Assignment 2
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1a) Simplify $(a + b + c') \cdot (a'b' + c)$

$$= aa'b' + ac + ba'b' + bc + c'a'b' + c'c$$
$$= 0 + ac + 0 + bc + a'b'c' + 0$$
$$= ac + bc + (a + b + c)'$$

1b) Simplify $x'y'z' + w'x'yz' + wx'yz'$

$$= x'z'(y' + w'y + wy)$$
$$= x'z'\big(y' + y(w' + w)\big)$$
$$= x'z'\big(y' + y(1)\big)$$
$$= x'z'(y' + y)$$
$$= x'z'(1) = x'z'$$

2a) Find complement of $F = (a + c)(a + b')(a' + b + c')$

$$F' = \big((a + c) \cdot (a + b') \cdot (a' + b + c')\big)'$$
$$F' = (a + c)' + (a + b')' + (a' + b + c')'$$
$$F' = a' \cdot c' + a' \cdot b + a \cdot b' \cdot c$$

a	a'	b	b'	c	c'	$X = a + c$	$Y = a + b'$	$Z = a' + b + c'$	$F = X \cdot Y \cdot Z$	F'
1	0	1	0	1	0	1	1	1	1	0
1	0	1	0	0	1	1	1	1	1	0
1	0	0	1	1	0	1	1	0	0	1
1	0	0	1	0	1	1	1	1	1	0
0	1	1	0	1	0	1	0	1	0	1
0	1	1	0	0	1	0	0	1	0	1
0	1	0	1	1	0	1	1	1	1	0
0	1	0	1	0	1	0	1	1	0	1

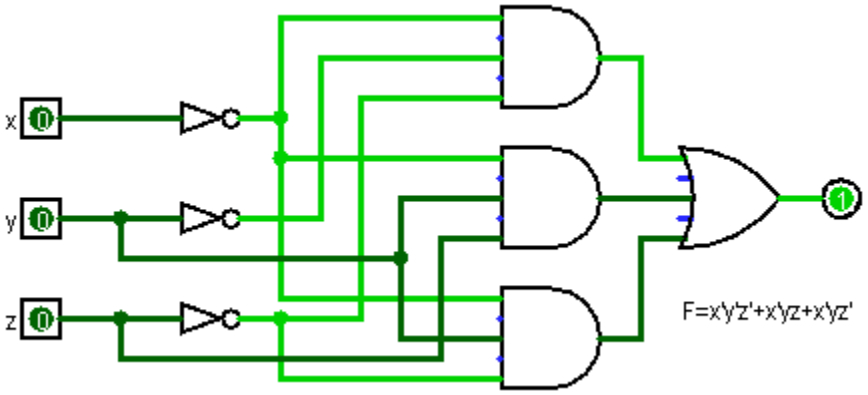
a	a'	b	b'	c	c'	$X = a' \cdot c'$	$Y = a' \cdot b$	$Z = a \cdot b' \cdot c$	$F' = X + Y + Z$
1	0	1	0	1	0	0	0	0	0
1	0	1	0	0	1	0	0	0	0
1	0	0	1	1	0	0	0	1	1
1	0	0	1	0	1	0	0	0	0
0	1	1	0	1	0	0	1	0	1
0	1	1	0	0	1	1	1	0	1
0	1	0	1	1	0	0	0	0	0
0	1	0	1	0	1	1	0	0	1

2b) Using duality find complement of $F = xy'z' + w'x + yz' + wx'yz'$

Duality of F: $(x + y' + z') \cdot (w' + x) \cdot (y + z') \cdot (w + x' + y + z')$
Complement each literal: $F' = (x' + y + z) \cdot (w + x') \cdot (y' + z) \cdot (w + x + y' + z)$

