Ödev - 3

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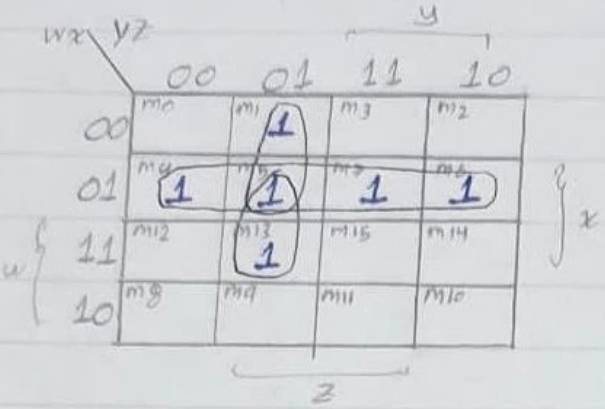
Q1.

(a) $F(w,x,y,z) = \Sigma(1,4,5,6,7,13)$

$m_1, m_4, m_5, m_6, m_7, m_{13}$

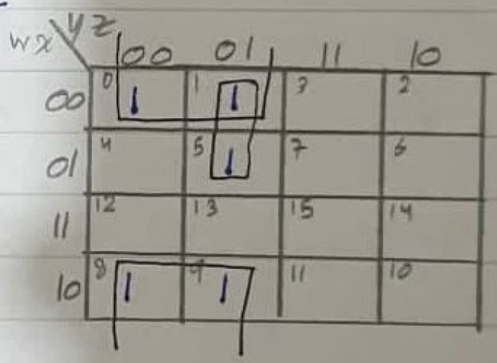


$F = (w'x'y'z + w'xy'z) + (w'xy'z' + w'xyz + w'xyz' + w'xyz') + (w'xy'z + wxy'z)$

$F = (w'y'z) + (w'x) + (xy'z)$ $\quad$ **$F = w'y'z + w'x + xy'z$**

(b)

$F(w,x,y,z) = \Sigma(0,1,5,8,9)$



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

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

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

Q2. (a) $wyz \xrightarrow{(x+\bar{x})} + \bar{w}\bar{x} \xrightarrow{(y+\bar{y})\cdot(z+\bar{z})} + wx\bar{z} \xrightarrow{(y\bar{y})}$

wx \ yz	00	01	11	10
00	0: 1	1: 1	3: 1	2: 1
01	4	5	7	6
11	12: 1	13	15: 1	14: 1
10	8	9	11: 1	10

~~$F = wxyz\bar{z} + w$~~

$F = w\bar{x}yz + wxyz + \bar{w}\bar{x}yz + w\bar{x}y\bar{z} + \bar{w}\bar{x}\bar{y}z + \bar{w}\bar{x}\bar{y}\bar{z} + wxy\bar{z} + wx\bar{y}\bar{z}$

$F = \Sigma(0, 1, 2, 3, 11, 12, 14, 15)$

(b) $A'B + A'CD + B'CD + BC'D' \xrightarrow{(C+C')\cdot(D+D')} \xrightarrow{(B+B')} \xrightarrow{(A+\bar{A})} \rightarrow 1(A+\bar{A})$

$= \bar{A}B\bar{C}D + \bar{A}BC\bar{D} + \bar{A}BCD + \bar{A}B\bar{C}\bar{D} + \cancel{A'B'CD} \bar{A}\bar{B}CD + \bar{A}BCD + A\bar{B}CD + \bar{A}\bar{B}CD + \bar{A}BC\bar{D} + AB\bar{C}\bar{D}$

AB \ CD	00	01	11	10
00	0	1	3: 1	2
01	4: 1	5: 1	7: 1	6: 1
11	12: 1	13	15	14
10	8	9	11: 1	10

$F = \Sigma(3, 4, 5, 6, 7, 11, 12)$

Q3. (a) $F(w, x, y, z) = \Sigma(0, 1, 2, 5, 8, 10, 13)$ POS

wx \ yz	00	01	11	10
00	0: 1	1: 1	3: 0	2: 1
01	4: 0	5: 1	7: 0	6: 0
11	12: 0	13: 1	5: 0	14: 0
10	8: 1	9: 0	11: 0	10: 1

$A\bar{B}D$ $B\bar{D}$

~~$F = (B\bar{C} + CD + AB\bar{D})'$~~

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

$F' = xz' + yz + wxz'$

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

$F(A,B,C,D) = \Pi(1, 3, 6, 9, 11, 12, 14)$

(b)

