“ASSIGNMENT NO 2”

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Registration No: 19PWCSE1801

Class Section: A

Submitted To Sir Rehmat Ullah

Date:(December 18, 2020)

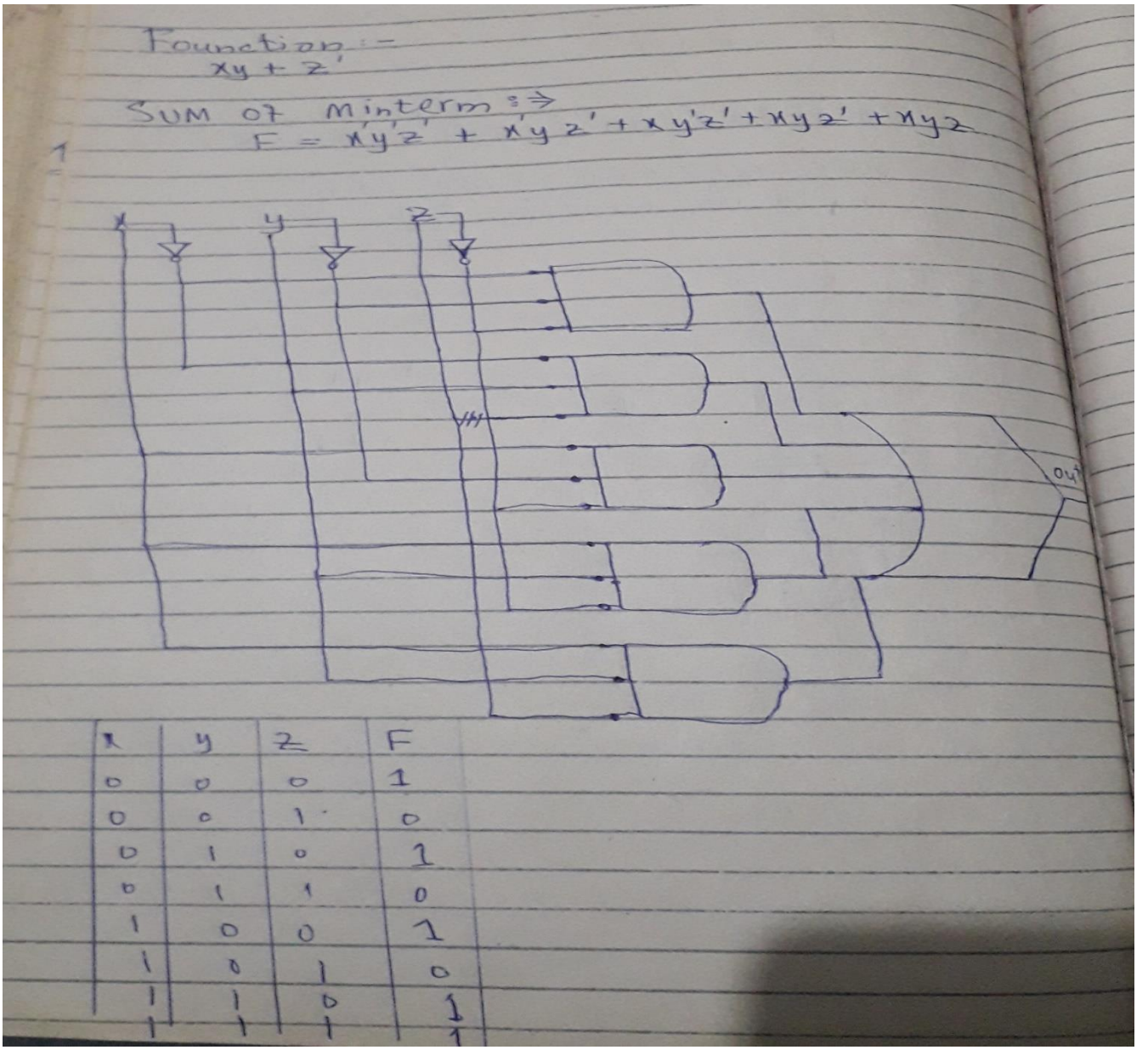
Digital Logic Design

Department of Computer Systems Engineering

University of Engineering and Technology, Peshawar

1.Think of ten 3-variable functions and design circuits for them using sum-of-minterms technique.

