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Part ①

① 1- $F = \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + \bar{A}B\bar{C} + AB\bar{C} + ABC$

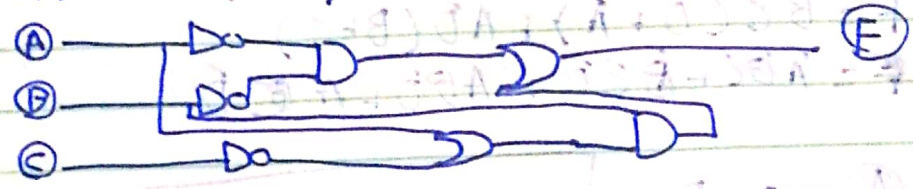
2- $F = \bar{A}\bar{B}(\bar{C}+C) + AB(\bar{C}+C) + \bar{A}B\bar{C}$

$F = \bar{A}\bar{B} + AB + \bar{A}B\bar{C}$

$F = \bar{A}\bar{B} + B(A + \bar{A}\bar{C})$

$F = \bar{A}\bar{B} + B(\bar{C} + A)$

3-



② 1) $F = \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + \bar{A}B\bar{C} + AB\bar{C} + A\bar{B}C + A\bar{B}\bar{C}$

2) $F = \bar{A}\bar{B}(\bar{C}+C) + B\bar{C}(\bar{A}+A) + A\bar{B}(\bar{C}+C)$

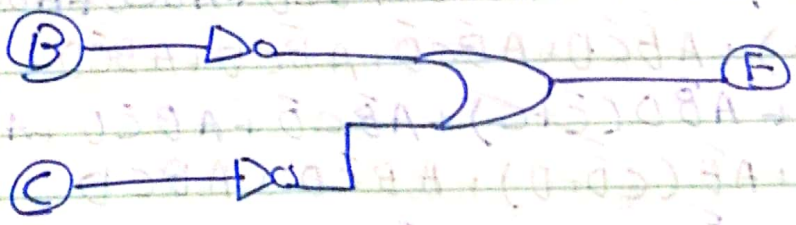
$F = \bar{A}\bar{B} + B\bar{C} + A\bar{B}$

$F = \bar{B}(\bar{A}+A) + B\bar{C}$

$F = \bar{B} + B\bar{C}$

$F = \bar{B} + \bar{C}$

3)



(3) 1) $F = \bar{A}B\bar{C}\bar{D} + \bar{A}B\bar{C}D + AB\bar{C}\bar{D} + A\bar{B}CD + ABC\bar{D} + AB\bar{C}\bar{D}$

2) $F = \bar{A}\bar{B}\bar{C}(\bar{D}+D) + AB\bar{C}\bar{D} + A\bar{B}C\bar{D} + ABC\bar{D} + AB\bar{C}\bar{D}$

$F = \bar{B}\bar{C}(\bar{A}+A\bar{D}) + AB\bar{C}\bar{D} + ABC\bar{D} + AB\bar{C}\bar{D}$

$F = \bar{B}\bar{C}(\bar{D}+\bar{A}) + A\bar{B}C\bar{D} + ABC\bar{D} + AB\bar{C}\bar{D}$