AB \ CD	00	01	11	10
00	0: 1	1: 0	3: 0	2: 1
01	4: 1	5: 1	7: 1	6: 0
11	12: 0	13: 1	15: 1	14: 0
10	8: 1	9: 0	11: 0	10: 1

$\rightarrow B\bar{C}\bar{D}$

$\rightarrow AB\bar{D}$

$\bar{B}C$

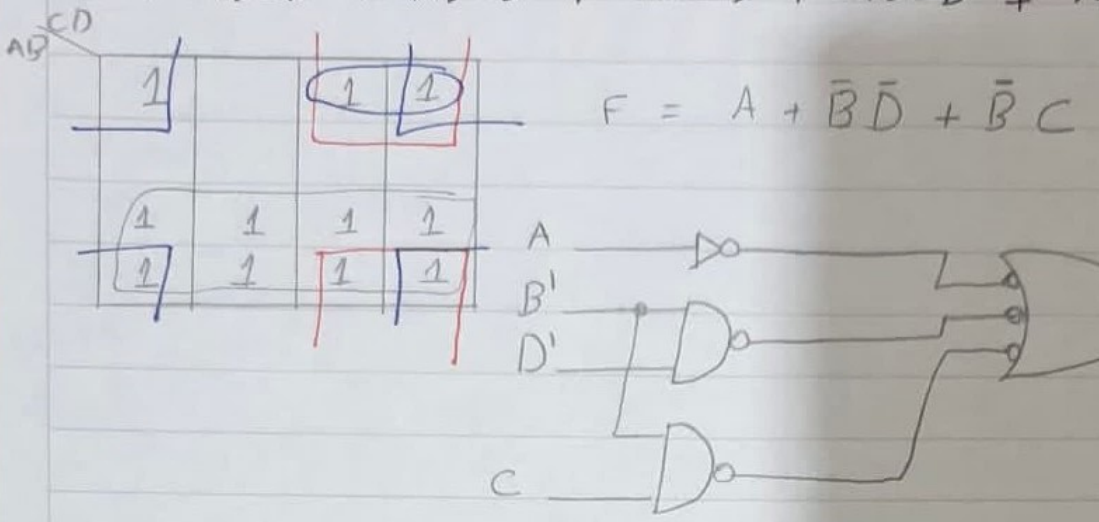
$F = (\bar{B}\bar{D} + B\bar{C}\bar{D} + AB\bar{D})'$

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

Q4. (a)

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

$$= \bar{A}\bar{B}C\bar{D} + \bar{A}\bar{B}C\bar{D} + AB\bar{C}\bar{D} + AB\bar{C}D + AB\bar{C}\bar{D} + A\bar{B}\bar{C}\bar{D}$$
$$+ ABCD + A\bar{B}CD + ABC\bar{D} + A\bar{B}C\bar{D} + \bar{A}\bar{B}C\bar{D}$$



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

(b)

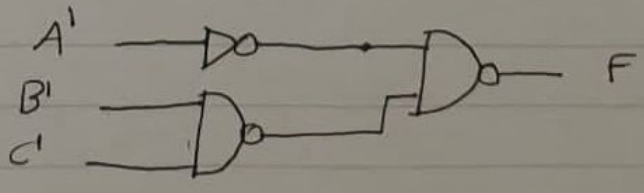
$$F(A,B,C) = (\bar{A}+\bar{B}+\bar{C})(\bar{A}+\bar{B})(\bar{A}+\bar{C})$$