3a) Find truth table and draw circuit for $F = x'y'z' + x'yz + x'yz'$

x	x'	y	y'	z	z'	$A = x' \cdot y' \cdot z'$	$B = x' \cdot y \cdot z$	$C = x' \cdot y \cdot z'$	$F = A + B + C$
1	0	1	0	1	0	0	0	0	0
1	0	1	0	0	1	0	0	0	0
1	0	0	1	1	0	0	0	0	0
1	0	0	1	0	1	0	0	0	0
0	1	1	0	1	0	0	1	0	1
0	1	1	0	0	1	0	0	1	1
0	1	0	1	1	0	0	0	0	0
0	1	0	1	0	1	1	0	0	1



3b) *Find truth table and draw circuit for* $F = ac'b + c' + d'b'$

a	a'	b	b'	c	c'	d	d'	$X = a \cdot c' \cdot b$	$Y = d' \cdot b'$	$F = X + c' + Y$
1	0	1	0	1	0	1	0	0	0	0
1	0	1	0	1	0	0	1	0	0	0
1	0	1	0	0	1	1	0	1	0	1
1	0	1	0	0	1	0	1	1	0	1
1	0	0	1	1	0	1	0	0	0	0
1	0	0	1	1	0	0	1	0	1	1
1	0	0	1	0	1	1	0	0	0	1
1	0	0	1	0	1	0	1	0	1	1
0	1	1	0	1	0	1	0	0	0	0
0	1	1	0	1	0	0	1	0	0	0
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0	1	0	1	1	0	1	0	0	0	0
0	1	0	1	1	0	0	1	0	1	1
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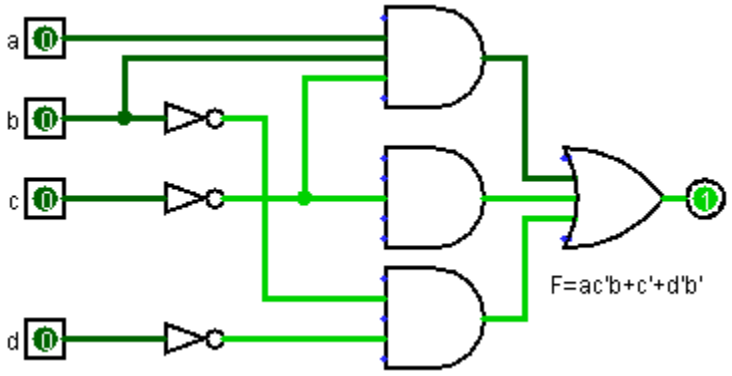
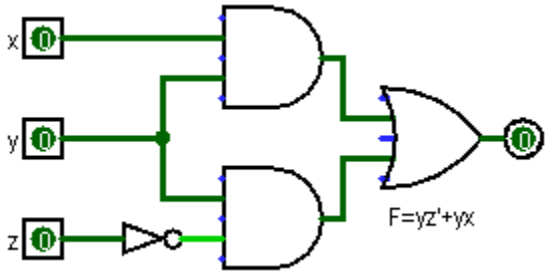


4) Produce function expression as SoP, simplify and draw circuit

$$f(xyz) = x'yz' + xyz' + xyz$$

$$= yz'(x' + x) + xyz$$
$$= yz'(1) + xyz$$
$$= yz' + xyz$$
$$= y(z' + xz)$$
$$= y(z' + x)$$
$$= yz' + yx$$