$F = \bar{B}\bar{C}(\bar{D}+\bar{A}) + AC\bar{D}(\bar{B}+B) + AB\bar{C}\bar{D}$

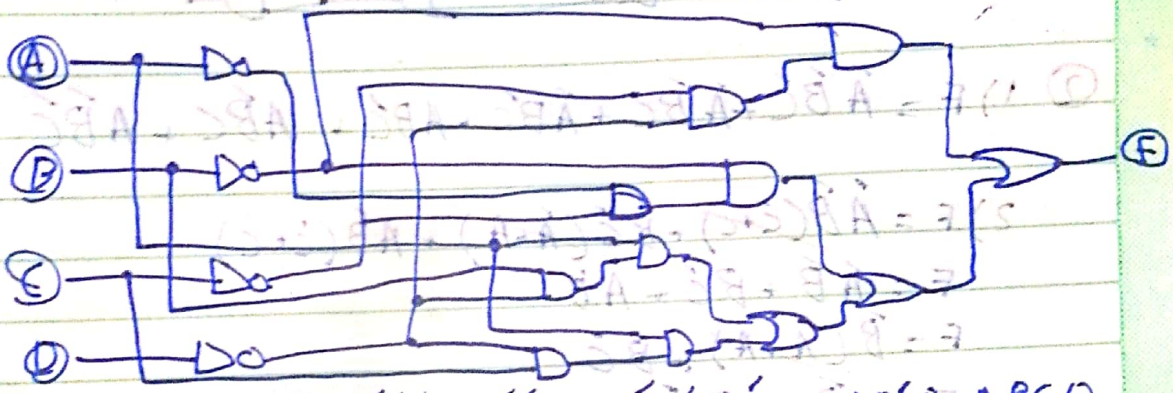
$F = \bar{B}\bar{C}(\bar{D}+\bar{A}) + AC\bar{D} + AB\bar{C}\bar{D}$

$F = \bar{B}\bar{C}(\bar{D}+\bar{A}) + A\bar{D}(C+B\bar{C})$

$F = \bar{B}\bar{C}(\bar{D}+\bar{A}) + A\bar{D}(B+C)$

$F = \bar{A}\bar{B}\bar{C} + \bar{B}\bar{C}\bar{D} + AB\bar{D} + A\bar{B}C\bar{D}$

3)



(4) 1) $F = \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}C\bar{D} + A\bar{B}\bar{C}\bar{D} + A\bar{B}\bar{C}D + A\bar{B}C\bar{D} + \bar{A}B\bar{C}D + AB\bar{C}D + ABCD$

2) $F = \bar{A}\bar{B}\bar{D}(\bar{C}+C) + A\bar{B}\bar{C}\bar{D} + AB\bar{C}D + AB\bar{C}\bar{D} + A\bar{B}CD + AB\bar{C}D + ABCD$

$F = \bar{B}\bar{D}(A\bar{C}+\bar{A}) + A\bar{B}\bar{C}D + A\bar{B}C\bar{D} + AB\bar{C}D + AB\bar{C}D + ABCD$

$F = \bar{B}\bar{D}(\bar{C}+\bar{A}) + A\bar{B}\bar{C}D + A\bar{B}C\bar{D} + AB\bar{C}D + AB\bar{C}D + AB\bar{C}D$

$F = \bar{B}\bar{D}(\bar{C}+\bar{A}) + A\bar{B}D(\bar{C}+C) + AB\bar{C}\bar{D} + AB\bar{C}D + ABCD$