No.1:-



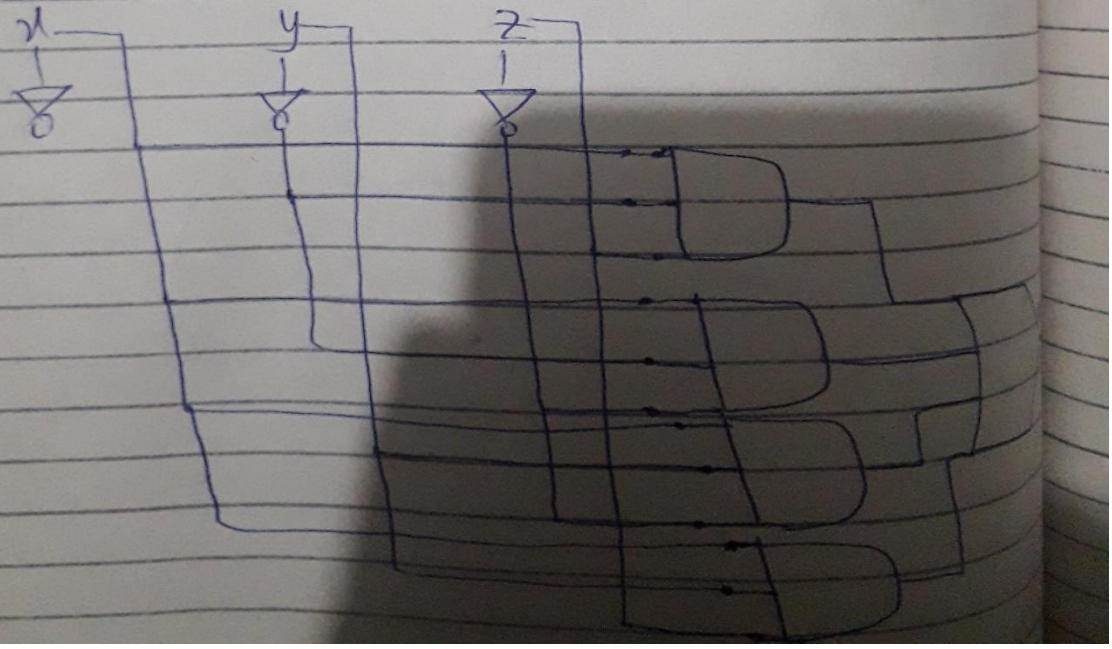
No.2:-

$F = x + xy'z$

Sum of minterm:-

$xy'z + xyz' + xyz' + xy$

x	y	z	F
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1



No.3:-

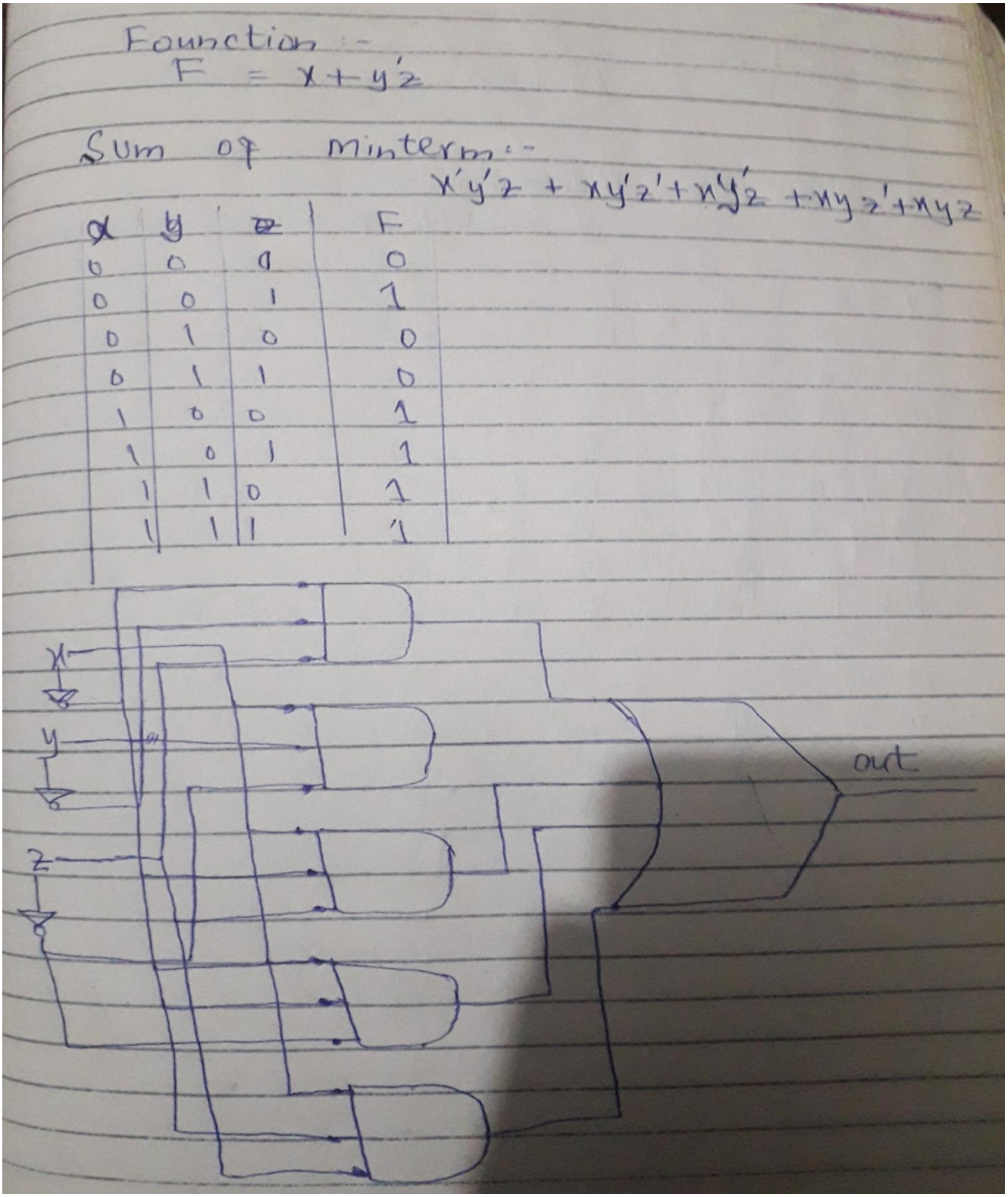
Fonction :-

$F = x + y'z$

Sum of minterm :-

$x'y'z + xy'z' + x'y'z + xyz' + xyz$

x	y	z	F
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1



No.4:-

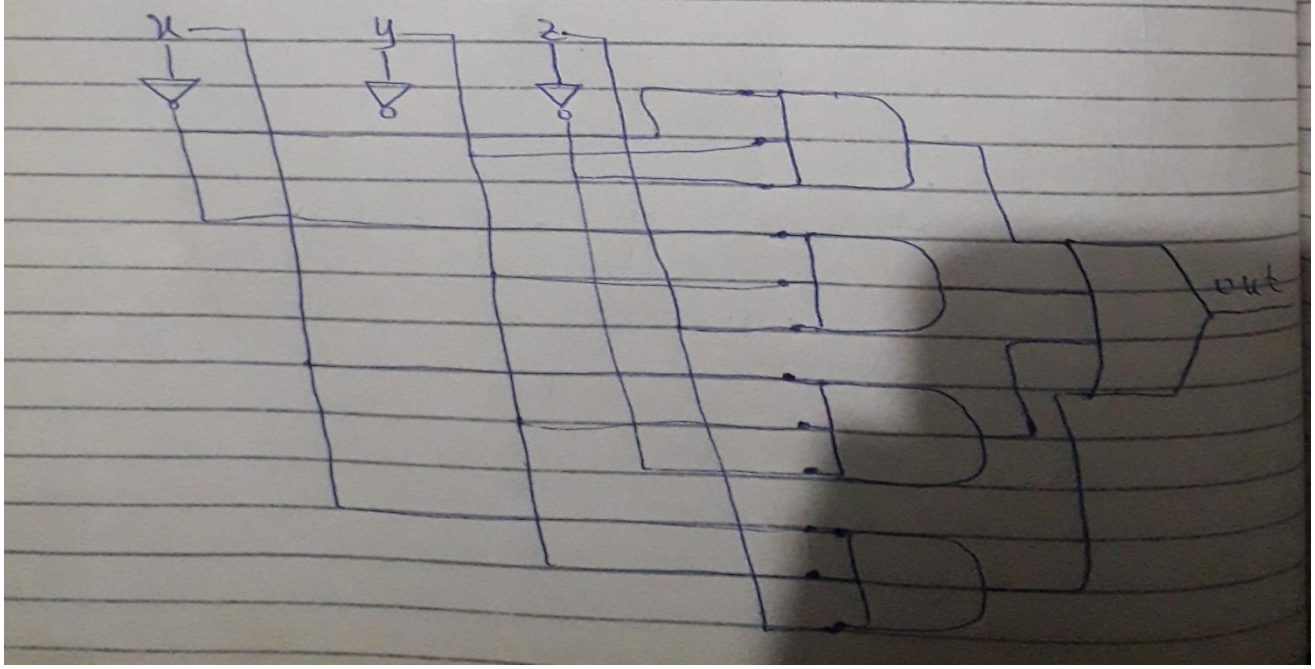
Fanction :-

$F = x'y + yz'$

Sum of mintems :-

$x'yz' + x'yz + xyz' + xyz$

x	y	z	F
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1



No.5:-

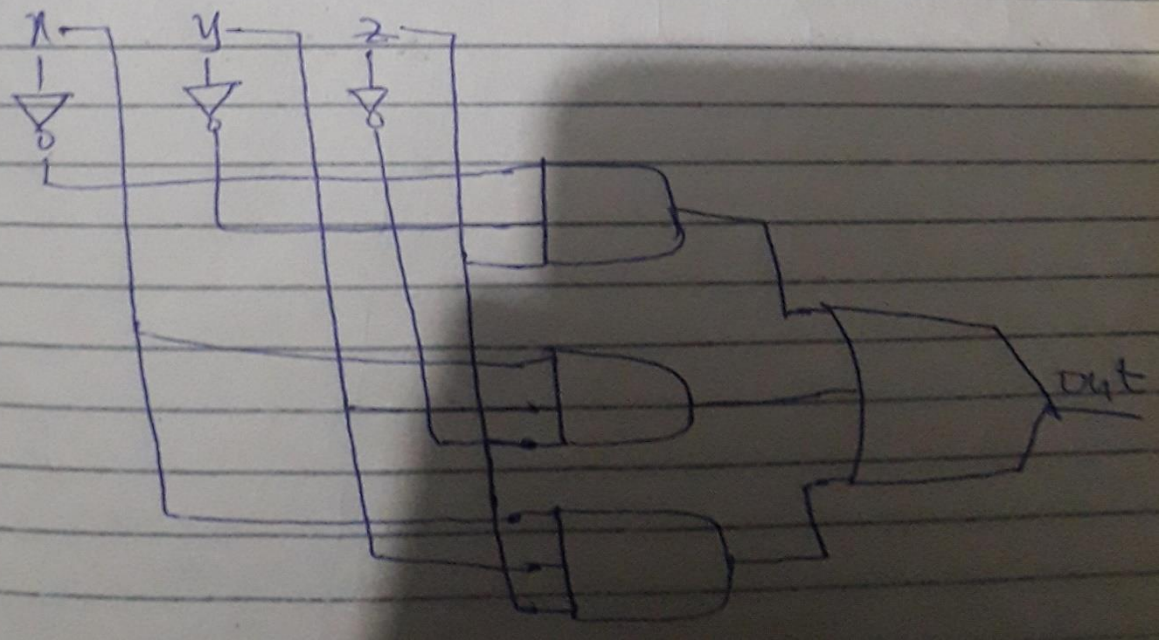
