

ITI1100A
Assignment # 3
SOLUTIONS

3.2

		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			

(a) $F = x'y' + xz$

		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			

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

		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			

(c) $F = xy' + x'y$

		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			

(d) $F = y + z$

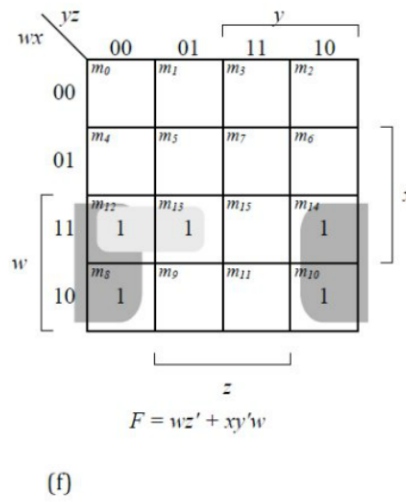
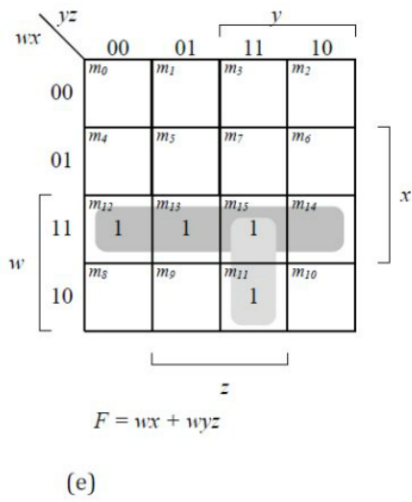
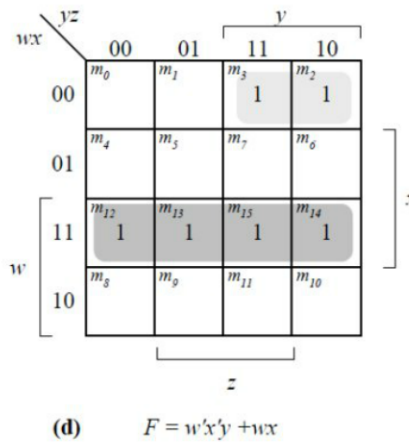
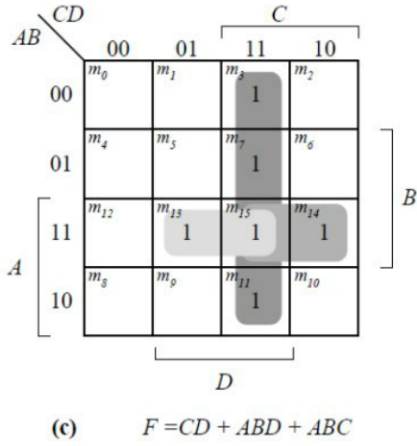
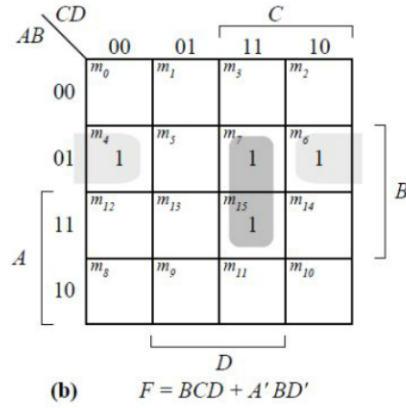
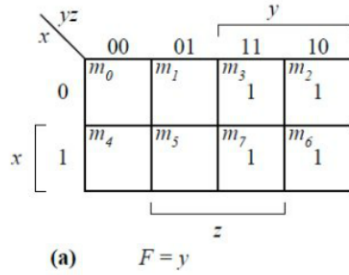
		yz		y	
		00	01	11	10
x	0	m_0	m_1	m_3	m_2
	1	m_4	m_5	m_7	m_6
		z			