$F = \bar{B}\bar{D}(\bar{C}+\bar{A}) + A\bar{B}(C\bar{D}+D) + AB\bar{C}D + ABCD$

$F = \bar{B}\bar{D}(\bar{C}+\bar{A}) + A\bar{B}(C+D) + AB\bar{C}D + ABCD$

$F = \bar{B}\bar{D}(\bar{C}+\bar{A}) + A\bar{B}(C+D) + AB\bar{D}(\bar{C}+C)$

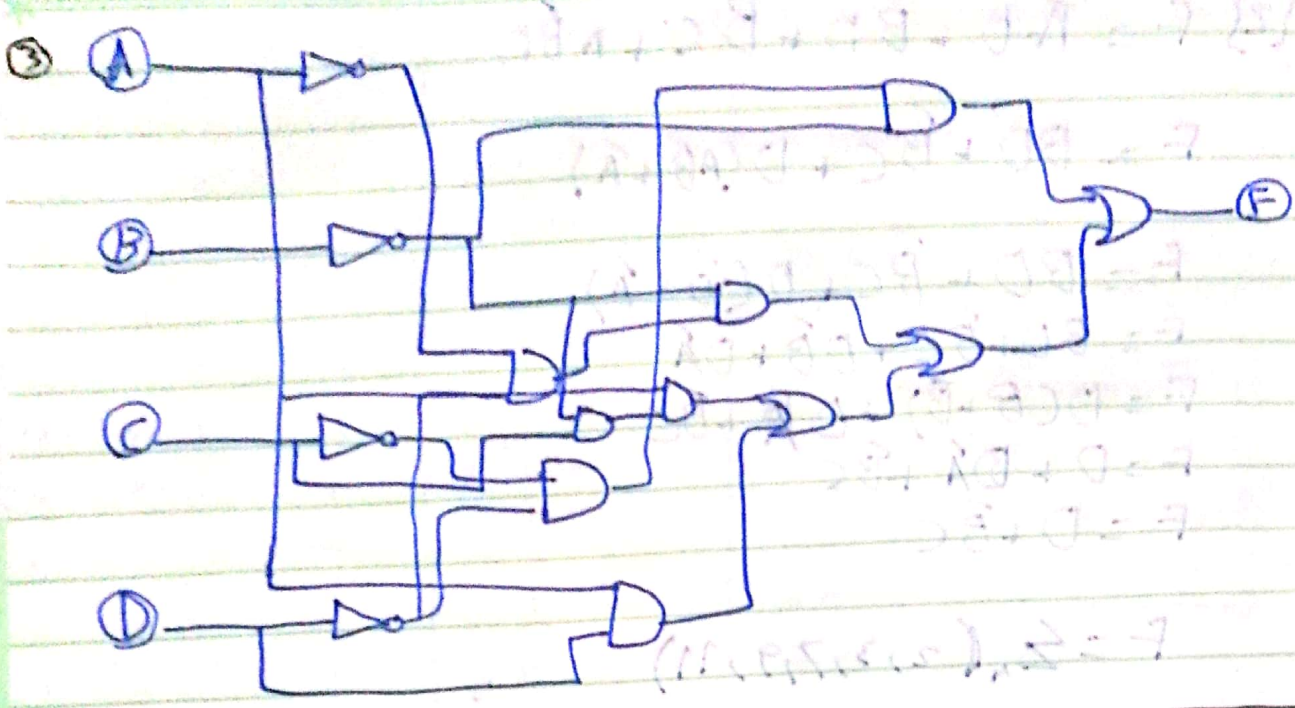
$F = \bar{B}\bar{D}(\bar{C}+\bar{A}) + A\bar{B}(C+D) + AB\bar{D}$

$F = \bar{B}C\bar{D} + \bar{A}\bar{B}\bar{D} + A\bar{B}C + A\bar{B}D + AB\bar{D}$

$F = \bar{B}C\bar{D} + \bar{A}\bar{B}\bar{D} + A\bar{B}C + A\bar{D}(\bar{B}+B)$

$F = \bar{B}C\bar{D} + \bar{A}\bar{B}\bar{D} + A\bar{B}C + AD$

③



Part 2 ① 1)

$F = AD + \bar{A}\bar{C}D + AB\bar{C}\bar{D}$
$11 + 10\,01 + 1110$

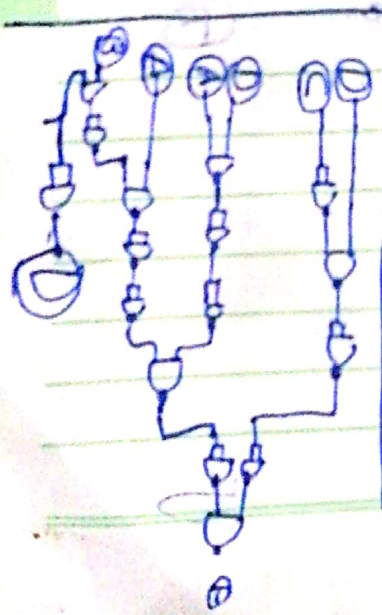
$F = D(A + \bar{A}\bar{C}) + AB\bar{C}\bar{D}$