Function:-

$F = x'y'z + xy$

Sum of minterm

$x'y'z + xyz' + xyz$

x	y	z	F
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1



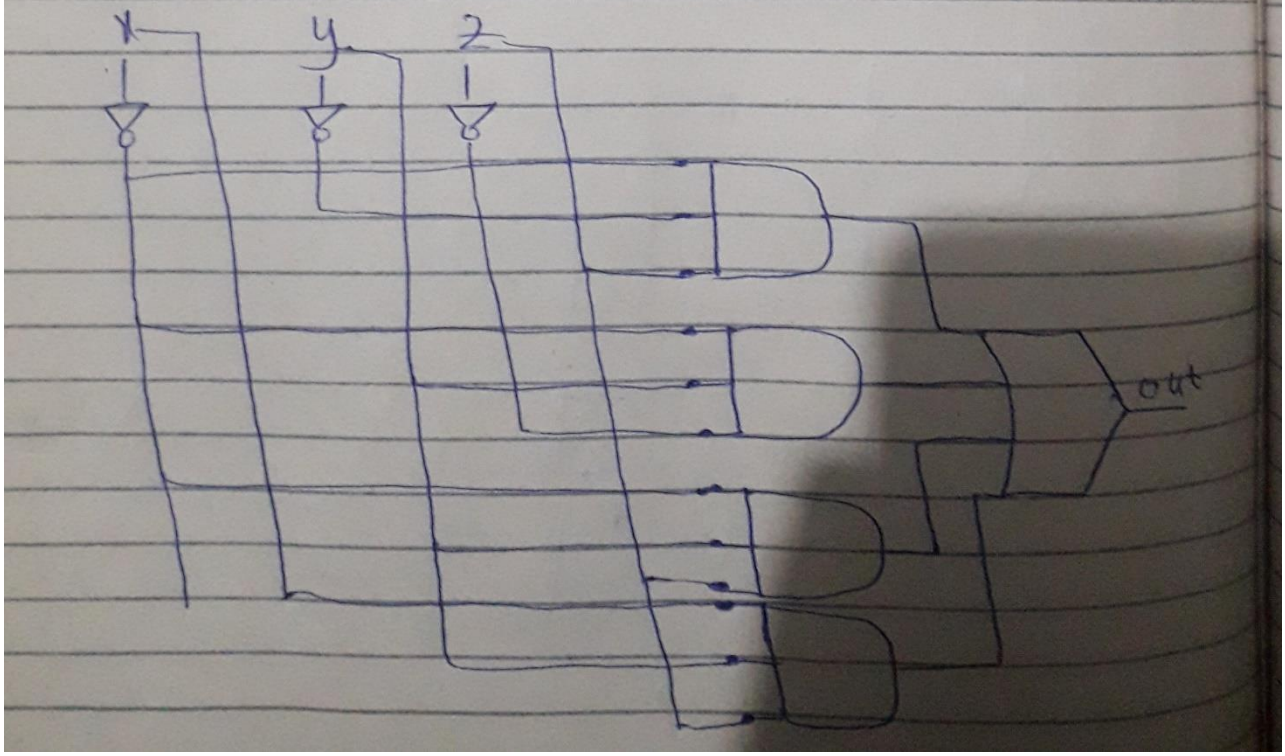
No.6:-

$F = x'z + yz$

Sum of minterm :-

$x'y'z + x'yz' + x'yz + xyz$

x	y	z	F
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1



No.7:-

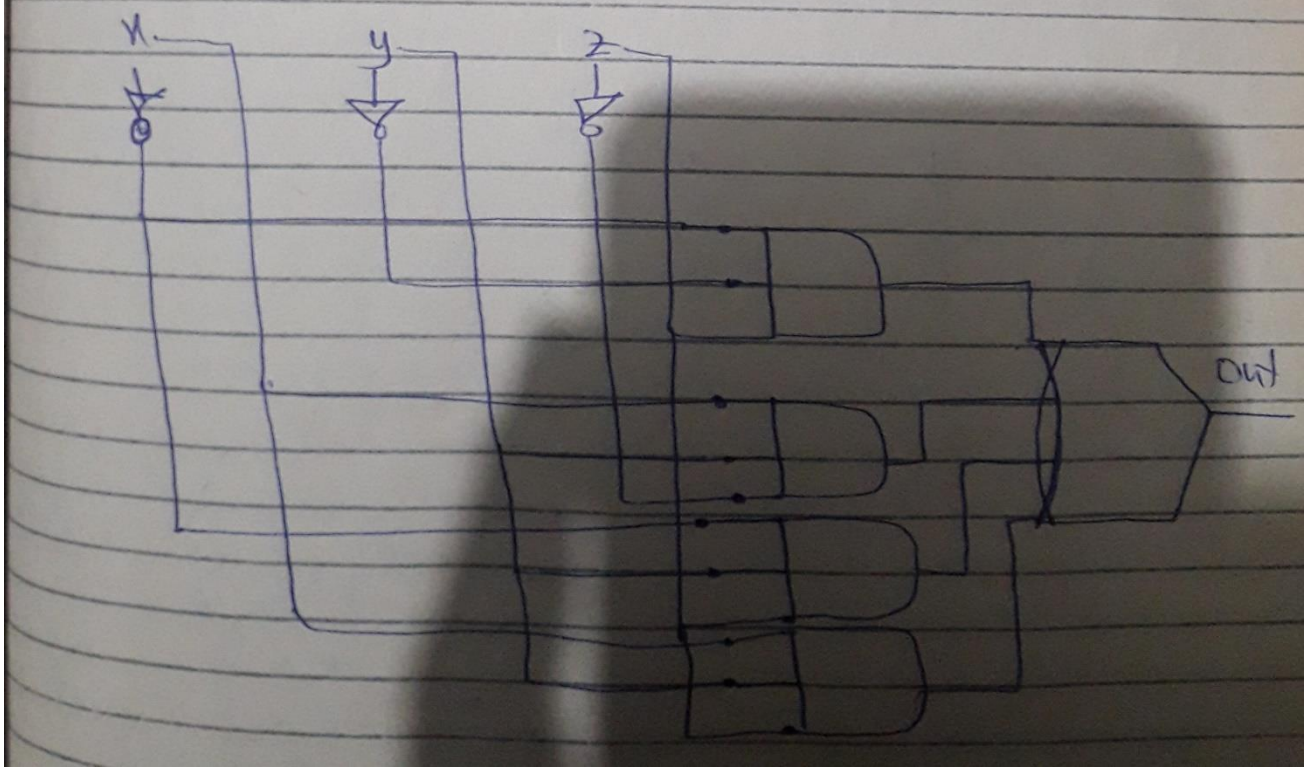
function:-

$F = xy + x'z$

Sum of minterm :-

$x'y'z + xy'z' + x'yz + xyz$

x	y	z	F
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1



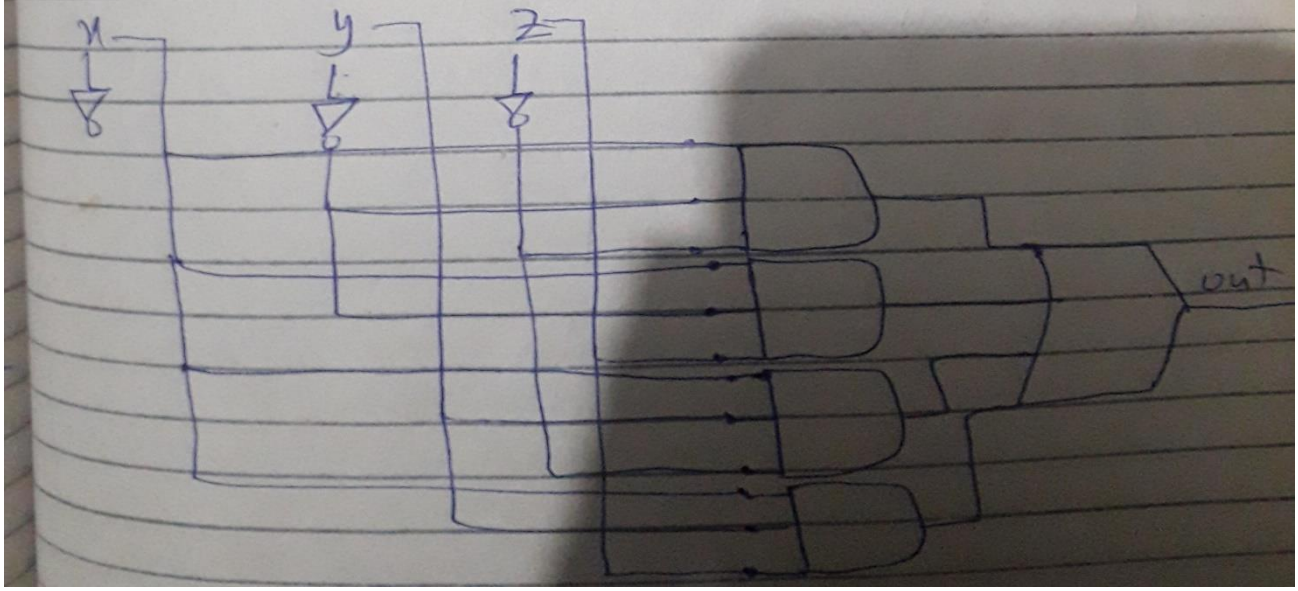
No.8:-

$F = xy' + xyz'$

Sum of Minterm :-