(e) $F = z'$

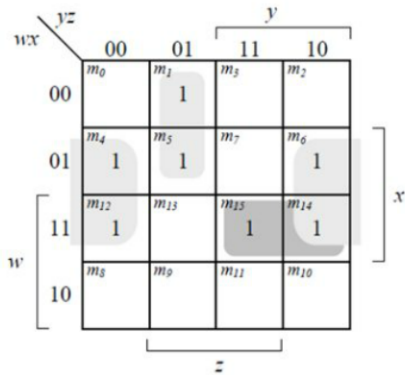
		yz		y	
		00	01	11	10
x	0	m_0	m_1	m_3	m_2
	1	m_4	m_5	m_7	m_6
		z			

(f) $F = x + yz$

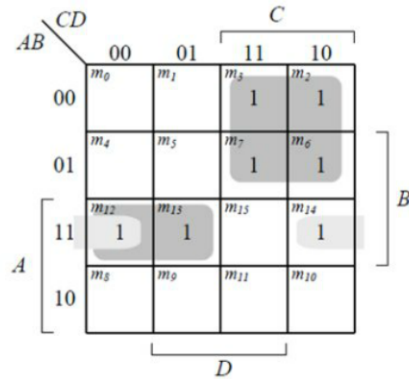
3.4



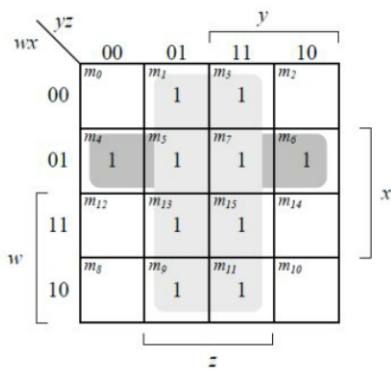
3.5



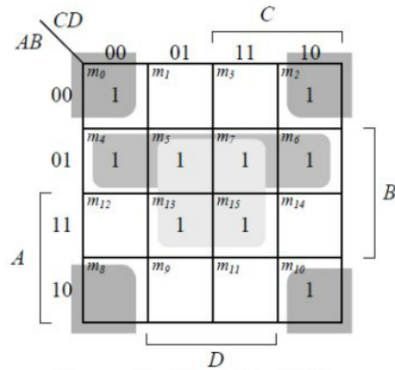
(a) $F = xz' + w'y'z + wxy$



(b) $F = A'C + ABC' + ABD'$



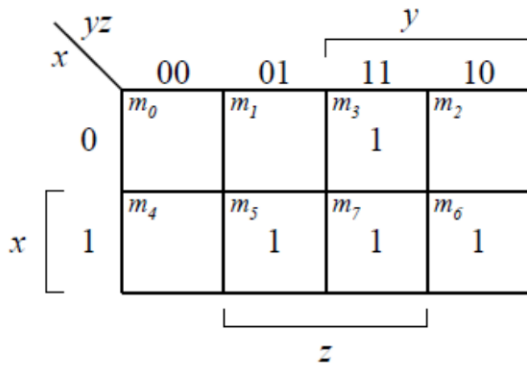
(c) $F = z + xw'$



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

3.8

(a) $F(x, y, z) = \Sigma(3, 5, 6, 7)$



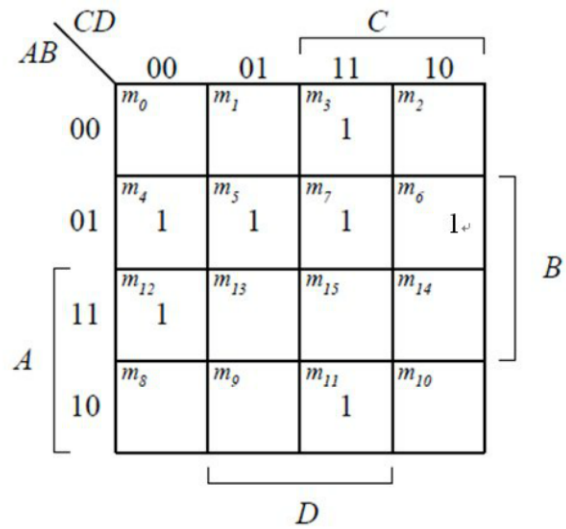
(b) $F = \Sigma(1, 3, 5, 9, 12, 13, 14)$