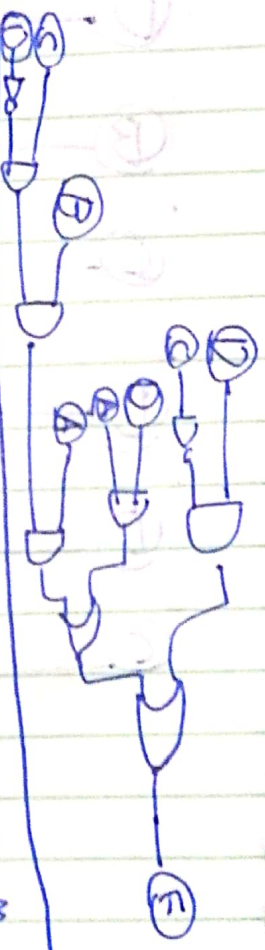
$F = D(A + \bar{C}) + AB\bar{C}\bar{D}$

$F = DA + D\bar{C} + AB\bar{C}\bar{D}$
$11 + 10 + 1110$

$F = m(0, 3, 11, 15)$

A	B	C	D	F	m
0	0	0	0	$\bar{A}\bar{B}\bar{C}\bar{D}$	✓ m_0
0	0	0	1	$\bar{A}\bar{B}\bar{C}D$	m_1
0	0	1	0	$\bar{A}\bar{B}C\bar{D}$	m_2
0	0	1	1	$\bar{A}\bar{B}CD$	✓ m_3
0	1	0	0	$\bar{A}B\bar{C}\bar{D}$	m_4
0	1	0	1	$\bar{A}B\bar{C}D$	m_5
0	1	1	0	$\bar{A}BC\bar{D}$	m_6
0	1	1	1	$\bar{A}BCD$	m_7
1	0	0	0	$A\bar{B}\bar{C}\bar{D}$	m_8
1	0	0	1	$A\bar{B}\bar{C}D$	m_9
1	0	1	0	$A\bar{B}C\bar{D}$	m_{10}
1	0	1	1	$A\bar{B}CD$	✓ m_{11}
1	1	0	0	$AB\bar{C}\bar{D}$	m_{12}
1	1	0	1	$AB\bar{C}D$	m_{13}
1	1	1	0	$ABC\bar{D}$	m_{14}
1	1	1	1	$ABCD$	✓ m_{15}





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[2] $F = \bar{A}D + BD + \bar{B}C + A\bar{B}D$

$F = BD + \bar{B}C + D(A\bar{B} + \bar{A})$

$F = BD + \bar{B}C + D(\bar{B} + \bar{A})$

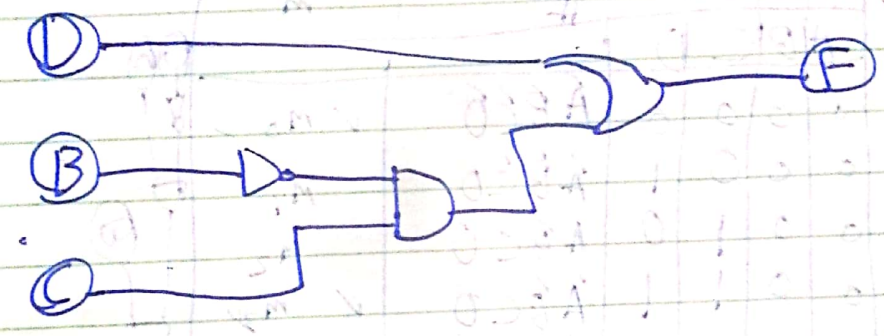
$F = BD + \bar{B}C + D\bar{B} + D\bar{A}$