$xy'z' + xy'z + xyz' + xyz$

x	y	z	F
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1



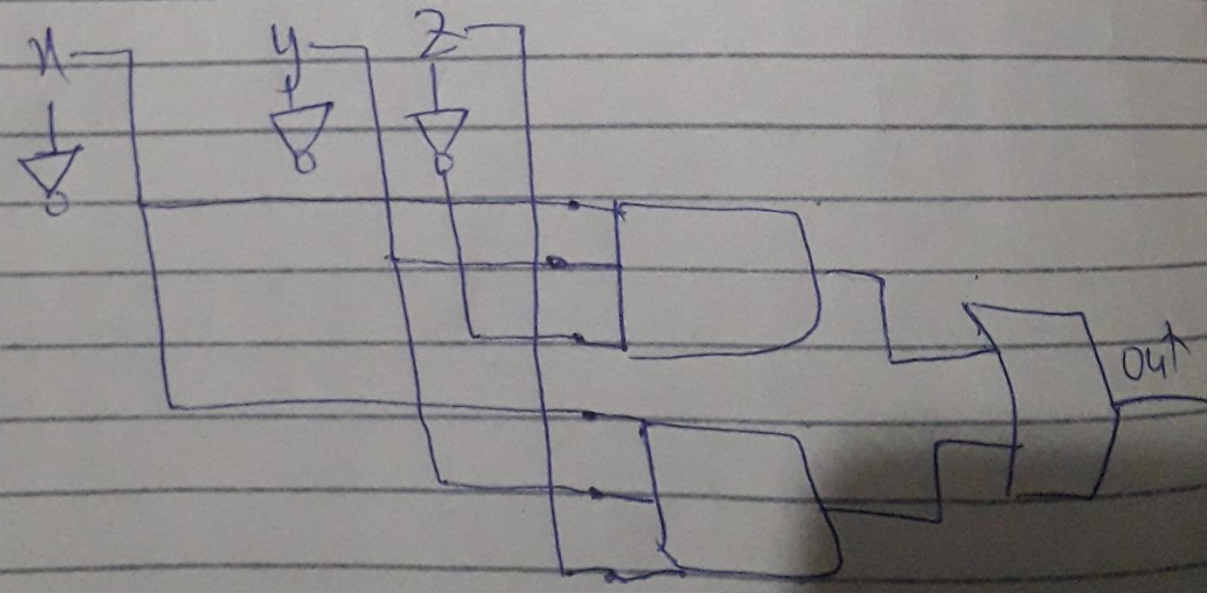
No.9:-

$F = xy'z' + xy$

Sum of Minterm :-

$xyz' + xyz$

x	y	z	F
0	0	0	0
0	0	1	0
0	1	0	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	0	1
1	1	1	1



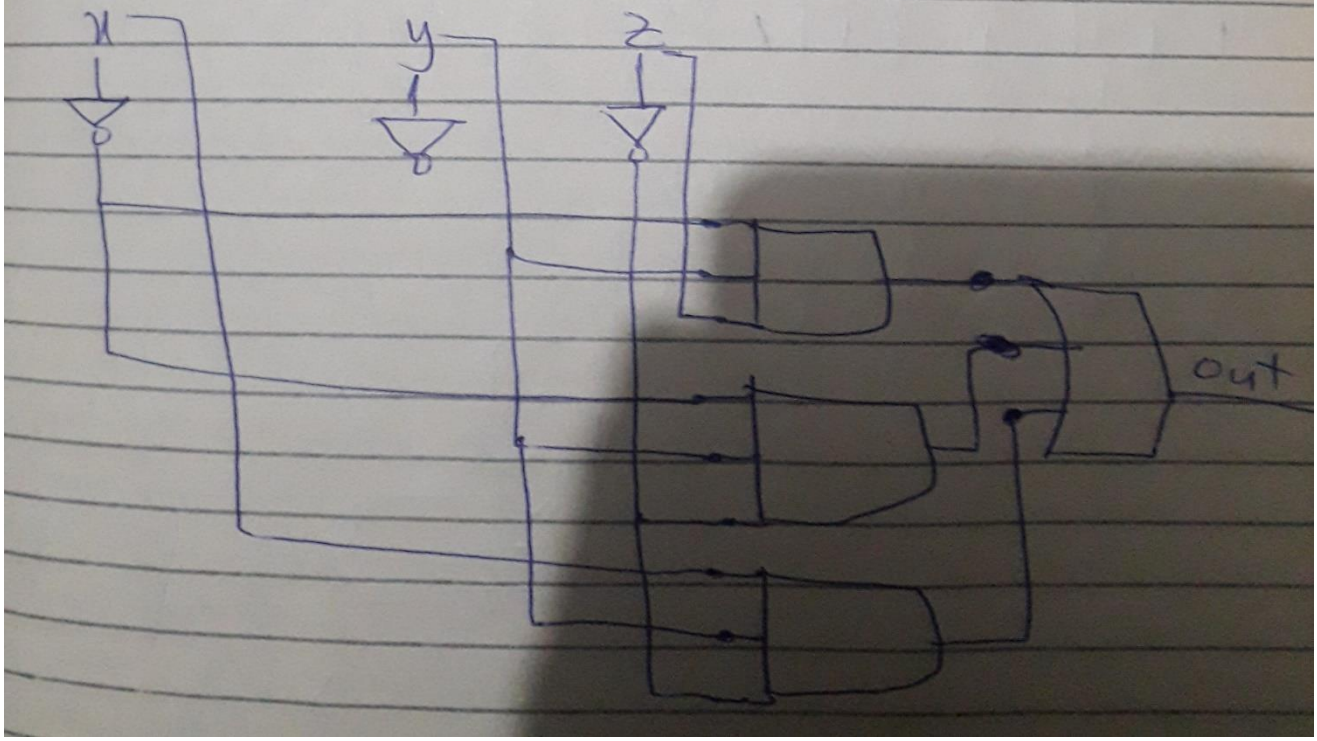
No.10:-

$F = xyz' + x'y$

Sum of Minterms :-

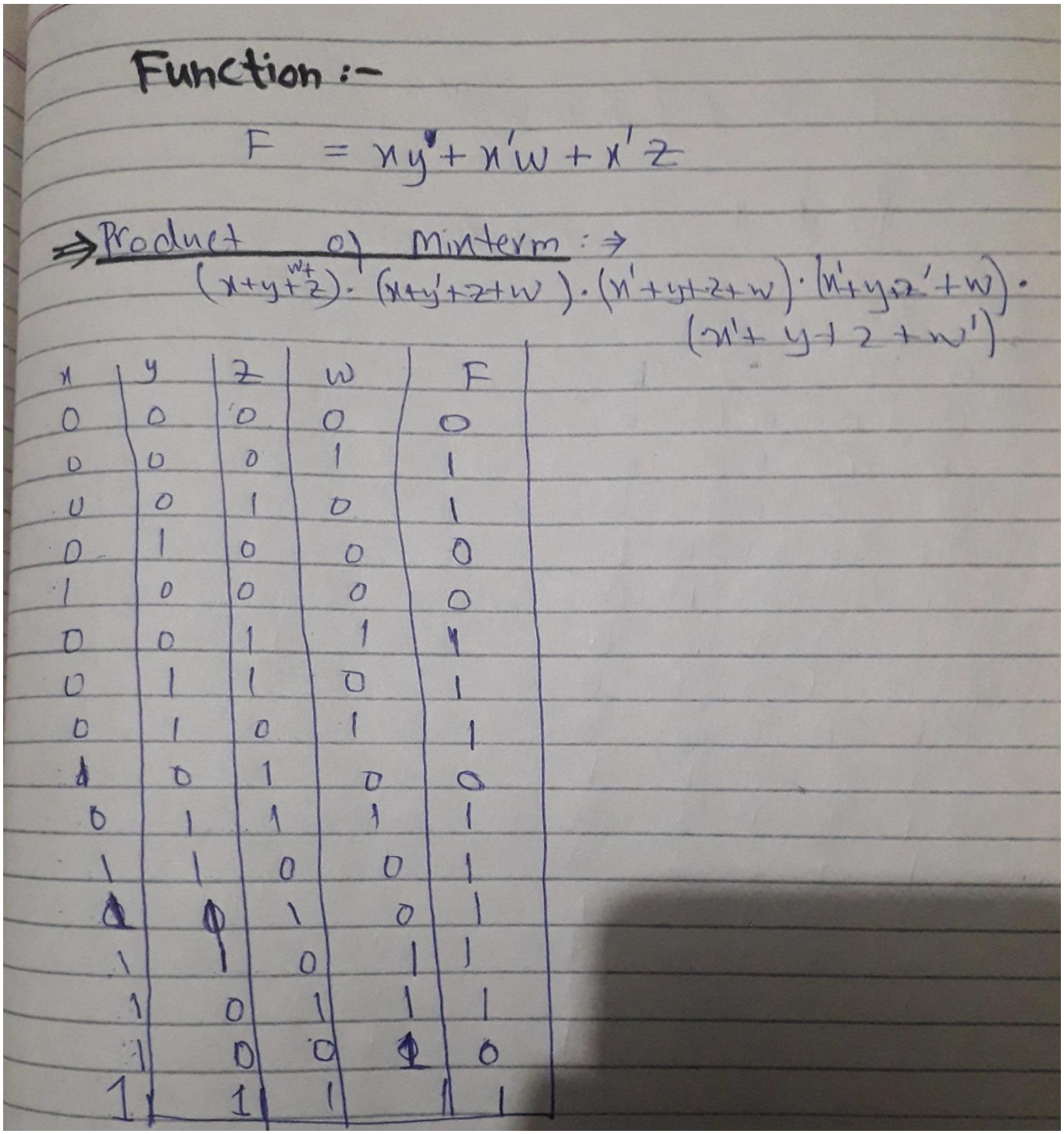
$x'yz + x'yz' + xyz'$

x	y	z	F
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	0



Q.no:-Think of five 4-variable functions and design circuits for them using product-of-maxterms technique.

