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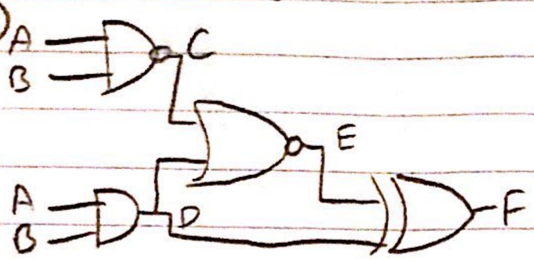
Academic Honesty: [signature]

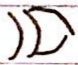
CSM51A Assignment 2

1a)



 = AND

 = OR

 = XOR

$C = (AB)'$, $D = (AB)$, $E = (C+D)'$
$F = (D \oplus E)$

A B	C D E	F
0 0	1 0 0	0
0 1	1 0 0	0
1 0	1 0 0	0
1 1	0 1 0	1

✓ 1b) $F = (DE' + D'E)$

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

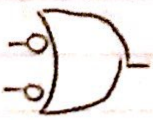
$F = AB((AB)' + AB) + (AB)'((AB)' + AB)'$

$F = AB(1) + (AB)'((AB)(AB)')$

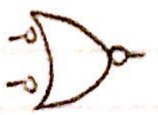
$F = AB + (AB)'(0)$

$\boxed{F = AB}$

2)  = NAND

 = AND

 = NOR

 = NAND

3a)

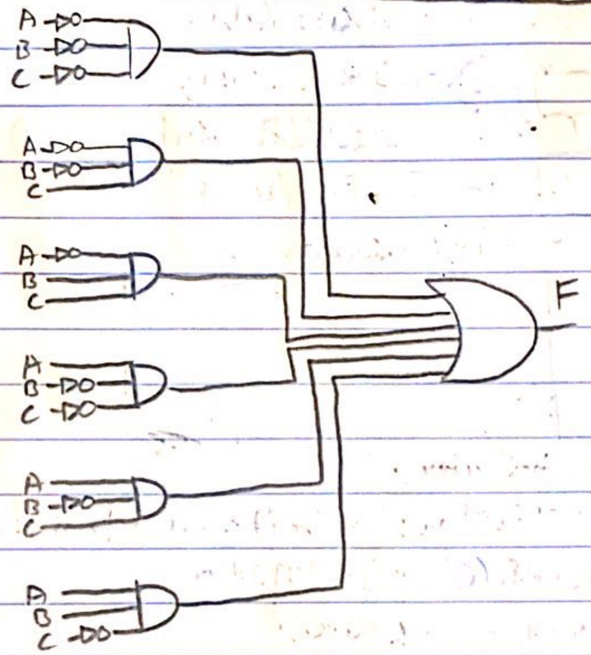
A	B	C	F
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

$\boxed{\text{ID: 305 413 659}}$

3b) $\boxed{F(A,B,C) = A'B'C' + A'B'C + A'BC + AB'C' + AB'C + ABC'}$

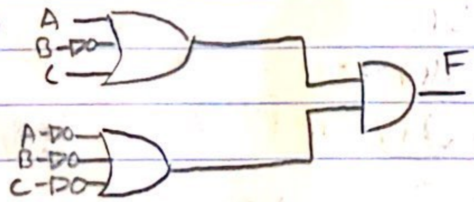
$\boxed{= m_0 + m_1 + m_3 + m_4 + m_5 + m_6 = \Sigma(0,1,3,4,5,6)}$

3c)



3d) $\boxed{F(A,B,C) = (A+B'+C)\cdot(A'+B'+C')} = \boxed{M_2 \cdot M_7 = \Pi(2,7)}$

3e)



4a)

A	B	C	D	E	F	G	H
0	0	0	1	0	1	0	0
0	0	1	1	0	0	0	1
0	1	0	1	0	1	0	0
0	1	1	1	1	0	0	1
1	0	0	0	0	1	0	0
1	0	1	1	0	1	0	0
1	1	0	0	0	1	0	0
1	1	1	1	1	1	1	1