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

AB \ C			
1	1	1	1
1	0	0	0

$$F = A' + B'C'$$

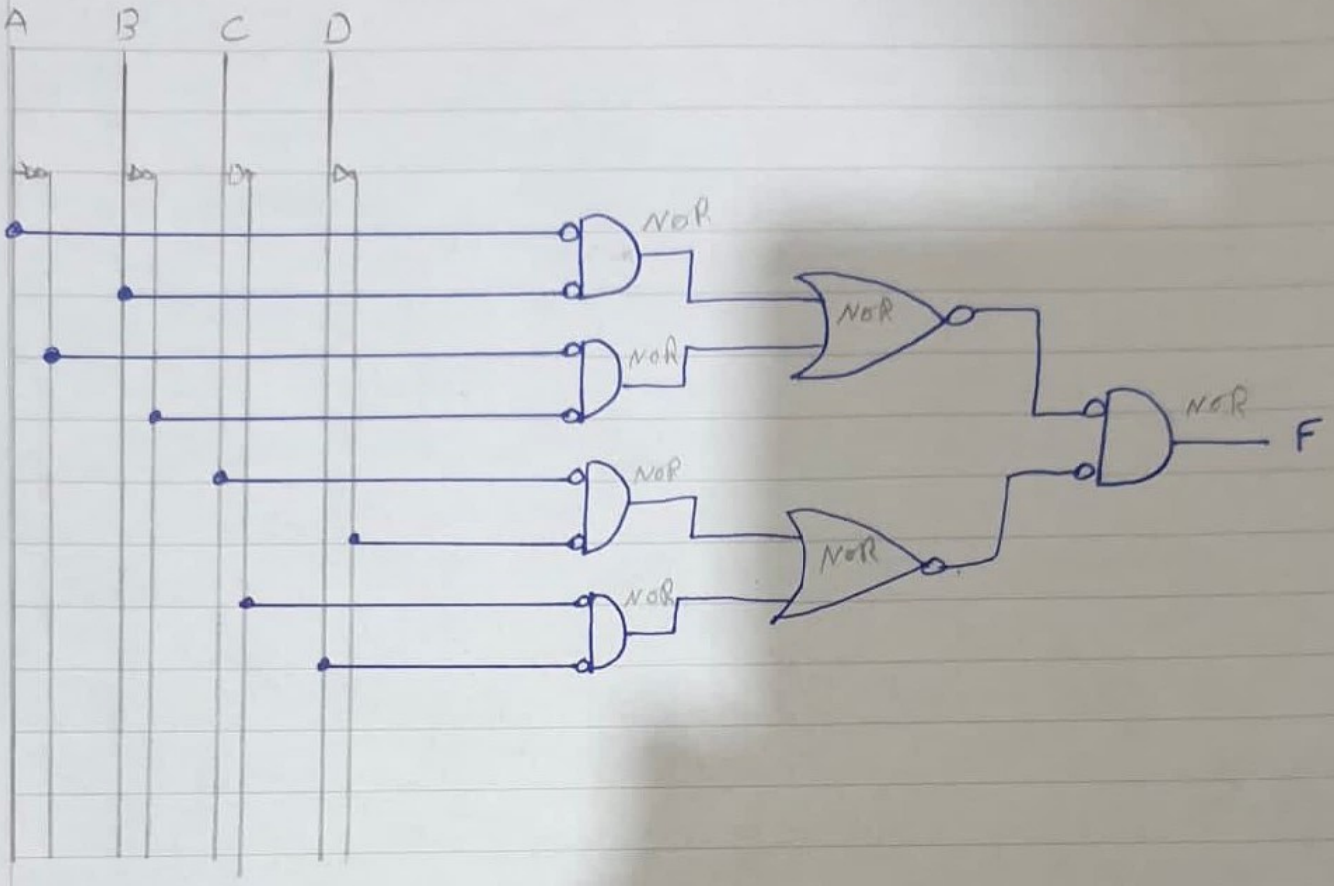
$$F = (A.(B'.C')')'$$



Q5

$$F(A,B,C,D) = (A \oplus B)' \cdot (C \oplus D)$$

$$= (AB + A'B') \cdot (CD' + C'D)$$



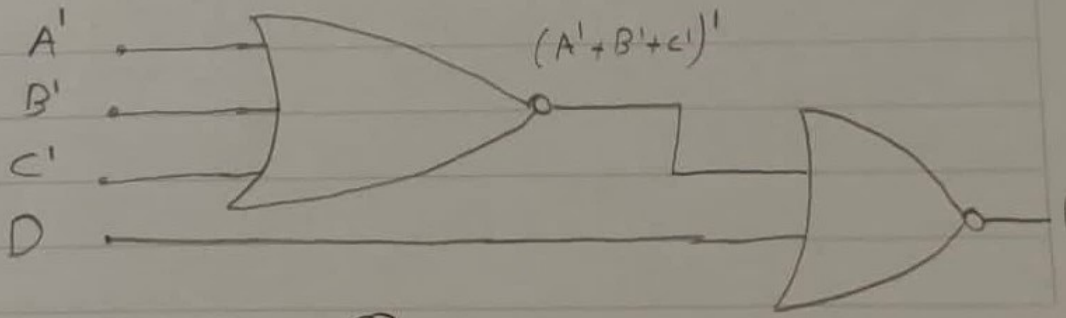
Q6. $F(A,B,C,D) = \Sigma(2,4,6,10,12)$

$d(A,B,C,D) = \Sigma(0,8,9,13)$

AB \ CD	00	01	11	10
00	x	0	0	1
01	1	0	0	1
11	1	x	0	0
10	x	x	0	1

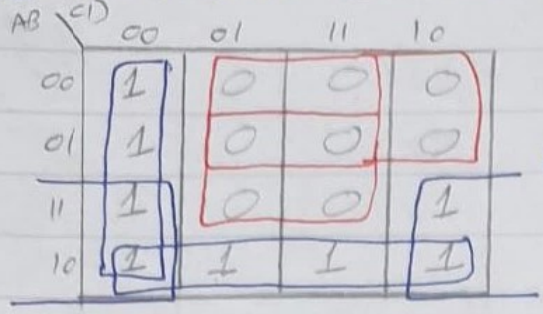
$$F = (D + ABC)'$$

$$F = \left(D + (A' + B' + C')'\right)'$$



Q7. $F(A,B,C,D) = \Sigma(0,4,8,9,10,11,12,14)$

(a) NAND-AND (b) AND-OR (c) OR-NAND (d) NOR-OR



$F = (A'D + A'C + BD)'$ → (b)

$F = (A'D)' . (A'C) . (BD)'$ → (a)

