

ITI1100B&C

Professor: Qi Hao

Assignment # 3

Submission Deadline Feb. 19, 2017 midnight (11h59 PM), BlackBoard Learn

From the textbook Chapter 3 pages 119-121, solve the following problems

3.2(c)(d)(e)(f), 3.4(c)(d)(e)(f), 3.5(c)(d), 3.6(a)(b), 3.8(c)(d), 3.10(c)(d)(f), 3.12(a), 3.13(c), 3.15, 3.16, 3.18.

3.2

Total
4 points

		yz		y			
		00	01	11	10		
x	0	m_0	m_1	m_3	m_2		
	1	m_4	m_5	m_7	m_6		
		z					

$$F = xy' + x'y$$

(c)

		yz		y			
		00	01	11	10		
x	0	m_0	m_1	m_3	m_2		
	1	m_4	m_5	m_7	m_6		
		z					

$$F = y + z$$

(d)

		yz		y			
		00	01	11	10		
x	0	m_0	m_1	m_3	m_2		
	1	m_4	m_5	m_7	m_6		
		z					

$$F = z'$$

(e)

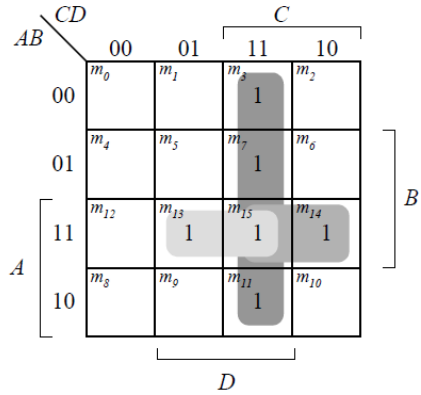
		yz		y			
		00	01	11	10		
x	0	m_0	m_1	m_3	m_2		
	1	m_4	m_5	m_7	m_6		
		z					

$$F = x + yz$$

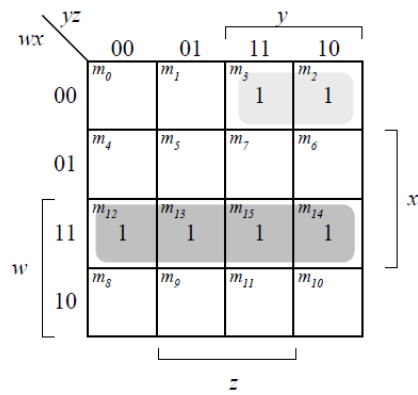
(f)

3.4

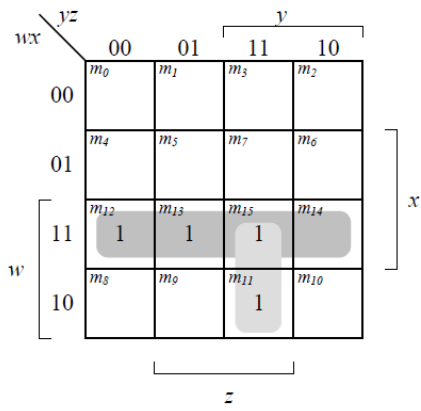
Total
4 points



(c) $F = CD + ABD + ABC$

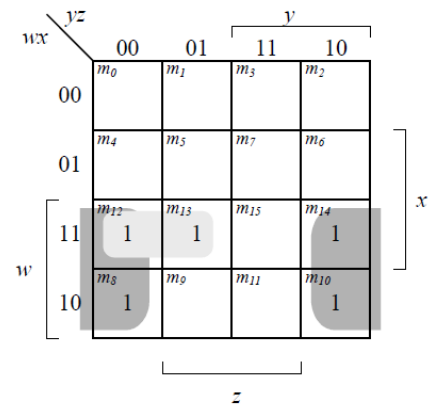


(d) $F = w'x'y + wx$



(e)