$D = (AC')' = A' + C$

$E = BC$

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

$G = (DEF)$

$H = (F \oplus G)' = F'G' + FG$

✓ 4b) $G=DEF$

$G=(A'+C)(BC)(A+C')$ - Substitute

$G=(A'BC+BCC)(A+C')$ - Distributivity

$G=(A'BC+BC)(A+C')$ - Idempotency

$G=BC(A'+1)(A+C')$ - Distributivity

$G=BC(1)(A+C')$ - Identity

$G=ABC+ABCC'$ - Distributivity

$\boxed{G=ABC}$ - Complement

$H=F'G'+FG$

$H=F'(ABC)'+F(ABC)$ } Substitute

$H=(A+C')'(ABC)'+(A+C')(ABC)$

$H=(A+C'+ABC)'+AABC+ABCC'$ - De Morgan's + Distributivity

$H=(A+C')'+AABC+ABCC'$ - Absorption

$H=(A+C')'+ABC+0$ - Idempotency

$H=A'C+ABC$ - De Morgan's

$H=C(A'+AB)$ - Distributivity

$\boxed{H=A'C+BC \text{ - Simplification}}$

✓ 5a) $F=AB+ABC+A'+B'+BC$

$F=AB+A'+B'+BC$ - Absorption

$F=A'+B+B'+BC$ - Simplification

$\boxed{F=1}$ - Complement

✓ 5b) $F=A+A'B+A'B'C+A'B'C'D+A'B'C'D'E$

$F=A+B+A'B'C+A'B'C'D+A'B'C'D'E$ - Simplification

$F=A+B+C+A'B'C'D+A'B'C'D'E$ - Simplification

$\boxed{F=A+B+C+D+E}$ - Simplification

✓ 5c) $F=A'B'+AB+A'B$

$F=A'B'+B(A+A')$ - Distributivity

$F=A'B'+B$ - Complement

$\boxed{F=A'+B \text{ - Simplification}}$

✓ 5d) $F=(AB'+C')(B'+C)(A+BC')$

$F=(AB'+C')(A+BC'')(B'+C)$ - Associativity

$F=(AB'+C')(A+(B'+C)')(B'+C)$ - De Morgan's Law

$F=(AB'+C')(B'+C)((B+C)'+A)$ - Associativity

$F=(AB'+C')(B'+C)A$ - Simplification

$F=(AB'+C')(AB'+AC)$ - Distributivity

$F=AB'(C'AC)$ - Distributivity

$\boxed{F=AB'}$ - Complement

✓ 5e) $F=A'+A(A'B+B'C)'$

$F=A'+A((A'B)'(B'C)')$ - De Morgan's

$F=A'+A((A+B')(B+C'))$ - De Morgan's

$F=A'+A(A+B')(B+C')$ - Associativity

$F=A'+(A+AB')(B+C')$ - Distributivity + Idempotency

