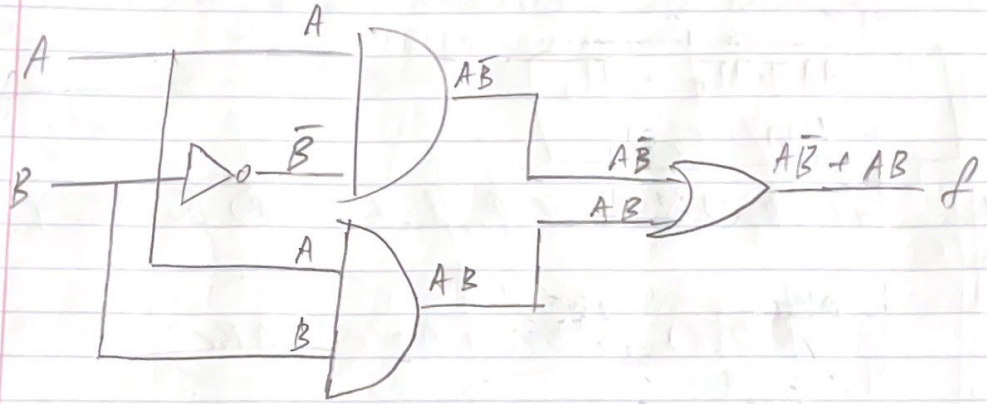
Agustin Espinoza SIE320 HW3 2/23/23

1. Determine the function f, in Boolean Expression form, for the logic diagram below. Reduce the final expression using Algebraic Reduction while showing all work.



$$f = A\bar{B} + AB$$

2. Truth Table Problem

A	B	C	f
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

a) Write the Sum-of-Products Boolean expression for the funct. f(A,B,C).

$$f = \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + \bar{A}BC + A\bar{B}\bar{C} + AB\bar{C}$$

b) Write Minterm Expression (both).

$$f = m_0 + m_2 + m_3 + m_4 + m_6$$
$$= \sum m(0, 2, 3, 4, 6)$$

c) Write Product-of-Sums (POS) Boolean Expression.

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

d) Write Maxterm Expression (both forms)

$$f = M_1 \cdot M_5 \cdot M_7$$
$$= \Pi M(1, 5, 7)$$

3. Using $f(A, B, C)$ Sum-of-Products (SOP) Boolean Expression below:

$$f(A, B, C) = AB'C + AB'C' + ABC'$$

a) Write the function table for function f.

	A	B	C	f
0	0	0	0	0
1	0	0	1	0
2	0	1	0	1
3	0	1	1	0
4	1	0	0	1
5	1	0	1	0
6	1	1	0	1
7	1	1	1	0

$2^3 = 8$

b) Write Minterm expressions (both forms)

$$f = m_2 + m_4 + m_6$$
$$f = \Sigma m(2, 4, 6)$$

c) Write POS Boolean expression

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

d) Write Maxterm expressions (both forms)

