BIRZEIT UNIVERSITY
Electrical and Computer Engineering
ENCS 234:
Chapter 2
Homework # 2 Solution

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1. Simplify the following Boolean function to minimum number of literals

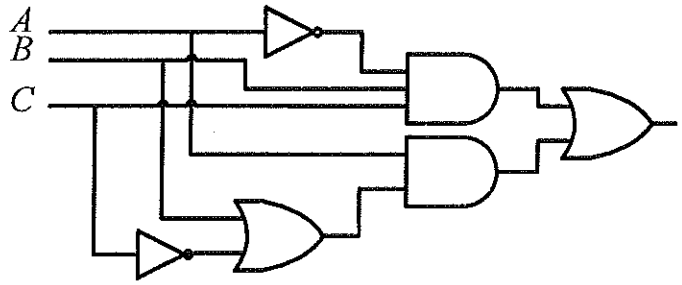
a. $xy + xy'$
$x(y + y')$
x

b. $(A + B)'.(A' + B')$
$A'B'.(A' + B')$
$A'A'B' + A'B'B'$
$A'B' + A'B'$
$A'B'$

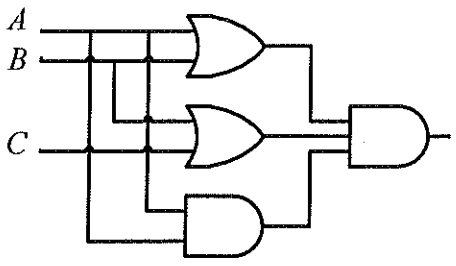
c. $A'B'C'D' + A'B'C'D + A'BC'D' + A'BC'D$
$A'B'C'(D' + D) + A'BC'(D' + D)$
$A'C'(B' + B)$
$A'C'$

2. Draw the logic diagrams for:

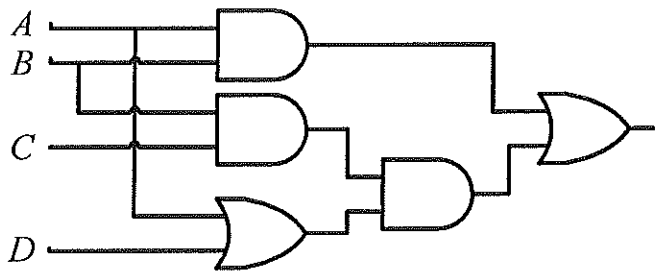
a. $F = A'BC + A(B + C')$



b. $F = (A + B)(B + C)(AB)$



c. $F = AB + BC(D + A)$



3. For the following Boolean function, find the truth table and express it in Sum *of Minterms* and *Product of Maxterms*

$$F(W,X,Y,Z) = W + W'XY + W'XYZ$$

	WXYZ	*F*	*Minterms*	*Maxterms*
0	0000	0		M_0
1	0001	0		M_1
2	0010	0		M_2
3	0011	0		M_3
4	0100	0		M_4
5	0101	0		M_5
6	0110	1	m_6	
7	0111	1	m_7	
8	1000	1	m_8	
9	1001	1	m_9	
10	1010	1	m_{10}	
11	1011	1	m_{11}	
12	1100	1	m_{12}	
13	1101	1	m_{13}	
14	1110	1	m_{14}	
15	1111	1	m_{15}	

$$F = \sum(6,7,8,9,10,11,12,13,14,15)$$

$$F = \prod(0,1,2,3,4,5)$$

4. Convert the following Boolean function into *Product of Sums*

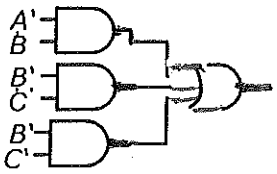
$$F = AB + AB'C$$

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

5. Given the following boolean function, implement it using AND,OR and NOT gates

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

AND – OR



6. Given the following Boolean functions

$$F_1(A,B,C) = AB + C$$
$$F_2(A,B,C) = A + AB + ABC$$

a. Show that the Boolean function $F = F_1 + F_2$ contains the *Sum of minterms* of F_1 and F_2

$F_1 = AB(C' + C) + (A' + A)(B' + B)C$
$F_1 = ABC' + ABC + A'B'C + A'BC + AB'C + ABC$
$F_1 = \sum(1,3,5,6,7)$

$F_2 = A(1 + B + BC)$
$F_2 = A(B' + B)(C' + C)$
$F_2 = AB'C' + AB'C + ABC' + ABC$
$F_2 = \sum(4,5,6,7)$

$F = F_1 + F_2$
$F = \sum(1,3,4,5,6,7)$

b. Show that the Boolean function $F = F_1.F_2$ contains only the *minterms* that are common to F_1 and F_2

$F = F_1.F_2$
$F = \sum(5,6,7)$