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

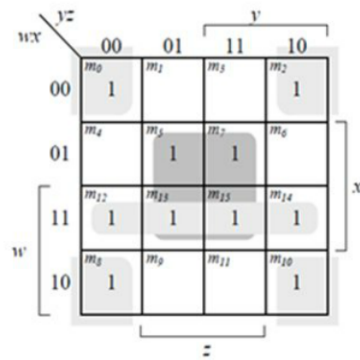
(c) $F = \Sigma(0, 1, 2, 3, 11, 12, 14, 15)$

		<i>y</i>			
		00	01	11	10
<i>wx</i>	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}
		<i>z</i>			

(d) $F = \Sigma(3, 4, 5, 6, 7, 11, 12)$



3.10



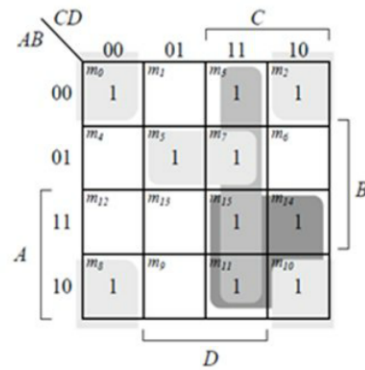
$F = \Sigma(0, 2, 5, 7, 8, 10, 12, 13, 14, 15)$

Essential: $xz, x'z'$

$F = xz + x'z' + wx$ or

$F = xz + x'z' + wz'$

(a)



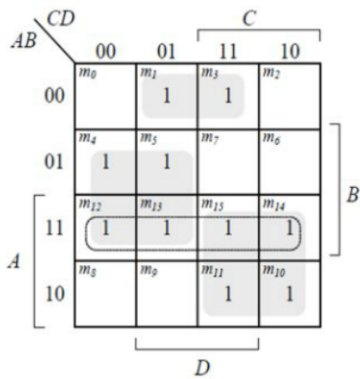
$F = \Sigma(0, 2, 3, 5, 7, 8, 10, 11, 14, 15)$

Essential: $AC, B'D', A'BD$

$F = AC + B'D' + A'BD + CD$ or

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

(b)

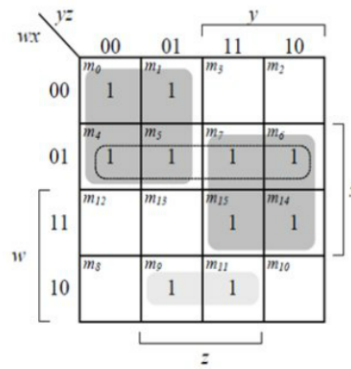


$$F = \Sigma(1, 3, 4, 5, 10, 11, 12, 13, 14, 15)$$

Essential: AC, BC'

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

(c)

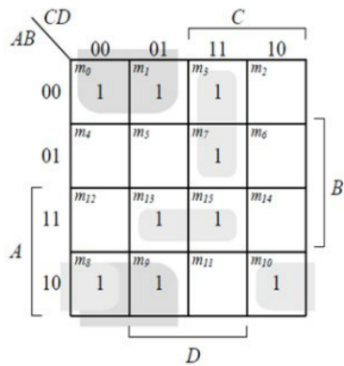


$$F = \Sigma(0, 1, 4, 5, 6, 7, 9, 11, 14, 15)$$

Essential: w'y', xy

$$F = w'y' + xy + wx'z$$

(d)

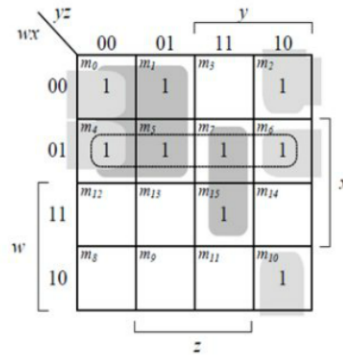


$$F(A, B, C, D) = \Sigma(0, 1, 3, 7, 8, 9, 10, 13, 15)$$

Essential: B'C', AB'D'

$$F = B'C' + AB'D' + A'CD + ABD$$

(e)