$F=A'+A(B+C')$ - Absorption

$F=A'+AB+C'$ - Distributivity

$\boxed{F=A'+B+C'}$ - Simplification

✓ 5f) $F=(A'B'+C)(A+B)(B'+AC)'$

$F=(A'B'+C)(A+B)(B(AC)')$ - De Morgan's

$F=((A+B)'+C)(A+B)(B(AC)')$ - De Morgan's

$F=C(A+B)(B(AC)')$ - Simplification

$F=(AC+BC)(B(A'+C'))$ - Distributivity + De Morgan's

$F=(AC+BC)(A'B+BC')$ - Distributivity

$F=C(A+B)B(A'+B')$ - Distributivity

$F=BC(A+B)(A'+B')$ - Associativity

$F=BC(A'+B')$ - Absorption

$F=A'BC+B'BC$ - Distributivity

$\boxed{F=A'BC \text{ - Complement}}$

√ 6) $E(A,B) = (A+B')(A'+B')$

$E(A,B) = (A(A'+B') + B'(A'+B'))$ - Distributivity

$E(A,B) = (AA' + AB' + A'B' + B'B')$ - Distributivity

$E(A,B) = (AB' + A'B' + B')$ - Complement

$E(A,B) = AB' + A'B' + (A+A')B'$

$E(A,B) = AB' + A'B' + AB' + A'B'$

$\boxed{E(A,B) = AB' + A'B'} = \boxed{m_0 + m_2 = \Sigma(0,2)}$

√ 7) $E(A,B,C) = A'B'C' + A'BC' + AB'C + ABC$

$E(A,B,C) = A'C'(B'+B) + AC(B'+B)$ - Distributivity

$E(A,B,C) = A'C' + AC$ - Complement

$E(A,B,C) = (A'C'+A)(A'C'+C)$ - Distributivity

$E(A,B,C) = (A+C')(A'+C)$ - Simplification

$E(A,B,C) = (A+BB'+C')(A'+BB'+C)$

$\boxed{E(A,B,C) = (A+B+C')(A+B'+C')(A'+B+C)(A'+B'+C)}$

$\boxed{E(A,B,C) = M_1 \cdot M_3 \cdot M_4 \cdot M_6 = \Pi(1,3,4,6)}$

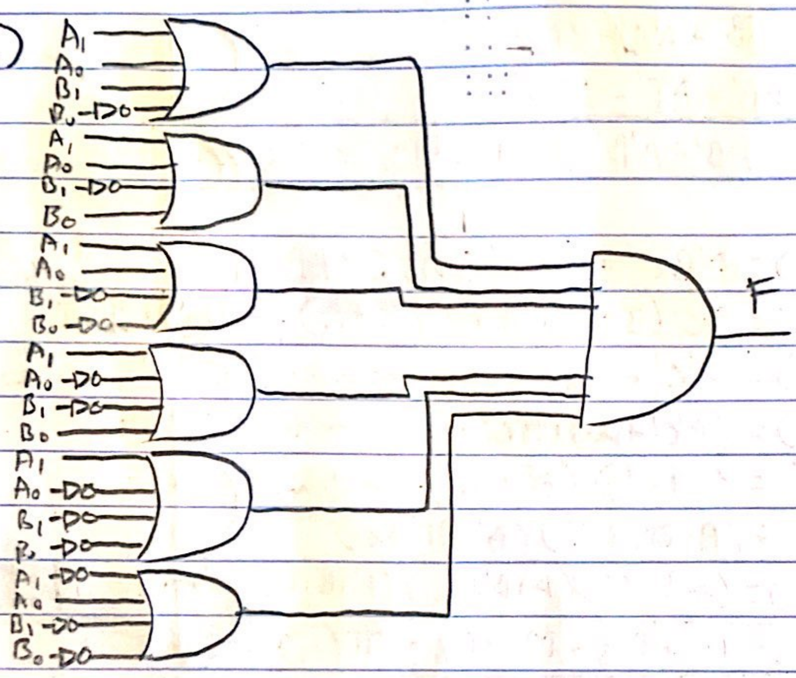
8a) $A \geq B$

A_1	A_0	B_1	B_0	F
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	1
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

8b) $\boxed{F=(A_1+A_0+B_1+B_0')(A_1+A_0+B_1'+B_0)(A_1+A_0+B_1'+B_0')(A_1+A_0'+B_1'+B_0)(A_1+A_0'+B_1'+B_0')(A_1'+A_0+B_1'+B_0')}$

$\boxed{F=M_1\cdot M_2\cdot M_3\cdot M_6\cdot M_7\cdot M_{11}=\Pi(1,2,3,6,7,11)}$

8c)