No.1:-



Function :-

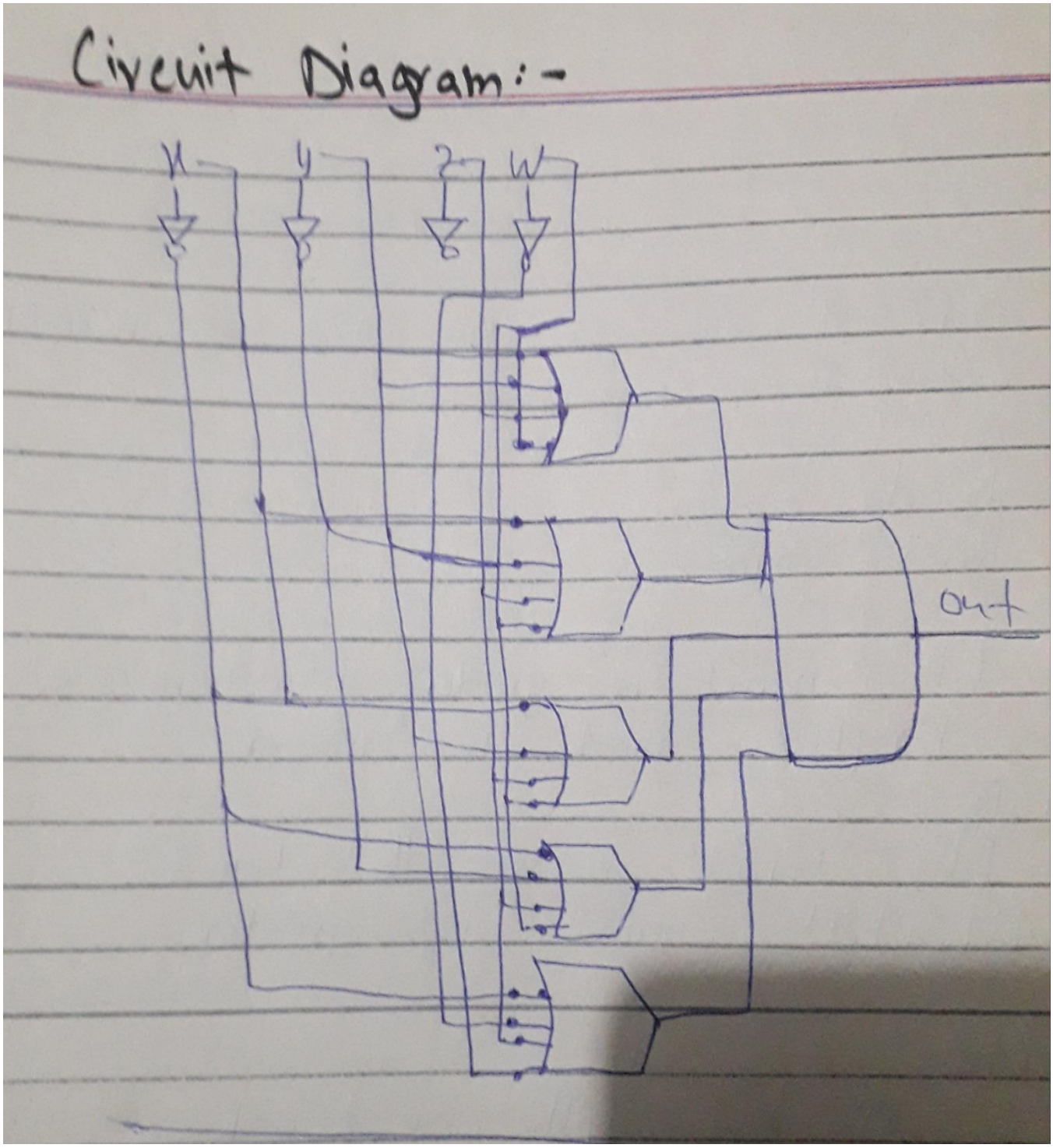
$$F = xy' + x'w + x'z$$

⇒ Product of Minterm :⇒

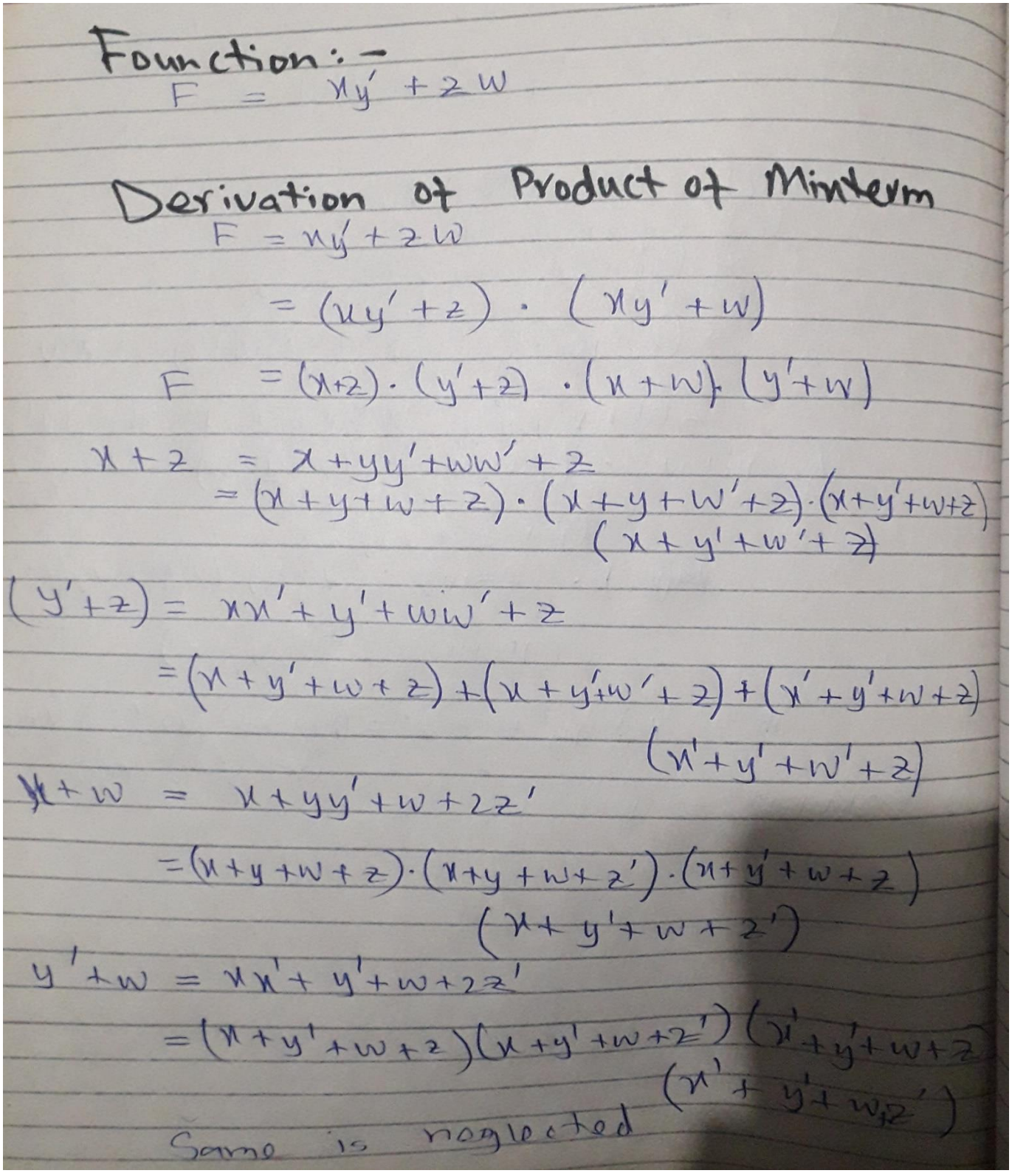
$$(x+y+w+z)\cdot(x+y'+z+w)\cdot(x'+y+z+w)\cdot(x'+y+z'+w)\cdot(x'+y+z+w')$$

x	y	z	w	F
0	0	0	0	0
0	0	0	1	1
0	0	1	0	1
0	1	0	0	0
1	0	0	0	0
0	0	1	1	1
0	1	1	0	1
0	1	0	1	1
1	0	1	0	0
0	1	1	1	1
1	1	0	0	1
1	0	1	0	1
1	1	0	1	1
1	0	1	1	1
1	0	0	1	0
1	1	1	1	1

Circuit Diagram:-



No.2:- In this function product of mixterm is find by booleon algebra.