$F = wx + wyz$

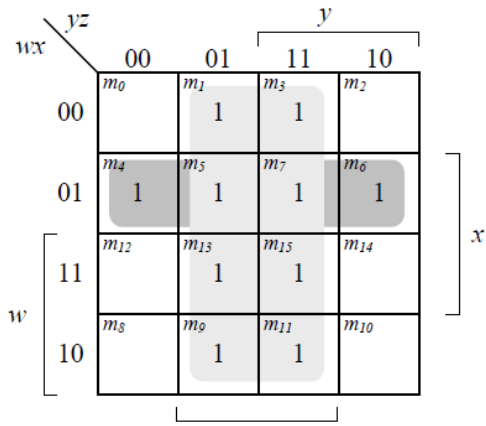


(f)

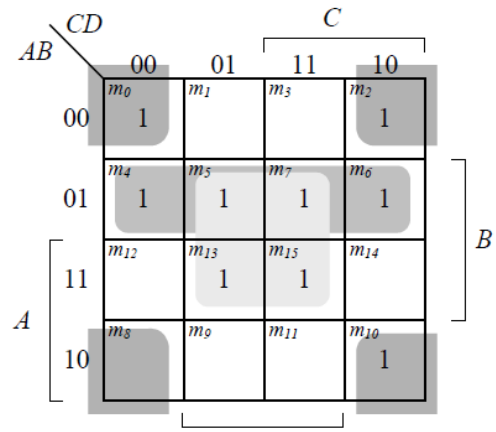
$F = wz' + xy'w$

3.5

Total
2 points



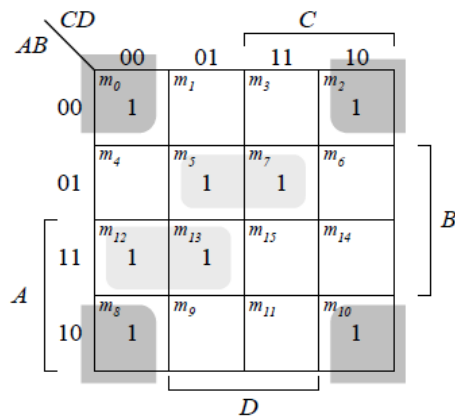
(c) $F = z + xw'$



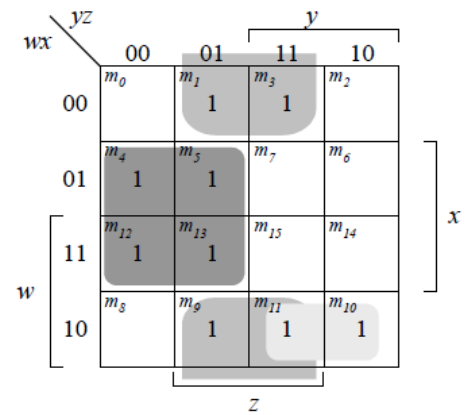
(d) $F = BD + A'B + B'D'$
or $F = BD + B'D' + A'D'$

3.6

2 points



(a) $F = B'D' + A'BD + ABC'$



(b) $F = xy' + x'z + wx'y$

3.8

Total
2 points

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

		y			
		00	01	11	10
wx	00	m_0 1	m_1 1	m_3 1	m_2 1
	01	m_4	m_5	m_7	m_6
	11	m_{12} 1	m_{13}	m_{15} 1	m_{14} 1
	10	m_8	m_9	m_{11} 1	m_{10}
		z			

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

		C			
		00	01	11	10
AB	00	m_0	m_1	m_3 1	m_2
	01	m_4 1	m_5 1	m_7 1	m_6
	11	m_{12} 1	m_{13}	m_{15}	m_{14}
	10	m_8	m_9	m_{11} 1	m_{10}
		D			