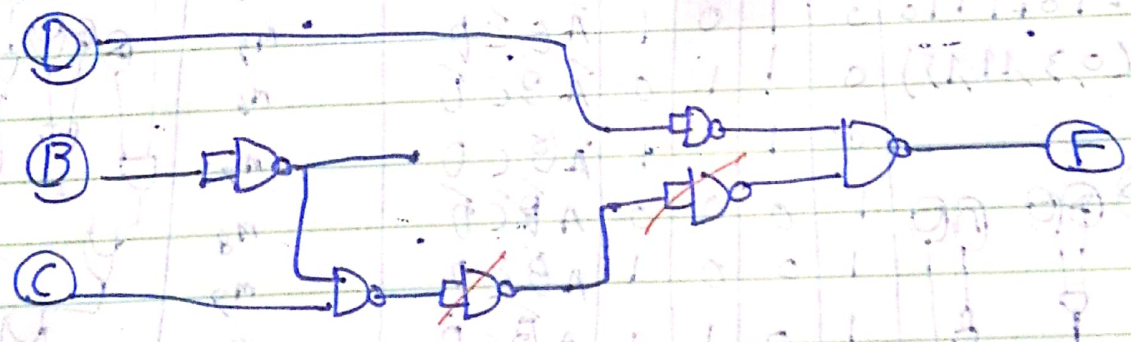
$F = D(B + \bar{B}) + D\bar{A} + \bar{B}C$

$F = D + D\bar{A} + \bar{B}C$

$F = D + \bar{B}C$

$F = \Sigma_M(2, 3, 7, 9, 11)$





(3)

W	X	y	z	F	m
0	0	0	0	$\bar{w}\bar{x}\bar{y}\bar{z}$	0
0	0	0	1	$\bar{w}\bar{x}\bar{y}z$	1
0	0	1	0	$\bar{w}\bar{x}y\bar{z}$	2
0	0	1	1	$\bar{w}\bar{x}yz$	3
0	1	0	0	$\bar{w}x\bar{y}\bar{z}$	4
0	1	0	1	$\bar{w}x\bar{y}z$	5
0	1	1	0	$\bar{w}xy\bar{z}$	6
0	1	1	1	$\bar{w}xyz$	7
1	0	0	0	$w\bar{x}\bar{y}\bar{z}$	8
1	0	0	1	$w\bar{x}\bar{y}z$	9
1	0	1	0	$w\bar{x}y\bar{z}$	10
1	0	1	1	$w\bar{x}yz$	11
1	1	0	0	$wx\bar{y}\bar{z}$	12
1	1	0	1	$wx\bar{y}z$	13
1	1	1	0	$wxy\bar{z}$	14
1	1	1	1	$wxyz$	15

(2)

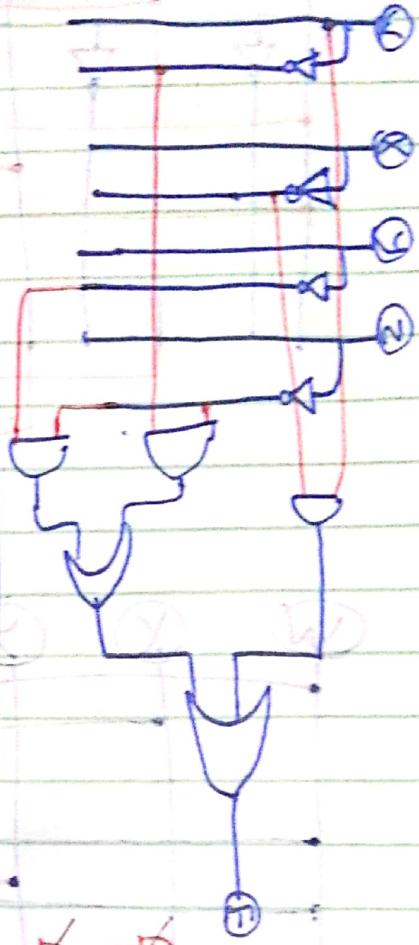
$F = w\bar{x} + \bar{y}\bar{z} + \bar{w}y\bar{z}$