Fonction :-

$F = xy' + zw$

Derivation of Product of Minterm

$F = xy' + zw$

$= (xy' + z) \cdot (xy' + w)$

$F = (x+z) \cdot (y'+z) \cdot (x+w) \cdot (y'+w)$

$x + z = x + yy' + ww' + z$

$= (x+y+w+z) \cdot (x+y+w'+z) \cdot (x+y'+w+z) \cdot (x+y'+w'+z)$

$(y'+z) = xx' + y' + ww' + z$

$= (x+y'+w+z) + (x+y'+w'+z) + (x'+y'+w+z) \cdot (x'+y'+w'+z)$

$x + w = x + yy' + w + zz'$

$= (x+y+w+z) \cdot (x+y+w+z') \cdot (x+y'+w+z) \cdot (x+y'+w+z')$

$y' + w = xx' + y' + w + zz'$

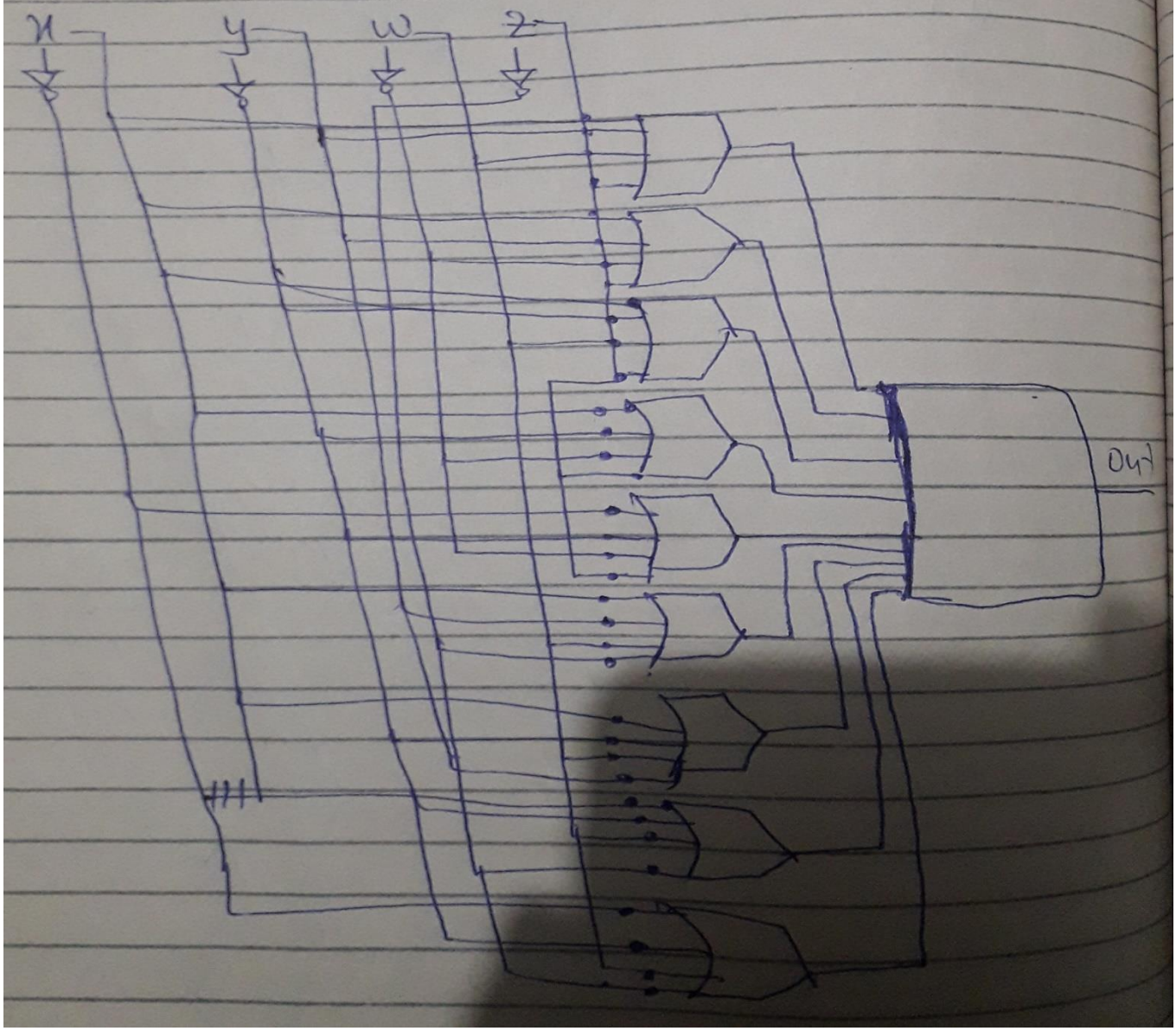
$= (x+y'+w+z)(x+y'+w+z')(x'+y'+w+z)(x'+y'+w+z')$

Same is neglected

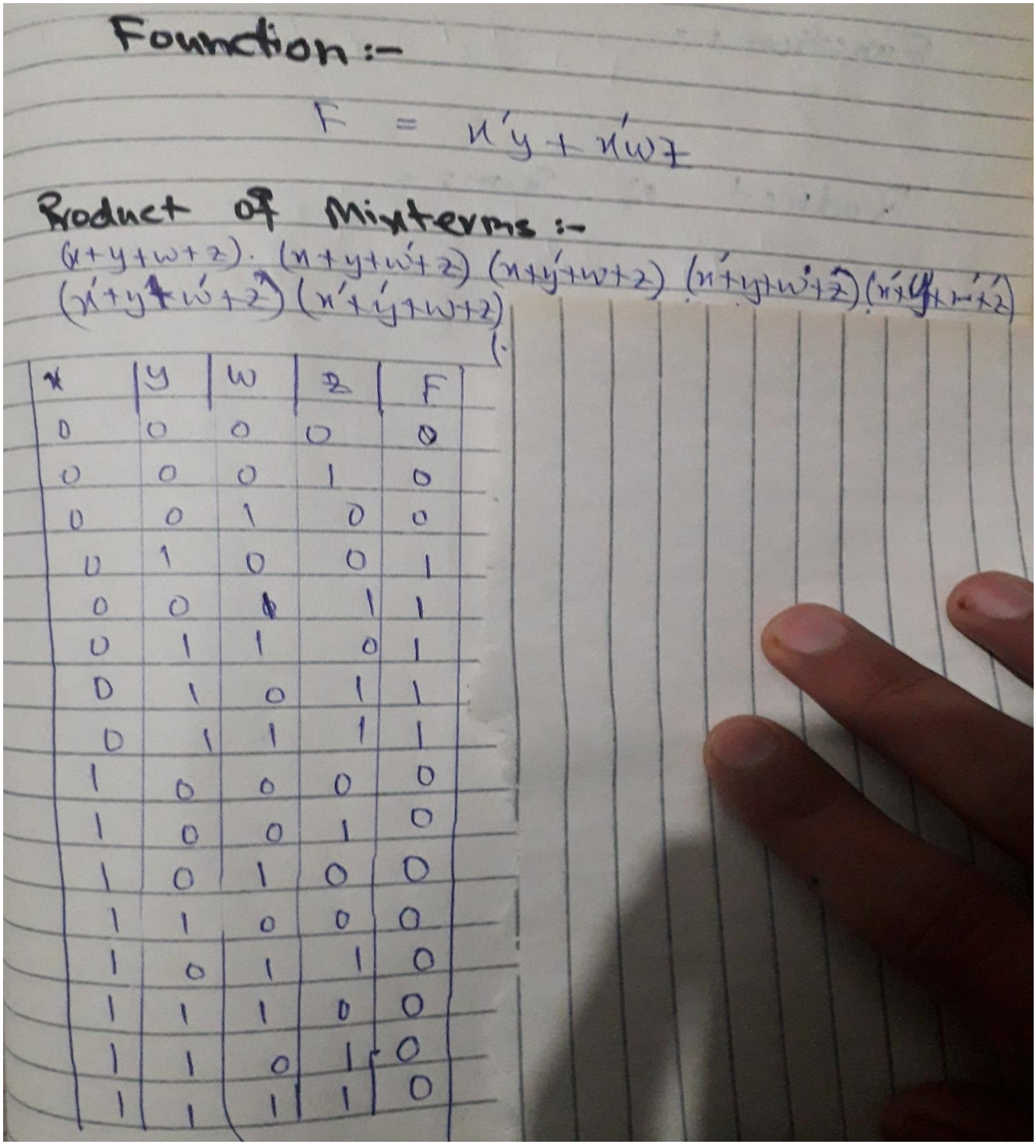
Product of Minterm:—

$F = (x+y+w+z)\cdot(x+y+w'+z)\cdot(x+y'+w+z)\cdot(x+y'+w'+z)\cdot(x'+y'+w'+z)\cdot(x+y+w+z')\cdot(x+y'+w+z)\cdot(x'+y'+w+z)$