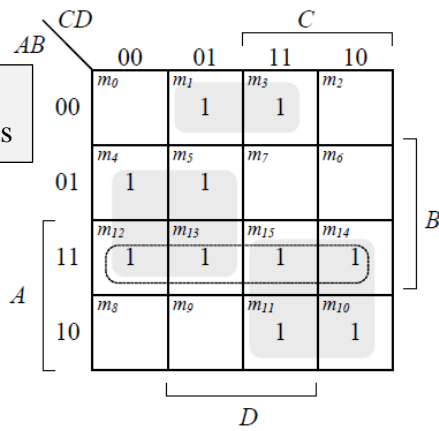
(d) Error. Correction:

		CD			
		00	01	11	10
AB	00			1	
	01	1	1	1	1
	11	1			
	10			1	

$$F(A, B, C, D) = \Sigma(3, 4, 5, 6, 7, 11, 12)$$

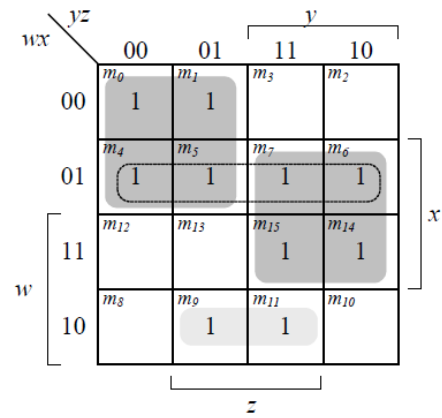
3.10

Total
6 points



$F = \Sigma(1, 3, 4, 5, 10, 11, 12, 13, 14, 15)$
Essential: AC, BC', A'B'D
Non-essential: AB, A'B'D, B'CD, A'C'D
 $F = AC + BC' + A'B'D$

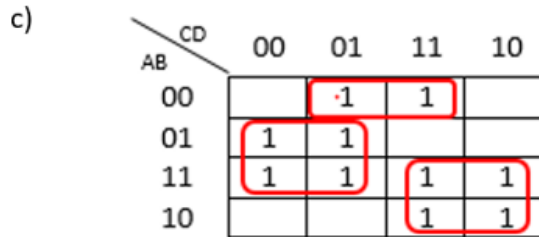
(c)



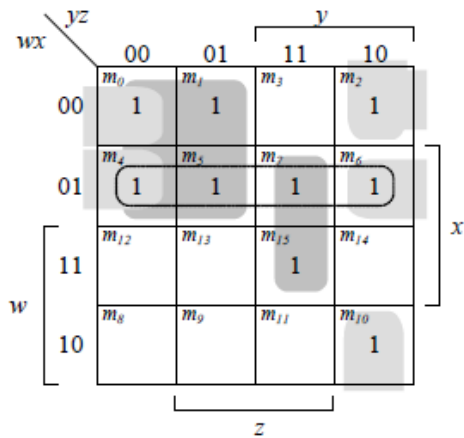
$F = \Sigma(0, 1, 4, 5, 6, 7, 9, 11, 14, 15)$
Essential: w'y', xy, wx'z
Non-essential: wx, x'y'z, w'wz, w'x'z
 $F = w'y' + xy + wx'z$

(d)

(c) has error. The correction is:



$F = BC' + AC + A'B'D$
Essential: BC', AC



$$F = S(0, 1, 2, 4, 5, 6, 7, 10, 15)$$

Essential: $w'y'$, $w'z'$, xyz , $x'yz'$

Non-Essential: $w'x$

$$F = w'y' + w'z' + xyz + x'yz'$$

(f)

3.12

(a)