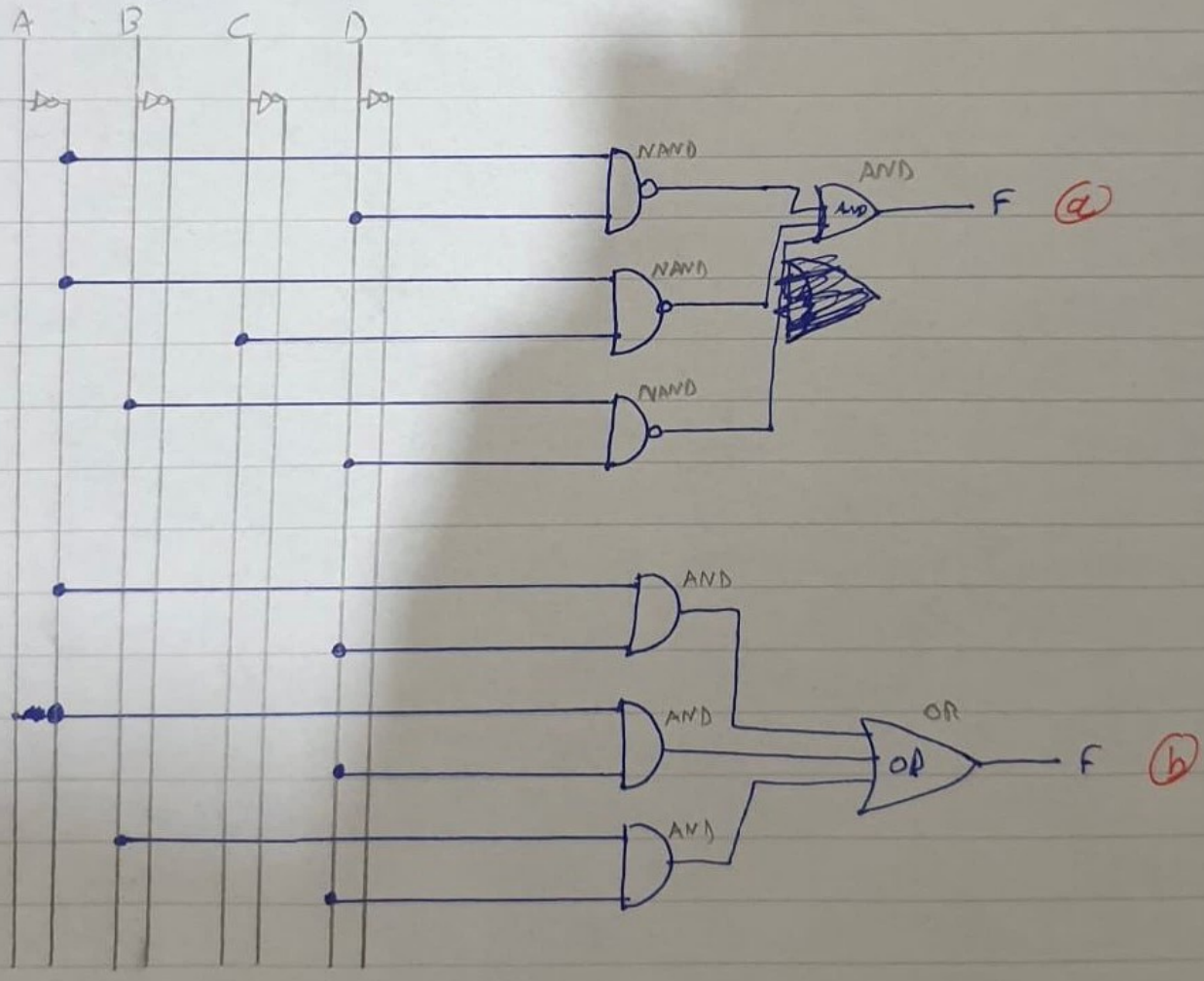
$F = (((C'D' + AB' + AD')')')'$

$F = ((C'D)' . (AB')' . (AD)')'$

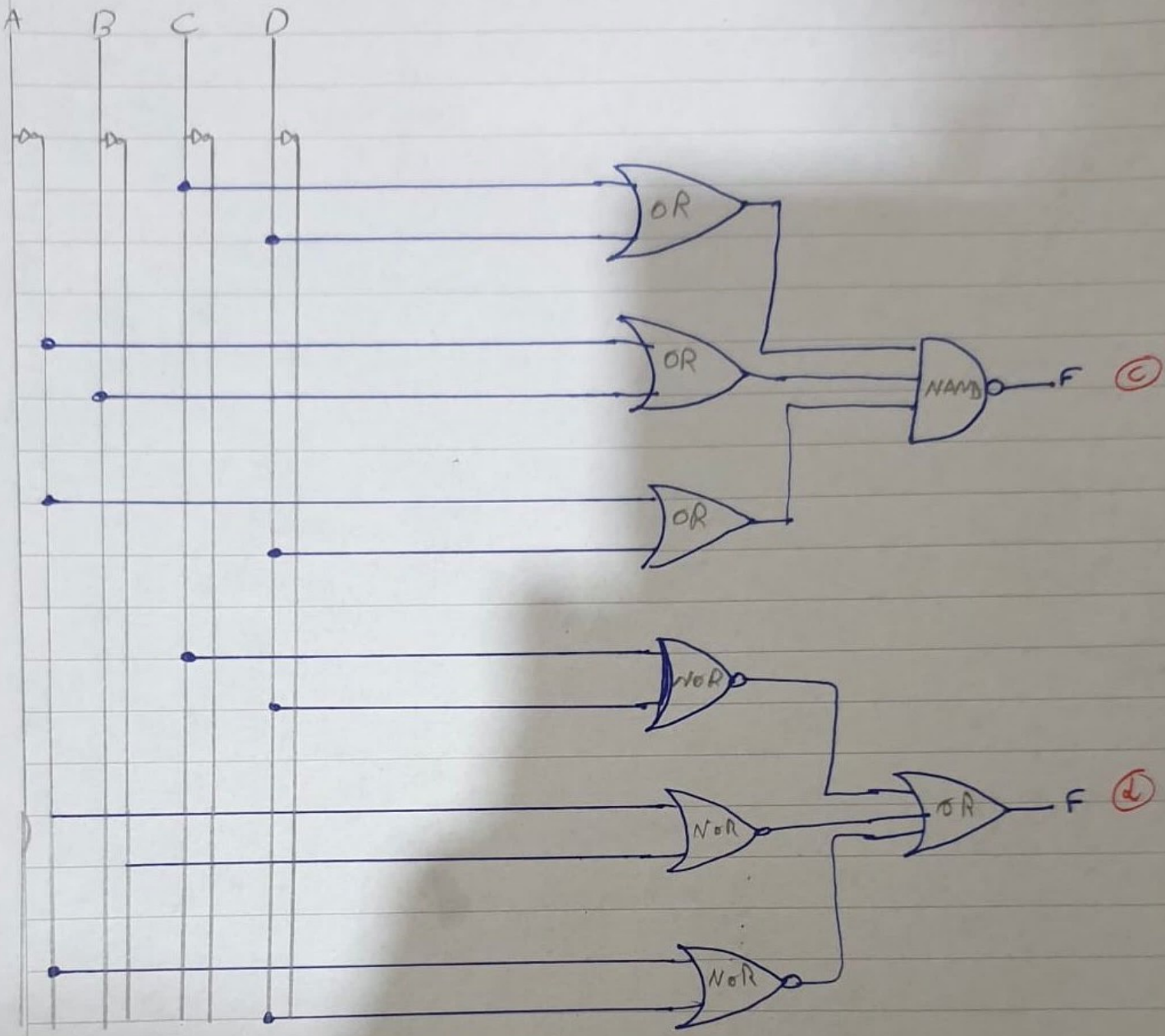
$F = ((C+D)(A'+B)(A'+D))'$ → (c)

$F = C'D' + AB' + AD'$

$F = (C+D)' + (A'+B)' + (A'+D)'$ → (d)



Q7.



$D = A \oplus B \oplus C$

$F = ABC' + (A' + B')C$

$F = (AB)C' + (AB)C' \Rightarrow F = (AB) \oplus C$