Circuit diagram:-



No.3:-



Fonction :-

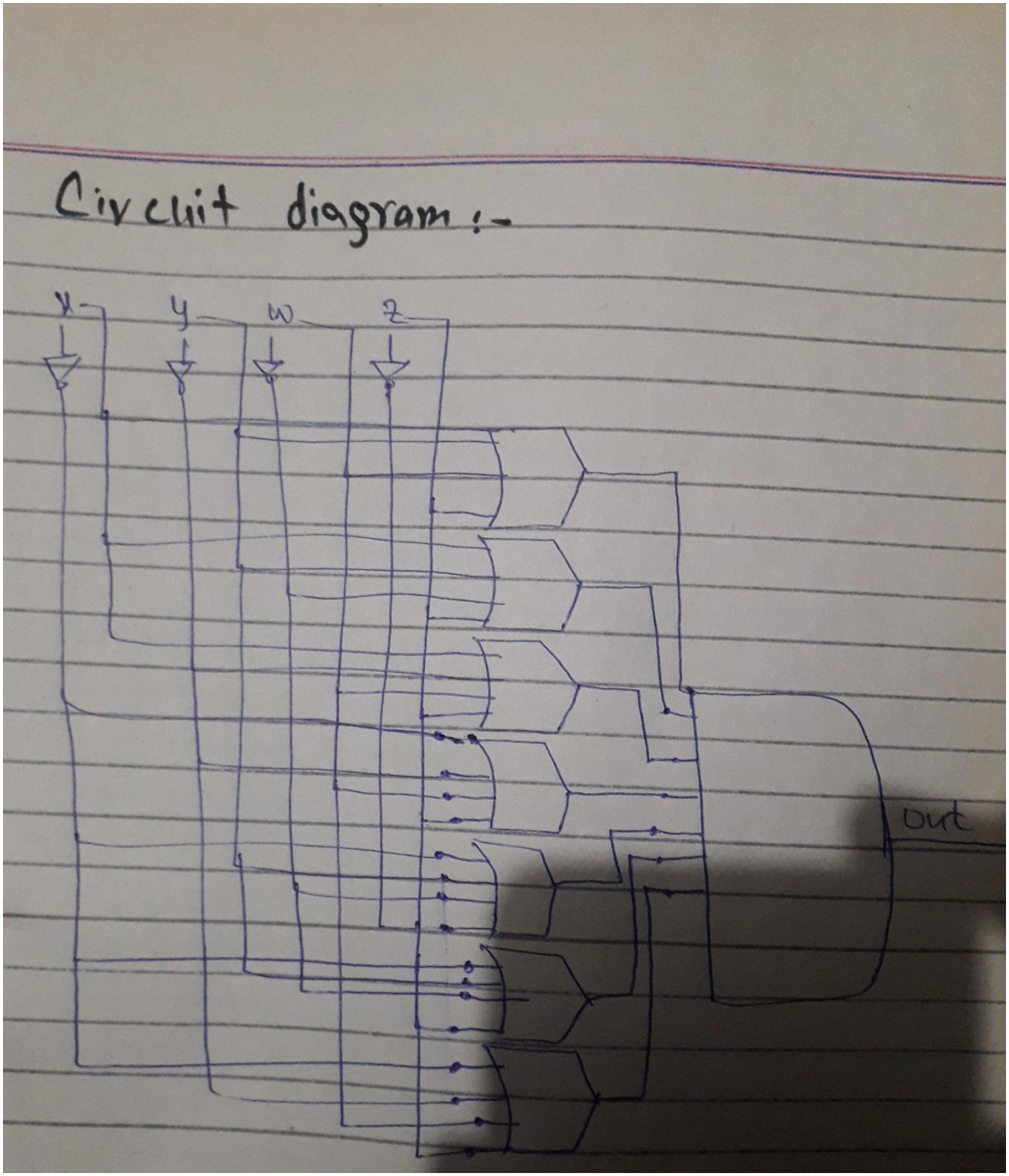
$F = x'y + x'w'z$

Product of Maxterms :-

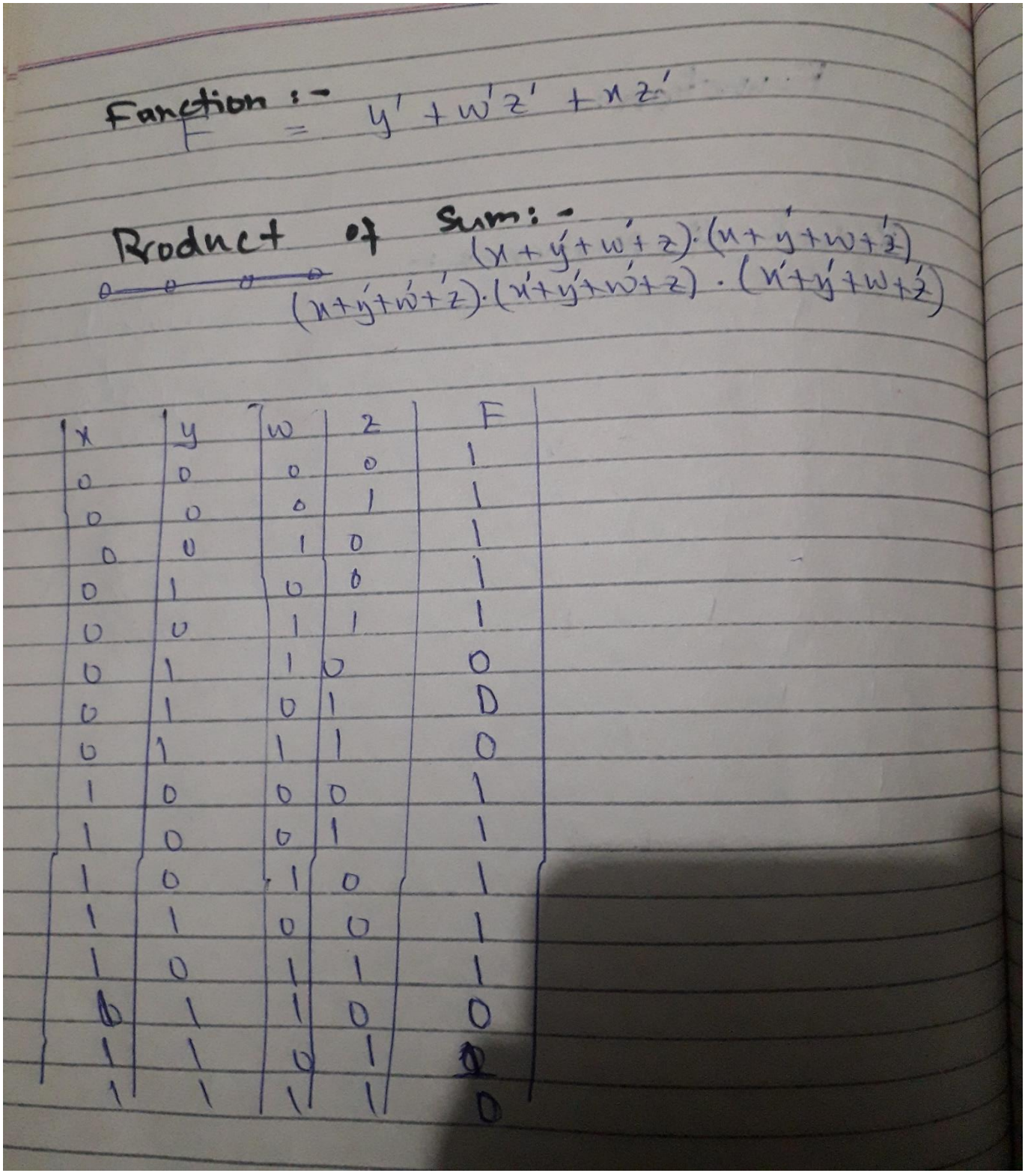
$(x+y+w+z).(x+y+w'+z)(x+y'+w+z)(x'+y+w'+z)(x'+y'+w'+z)$
$(x'+y+w'+z)(x'+y'+w+z)$

x	y	w	z	F
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	1	0	0	1
0	0	1	1	1
0	1	1	0	1
0	1	0	1	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	1	0	0	0
1	0	1	1	0
1	1	1	0	0
1	1	0	1	0
1	1	1	1	0