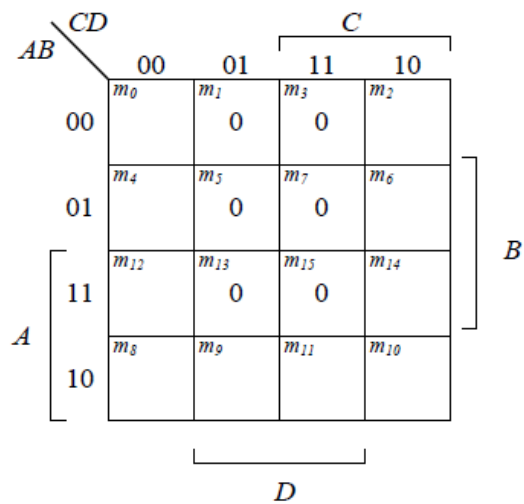
$$F = \Pi(1, 3, 5, 7, 13, 15)$$

$$F' = A'D + B'D$$

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

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

Total
2 points



3.13

Total 3 points

c)

The answer in the solution manual is wrong. The correct answer is as the follows:

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

$$F' = AB'D + ABC + ABC' + BC'D$$

	CD	00	01	11	10
AB	00				
	01		0		
	11	0	0	0	0
	10		0	0	

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

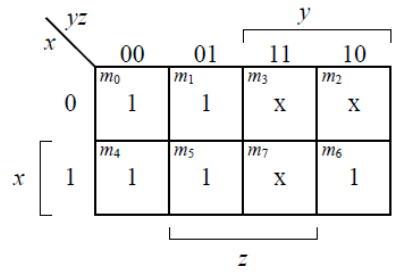
$$F = (A' + B')(A' + D')(B' + C + D')$$

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

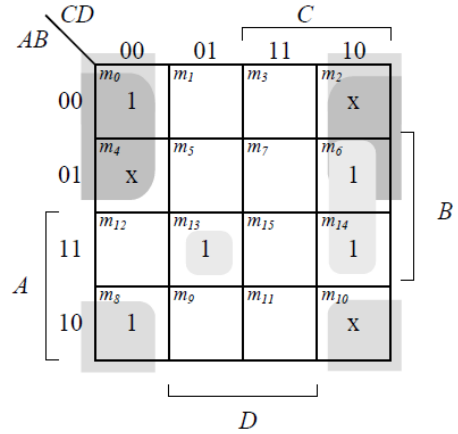
$$F = A'B' + A'C + A'D' + B'D'$$

3.15

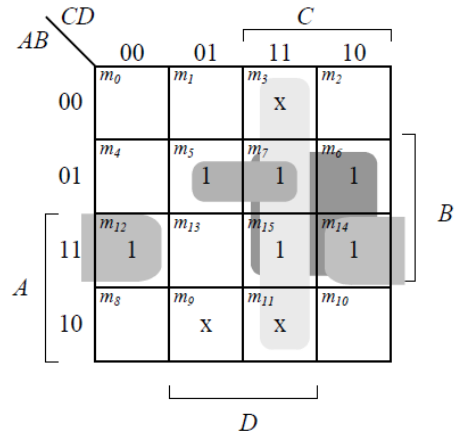
Total
6 points



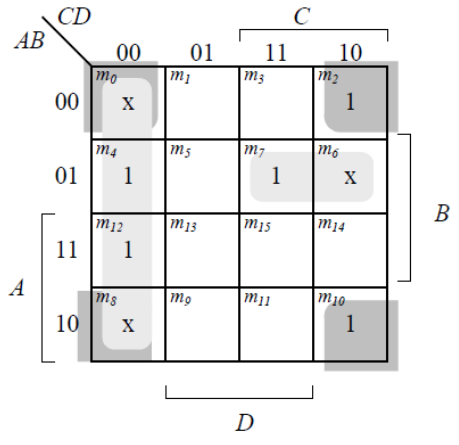
$F = 1$
 $F = \Sigma(0,1, 2, 3, 4, 5, 6, 7)$