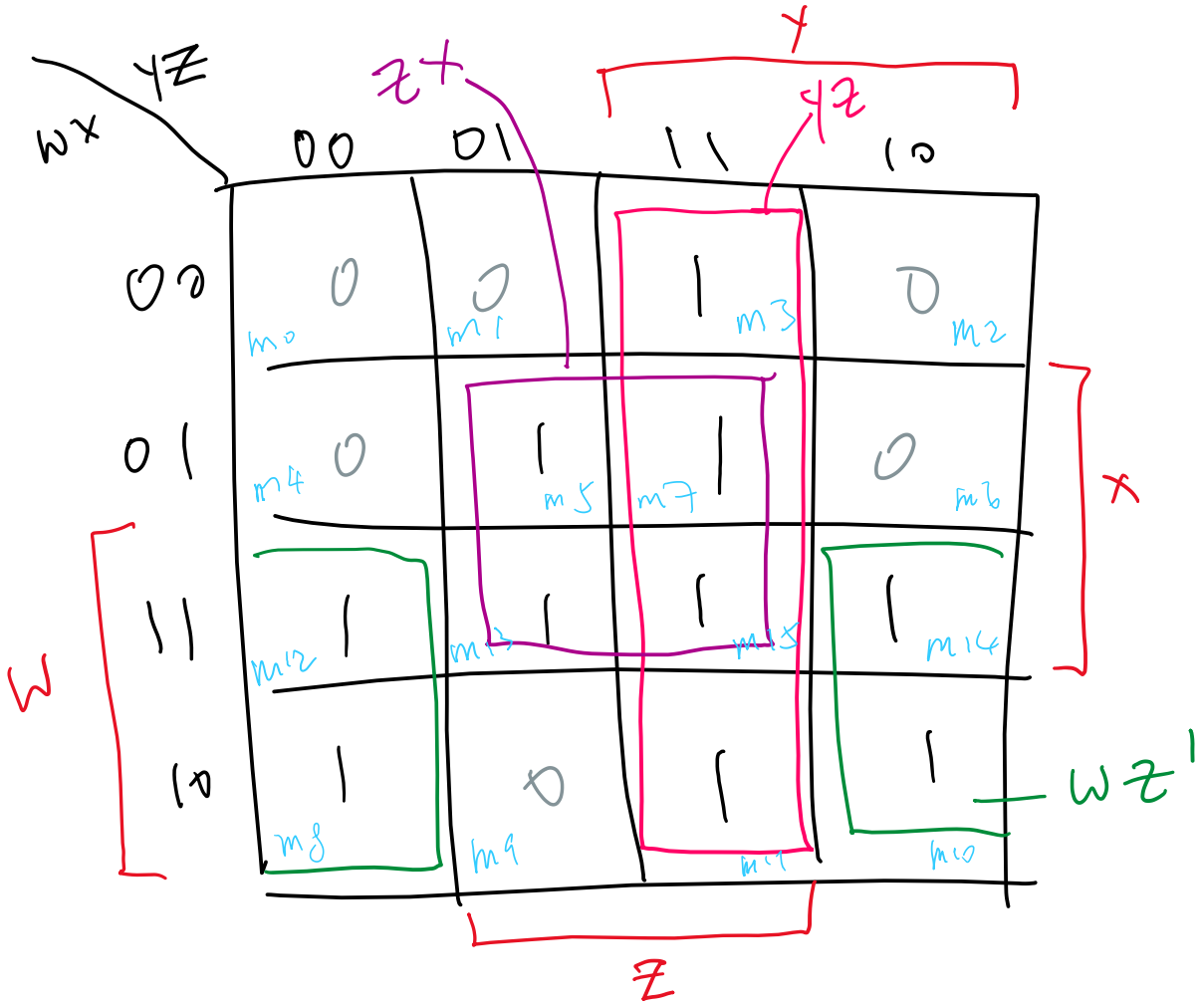
x	y	z	f
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1



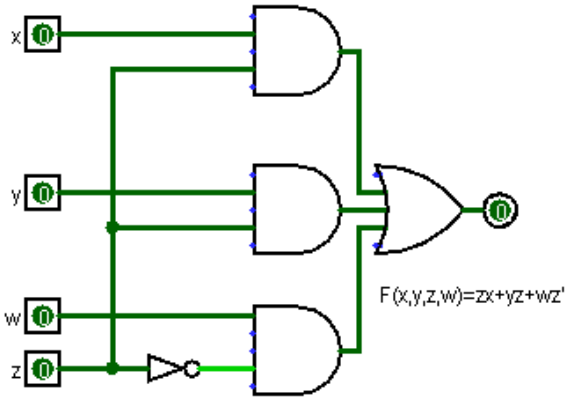
5) Draw and fill K − map, produce minterms, simplify function via K − map, draw circuit

$5a)\ F(x,y,z,w) = wxy + yz + xy'z + wz'$

$F(x,y,z,w) = \sum(m_3, m_5, m_7, m_8, m_{10}, m_{11}, m_{12}, m_{13}, m_{14}, m_{15})$