$$f = M_0 M_1 M_2 M_5 M_7$$
$$f = \Pi M(0, 1, 3, 5, 7)$$

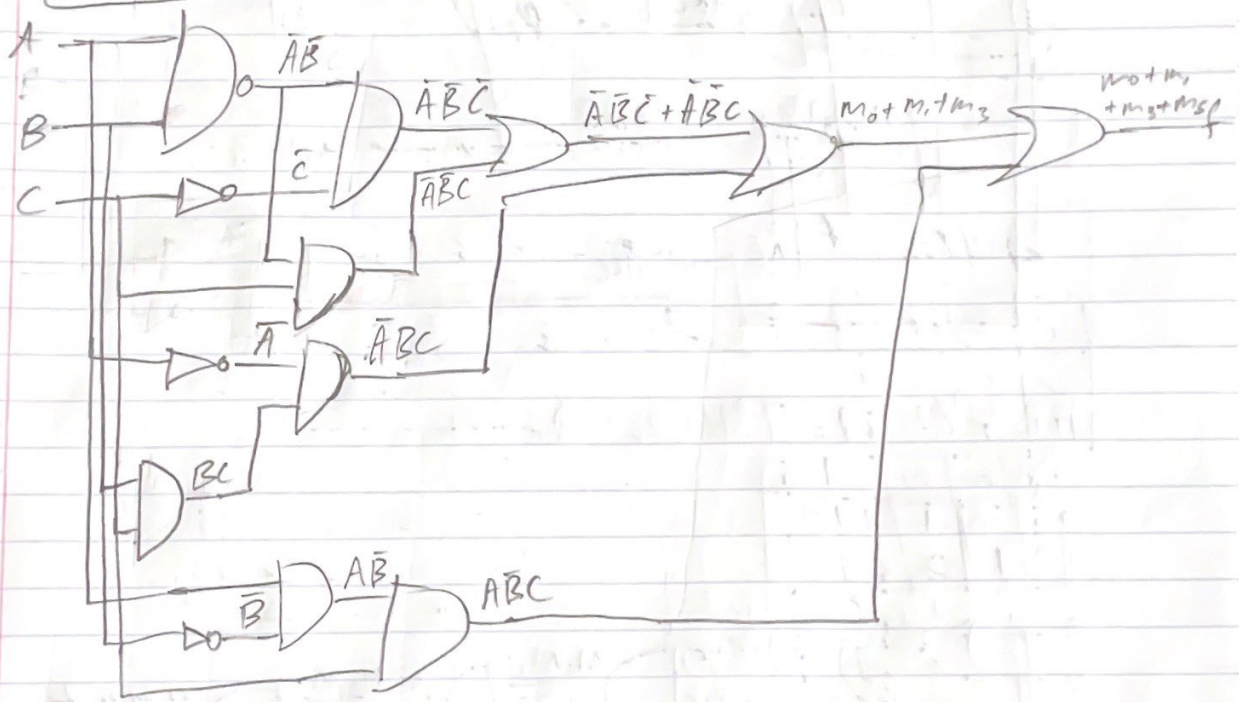
4. Karnaugh (K) Maps

a) Simplify the Boolean functions using a three-var K-Map.

b) Draw the cascading logic gates.

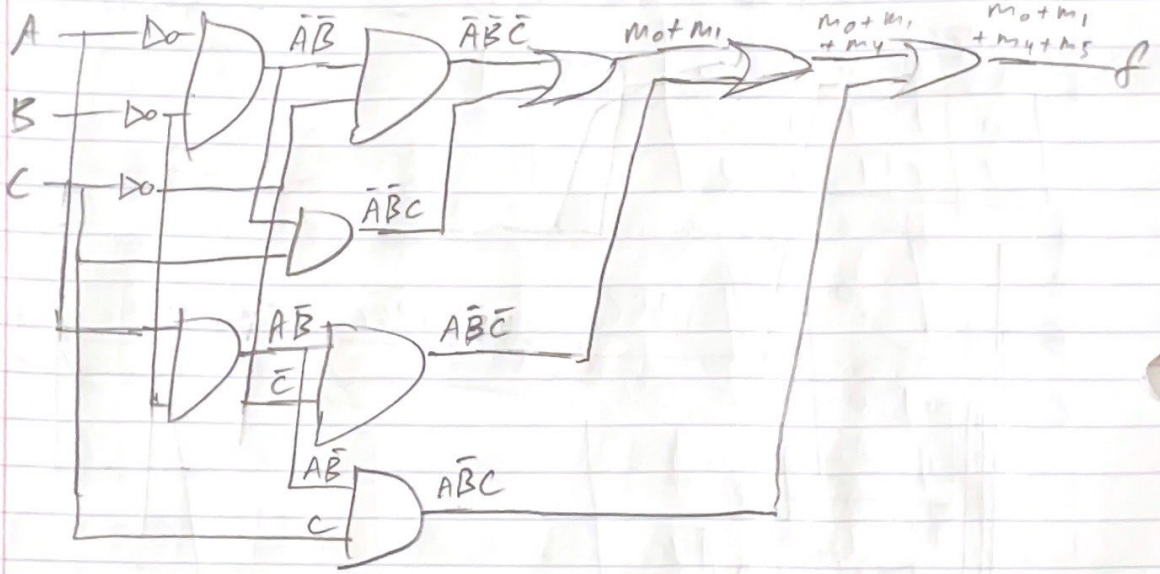
i. $f(A,B,C) = \sum m(0,1,3,5)$

A \ BC	00	01	11	10
0	1	1	1	0
1	0	1	0	0



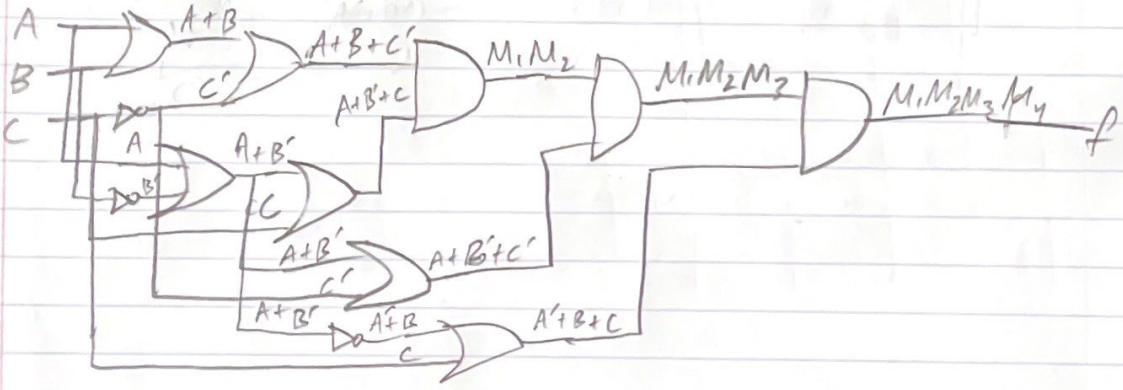
ii. $f(A,B,C) = \sum m(0,1,4,5)$

A \ BC	00	01	11	10
0	1	1	0	0
1	1	1	0	0



iii. $f(A,BC) = \prod M(1,2,3,4)$

A \ BC	00	01	11	10
0	0	1	1	0
1	1	0	0	1



iv. $f(A, B, C) = \prod M(0, 1, 2, 7)$

A \ BC	00	01	11	10
0	1	0	0	0
1	0	1	1	1