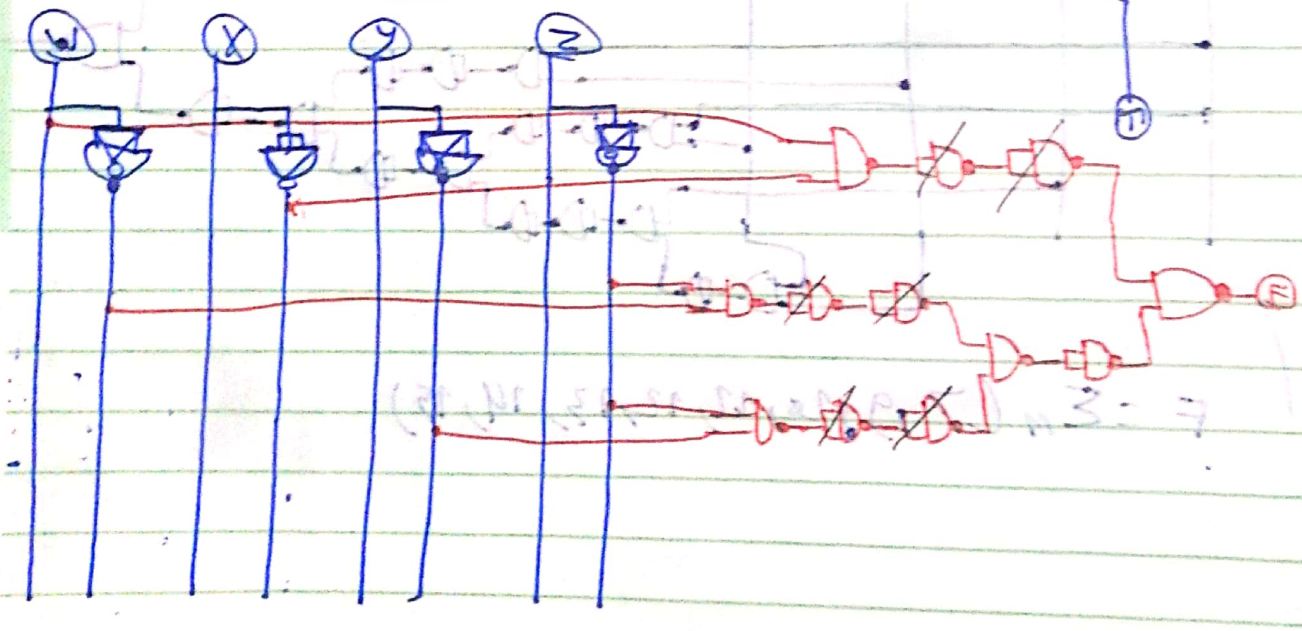
$F = w\bar{x} + \bar{z}(\bar{w}y + \bar{y})$

