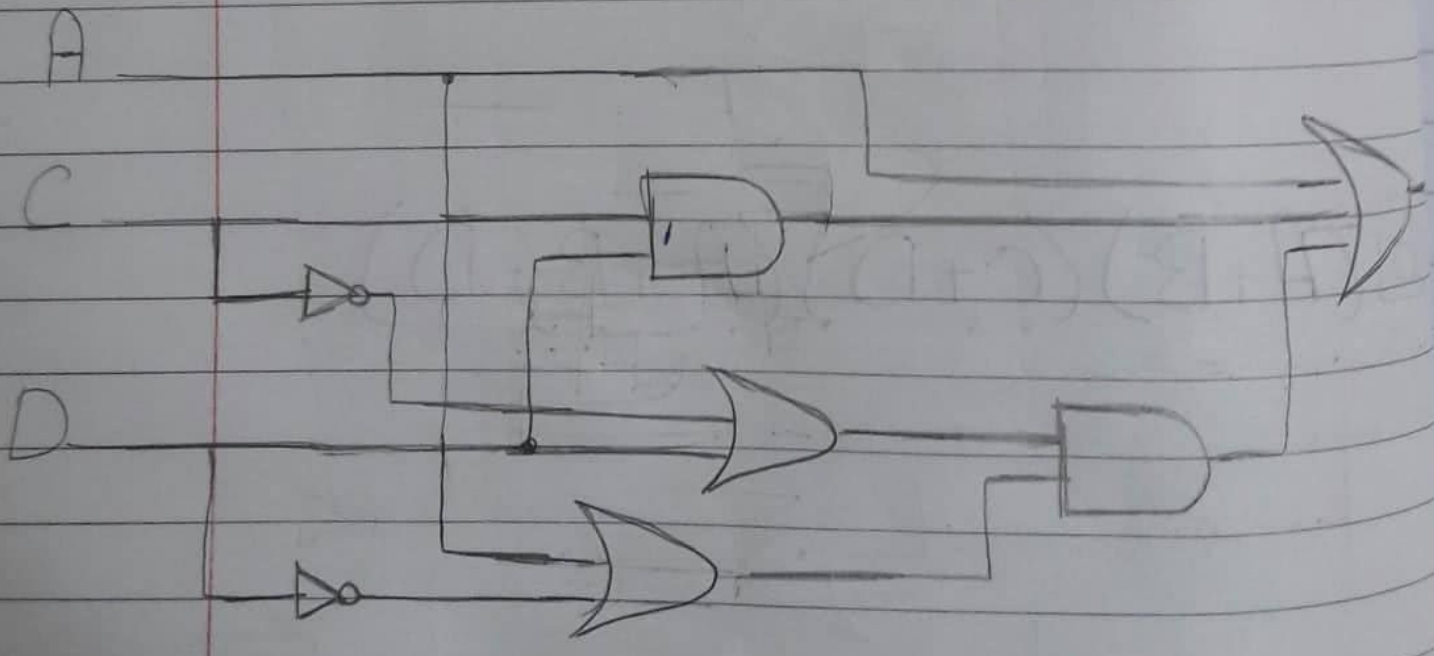
$$F = (x'+y')' + (x+y)' + (y+z')'$$



[c] $(AB + A'B')(CD' + C'D)$



[d] $A + CD + (A + D')(C' + D)$



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

$F_1 = a'b'c' + a'bc + ab'c' + abc$

$F_2 = a'bc' + a'bc + ab'c' + ab'c + abc$