$F = A'D' + B'D' + BCD' + ABC'D$
 $F = \Sigma(0, 2, 4, 6, 8, 10, 13, 14)$

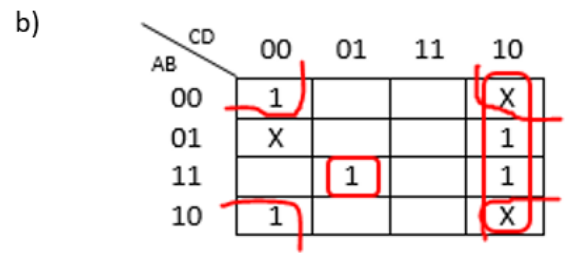


$F = BC + CD + ABD' + A'BD$
 $F = \Sigma(3, 5, 6, 7, 11, 12, 14, 15)$



$F = B'D' + C'D' + A'BC$
 $F = \Sigma(0, 2, 4, 6, 7, 8, 10, 12)$

(b) and (c) have errors. Corrections are:



$F = B'D' + CD' + ABC'D = \Sigma(0, 2, 6, 8, 10, 13, 14)$

c)

	CD	00	01	11	10
AB	00			X	
	01		1	1	1
	11	1		1	1
	10		X	X	

$$F = BC + A'BD + ABD' = \sum(5, 6, 7, 12, 14, 15)$$

3.16 (a)

Total 6 points

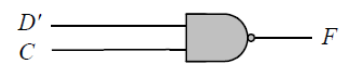
	CD	00	01	11	10
AB	m_0	m_1	m_3	m_2	
	00	1		1	1
	01	m_4	m_5	m_7	m_6
	01	1		1	1
	11	m_{12}	m_{13}	m_{15}	m_{14}
	11	1		1	1
	10	m_8	m_9	m_{11}	m_{10}
	10	1		1	1

0.5 points

$$F = C + D'$$

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

0.5 points



0.5 points

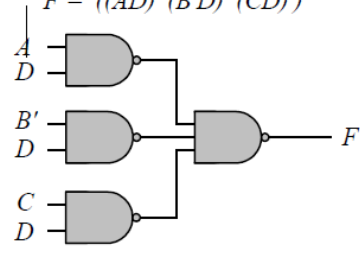
Note: error in (a). NAND inputs should be C' and D

(b)

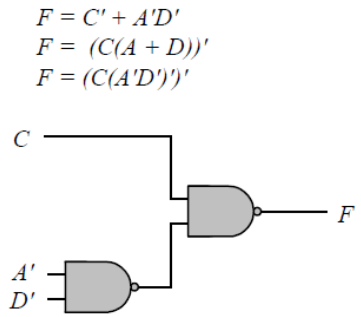
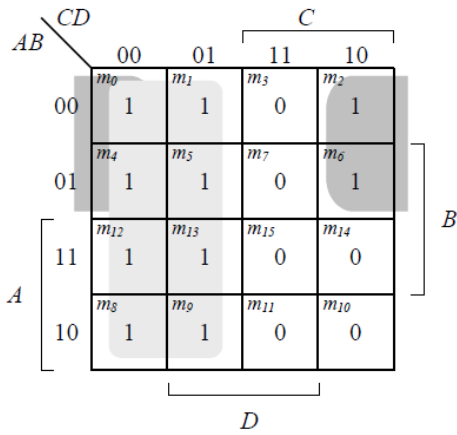
	CD	00	01	11	10
AB	m_0	m_1	m_3	m_2	
	00		1	1	
	01	m_4	m_5	m_7	m_6
	01			1	
	11	m_{12}	m_{13}	m_{15}	m_{14}
	11		1	1	
	10	m_8	m_9	m_{11}	m_{10}
	10		1	1	