$F = w\bar{x} + \bar{z}(\bar{w} + \bar{y})$

$F = w\bar{x} + \bar{z}\bar{w} + \bar{z}\bar{y}$

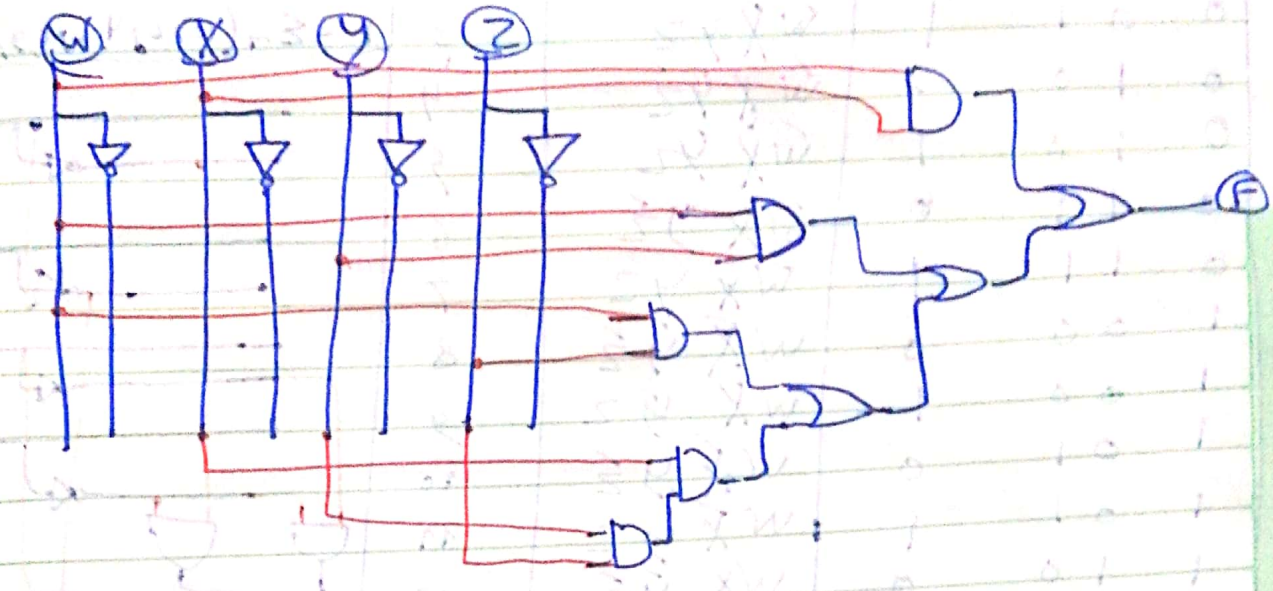
$F = \Sigma m(0,2,4,6,8,9,13,14)$

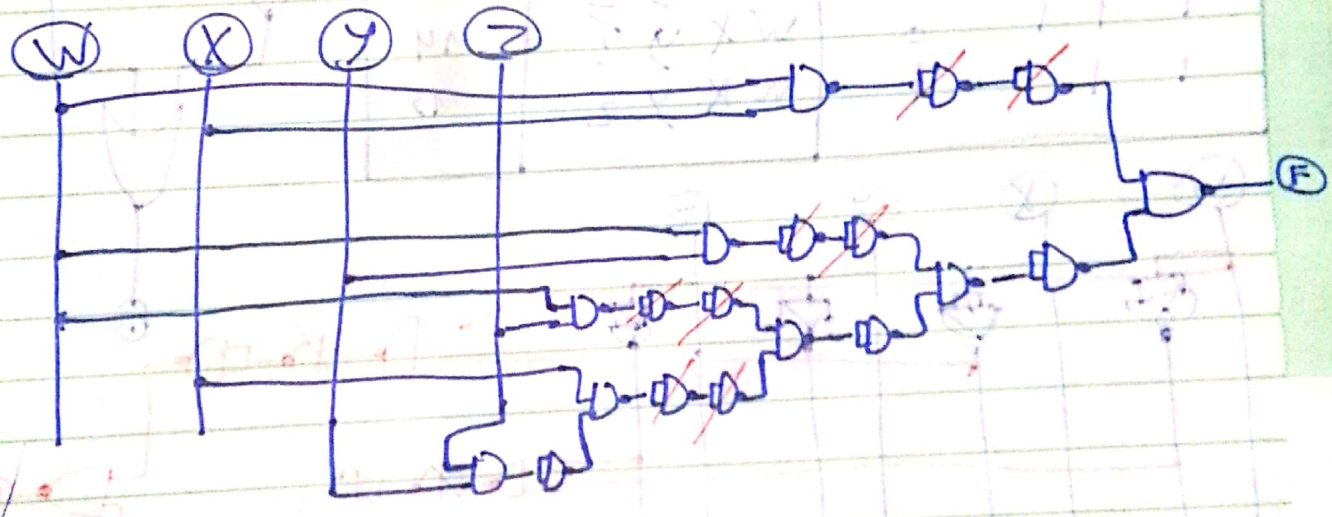




④ $F = W(X + Y + Z) + XYZ$

$F = WX + WY + WZ + XYZ$





$F = \Sigma_m (7, 9, 10, 11, 12, 13, 14, 15)$