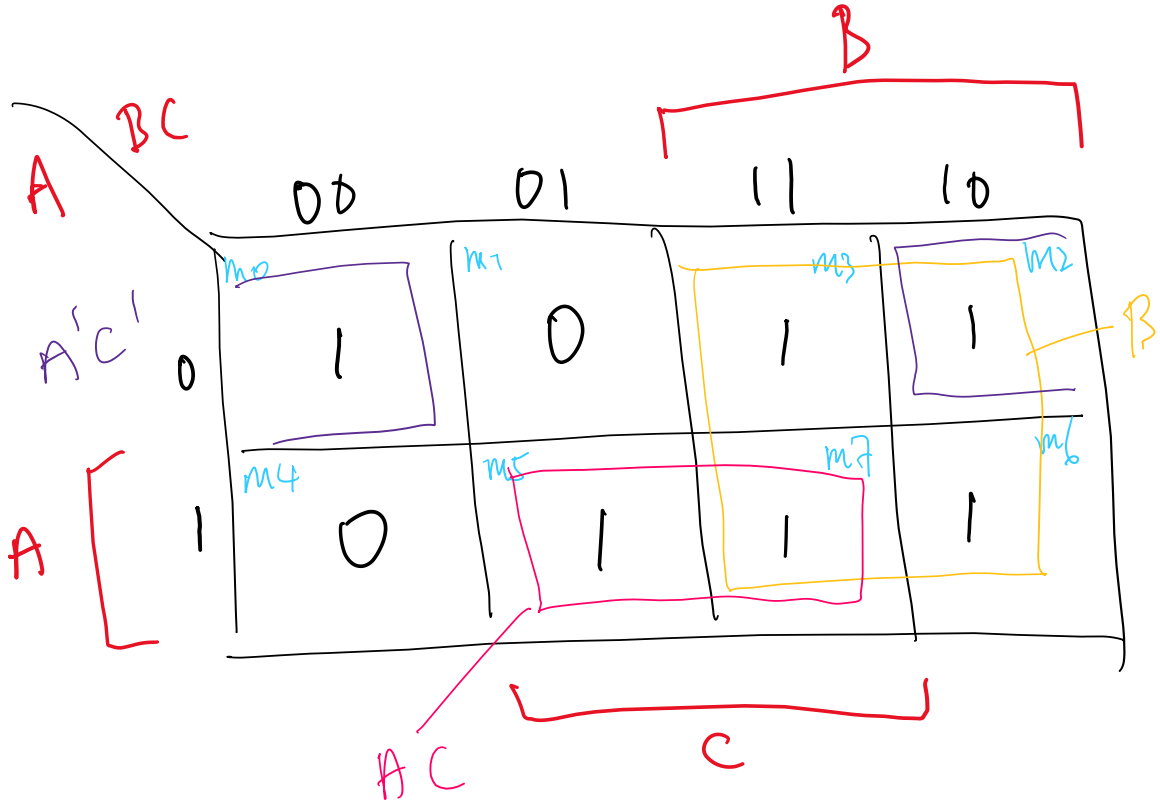


$F(x,y,z,w) = zx + yz + wz'$

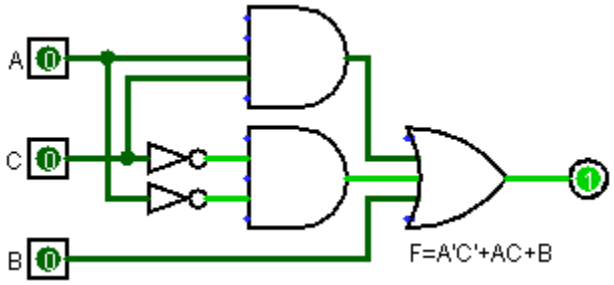


$5b)\ F(A,B,C) = A'B'C' + A'B + ABC' + AC$

$F(A,B,C) = \sum(m_0, m_2, m_3, m_5, m_7)$