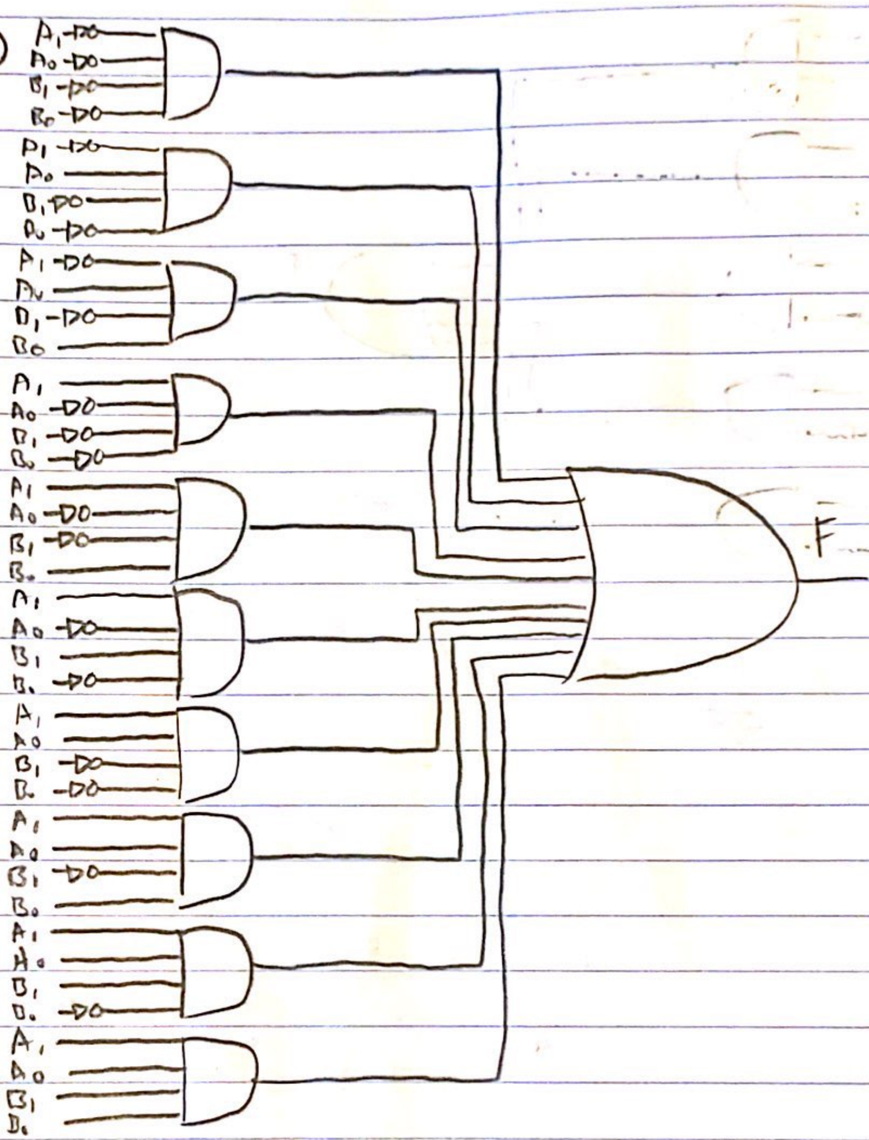


8d) $\boxed{F=(A_1'A_0'B_1'B_0')+(A_1'A_0B_1'B_0')+(A_1'A_0B_1'B_0)+(A_1A_0'B_1'B_0')+(A_1A_0'B_1'B_0)+(A_1A_0'B_1B_0')+(A_1A_0B_1'B_0')+(A_1A_0B_1'B_0)+(A_1A_0B_1B_0')+(A_1A_0B_1B_0)}$

$\boxed{F=m_0+m_4+m_5+m_8+m_9+m_{10}+m_{12}+m_{13}+m_{14}+m_{15}}$

$\boxed{F=\Sigma(0,4,5,8,9,10,12,13,14,15)}$

8e)



8f) $F=(A_1+A_0+B_1+B_0')(A_1+A_0+B_1'+B_0)(A_1+A_0+B_1'+B_0')$

$(A_1+A_0'+B_1'+B_0)(A_1+A_0'+B_1'+B_0')(A_1'+A_0+B_1'+B_0')$

$F=(A_1+A_0+B_1+B_0')(B_0B_0'+(A_1+A_0+B_1'))(B_0B_0'+(A_1+A_0'+B_1'))$

$(A_1'+A_0+B_1'+B_0')$

$F=(A_1+A_0+B_1+B_0')(A_1'+A_0+B_1'+B_0')(A_1+A_0+B_1')(A_1+A_0'+B_1')$

$F=(A_1+A_0+B_1+B_0')(A_1'+A_0+B_1'+B_0')(A_0A_0'+(A_1+B_1'))$

$F=(A_1+A_0+B_1+B_0')(A_1'+A_0+B_1'+B_0')(A_1+B_1')$

$F=[(A_0+B_0')+(A_1+B_1)(A_1'+B_1')](A_1+B_1')$

$F=(A_0+B_0')(A_1+B_1')+(A_1+B_1)(A_1'+B_1')(A_1+B_1')$

$F=A_0A_1+A_0B_1'+A_1B_0'+B_0'B_1'+(A_1A_1'+A_1'B_1+A_1B_1'+B_1B_1')(A_1+B_1')$

$\boxed{F=A_0A_1+A_0B_1'+A_1B_0'+B_0'B_1'+(A_1B_1')}$

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8g)