$$F = AD + B'D + CD$$

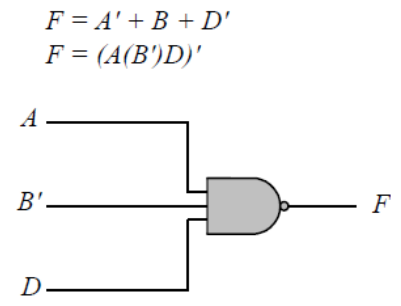
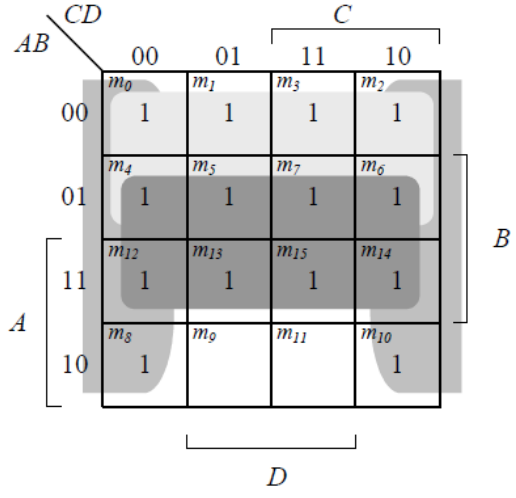
$$F = ((AD)'(B'D)'(CD)')'$$



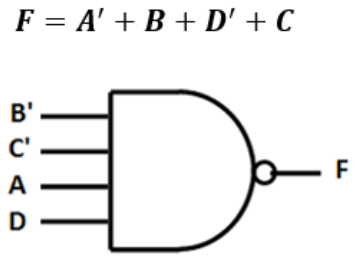
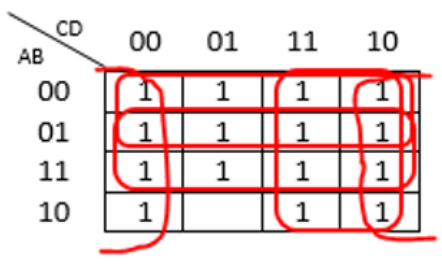
(c) $F = (A' + C' + D')(A' + C')(C' + D')$
 $F' = (A' + C' + D')' + (A' + C')' + (C' + D)'$
 $F' = ACD + AC + CD$



(d)



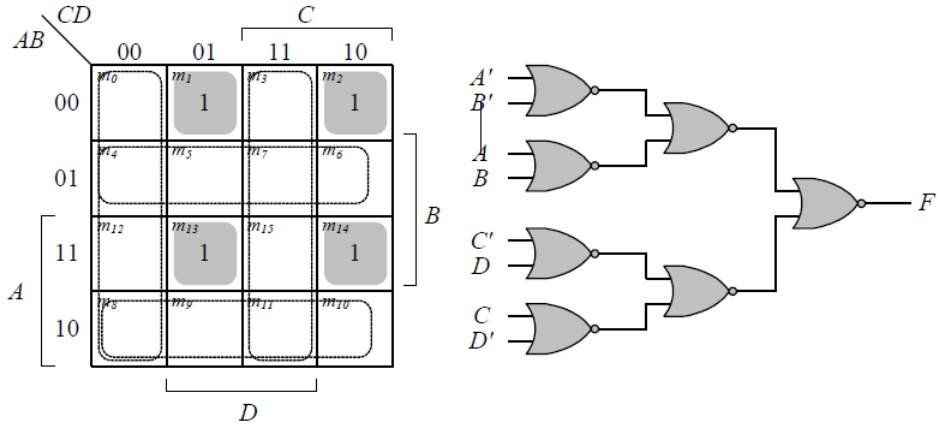
d) Error. Correction:



3.18

$$\begin{aligned}
 F &= (A \oplus B)'(C \oplus D) = (AB' + A'B)'(CD' + C'D) \\
 &= (AB + A'B')(CD' + C'D) = ABCD' + ABC'D + A'B'CD' + A'B'C'D \\
 F' &= (AB + A'B)' + (CD' + C'D)' \\
 F &= ((A' + B') + (A + B))' + ((C' + D)' + (C + D)')'
 \end{aligned}$$

Total
3 points



Note: there are also other alternative solutions for 3.18.