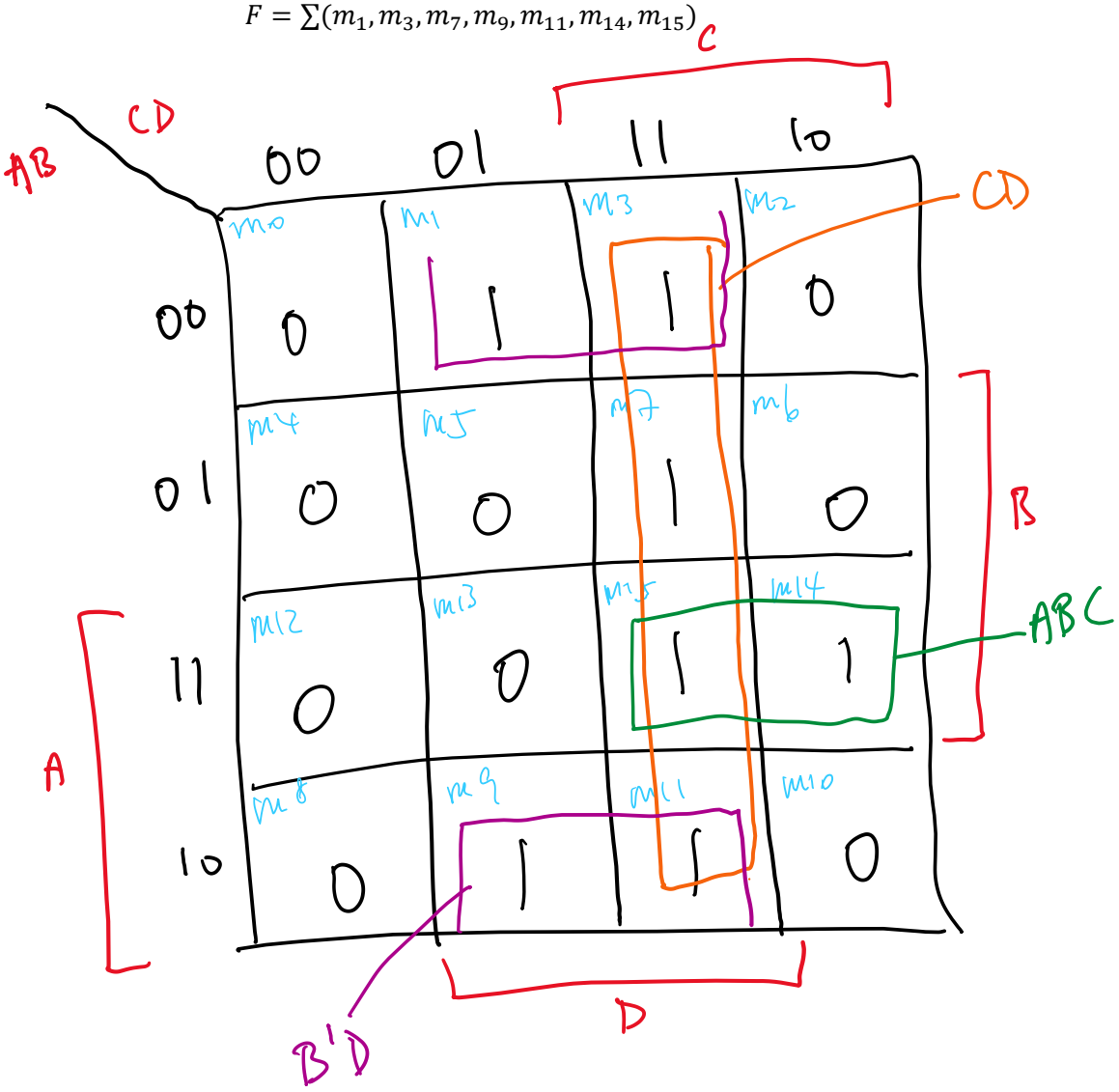


$F = A'C' + AC + B$



$5c)\ F = A'BCD + ABC + CD + B'D$

$F = \sum(m_1, m_3, m_7, m_9, m_{11}, m_{14}, m_{15})$



$F = ABC + CD + B'D$