Circuit diagram :-



No.4:-



Function :-

$F = y' + w'z' + xz'$

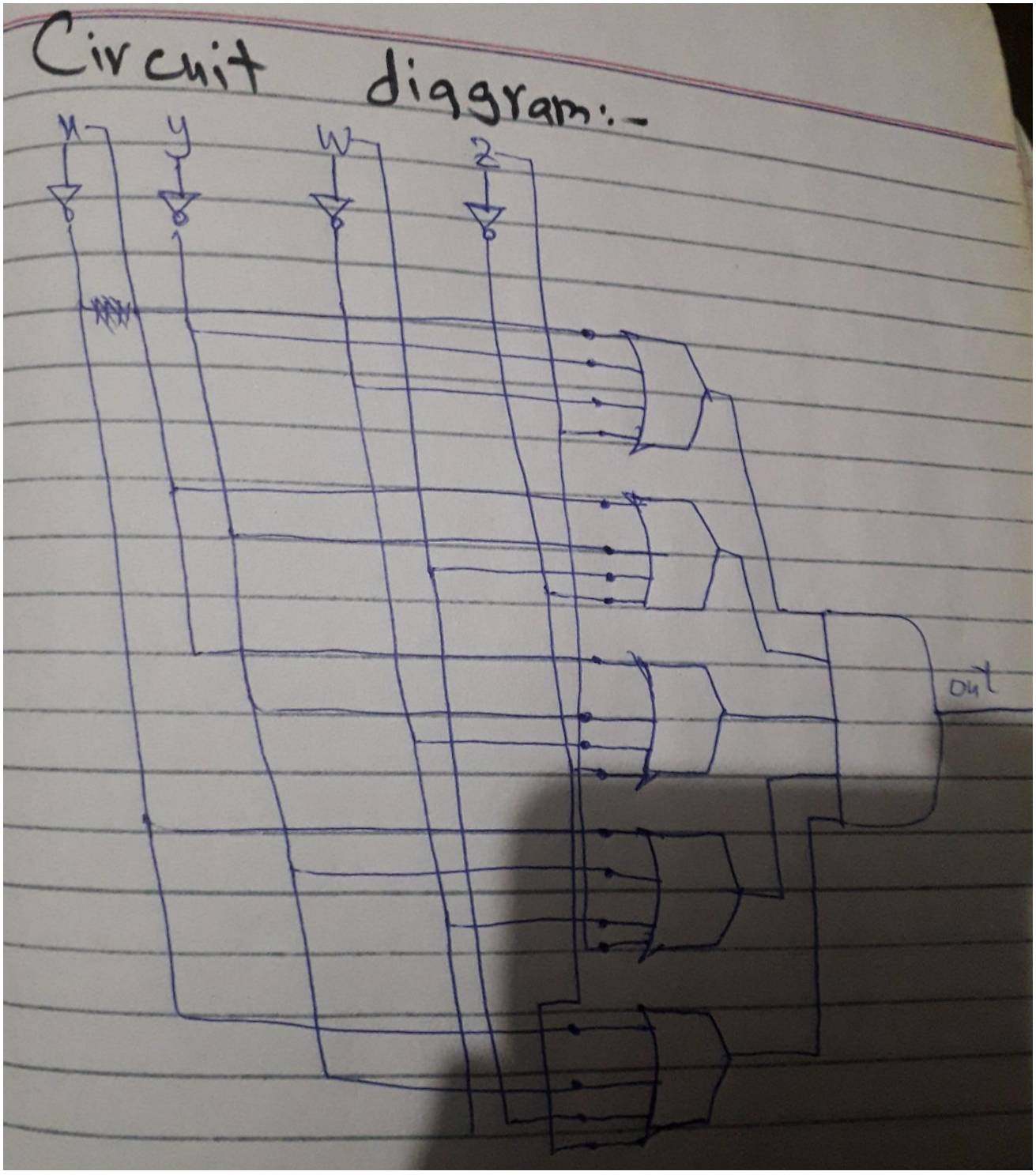
Product of Sum :-

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

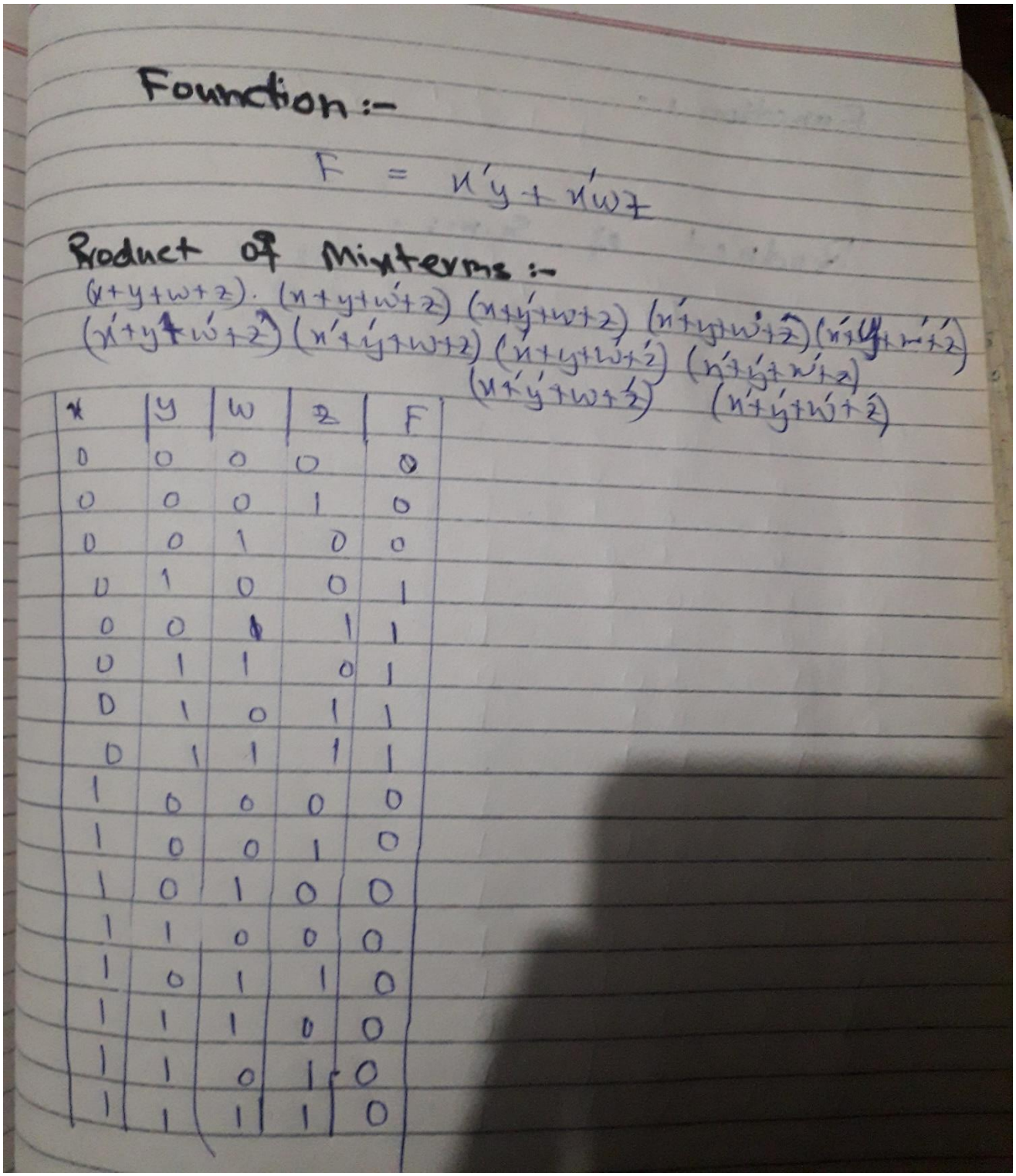
$(x + y' + w' + z) \cdot (x' + y' + w' + z) \cdot (x' + y' + w + z')$

x	y	w	z	F
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	1	0	0	1
0	0	1	1	1
0	1	1	0	0
0	1	0	1	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	1	0	0	1
1	0	1	1	1
1	1	1	0	0
1	1	0	1	0
1	1	1	1	0

Circuit diggram:-



No.5:-



Fonction :-

$$F = x'y + x'wz$$

Product of Maxterms :-

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

x	y	w	z	F
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	1	0	0	1
0	0	1	1	1
0	1	1	0	1
0	1	0	1	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	1	0	0	0
1	0	1	1	0
1	1	1	0	0
1	1	0	1	0
1	1	1	1	0

Circuit diagram :-