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

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

$$F = w'y' + xyz + x'yz' + w'z' \quad \text{or}$$

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

(f)

3.15

		y \bar{z}		
		00	01	11 10
x	0	m ₀ 1	m ₁ 1	m ₃ x m ₂ x
x	1	m ₄ 1	m ₅ 1	m ₇ x m ₆ 1

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

		CD		
		00	01	11 10
AB	00	m ₀ 1	m ₁	m ₃ m ₂ x
	01	m ₄ x	m ₅	m ₇ m ₆ 1
A	11	m ₁₂	m ₁₃ 1	m ₁₅ m ₁₄ 1
	10	m ₈ 1	m ₉	m ₁₁ m ₁₀ x

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

		CD		
		00	01	11 10
AB	00	m ₀	m ₁	m ₃ m ₂ x
	01	m ₄	m ₅ 1	m ₇ m ₆ 1 1
A	11	m ₁₂ 1	m ₁₃	m ₁₅ m ₁₄ 1 1
	10	m ₈	m ₉ x	m ₁₁ m ₁₀ x

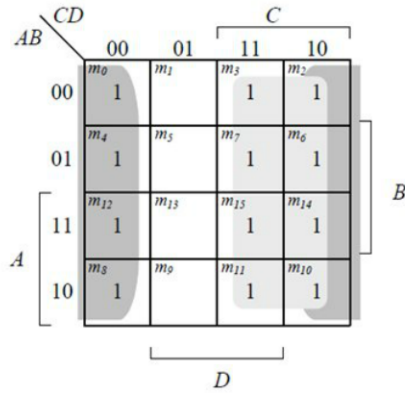
$F = BC + CD + ABD' + A'BD$
 $F = \Sigma(3, 5, 6, 7, 11, 12, 14, 15)$

		CD		
		00	01	11 10
AB	00	m ₀ x	m ₁	m ₃ m ₂ 1
	01	m ₄ 1	m ₅	m ₇ m ₆ 1 x
A	11	m ₁₂ 1	m ₁₃	m ₁₅ m ₁₄ 1
	10	m ₈ x	m ₉	m ₁₁ m ₁₀ 1

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

3.16

(a)

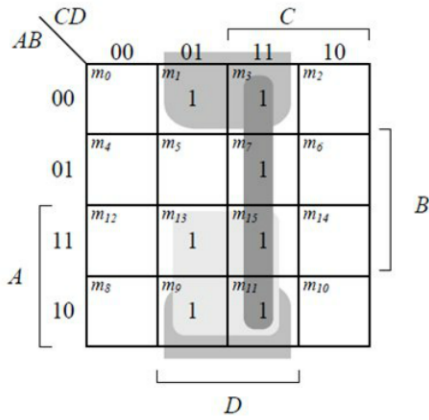


$$F = C + D'$$

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

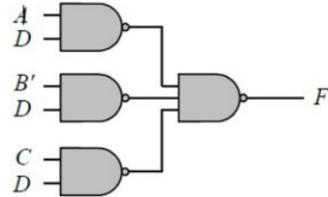


(b)

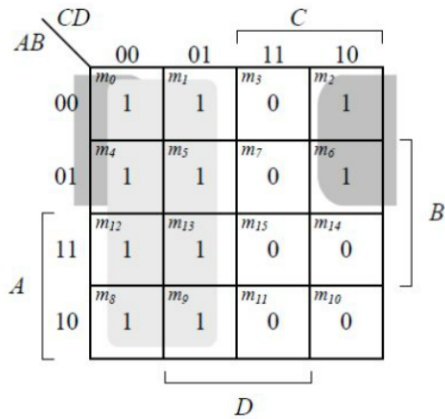


$$F = AD + B'D + CD$$

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



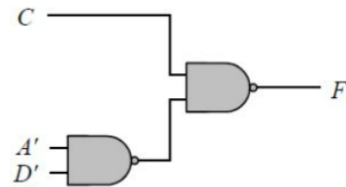
(c) $F = (A' + C' + D')(A' + C')(C' + D')$
 $F' = (A' + C' + D)' + (A' + C)' + (C' + D)'$
 $F' = ACD + AC + CD$



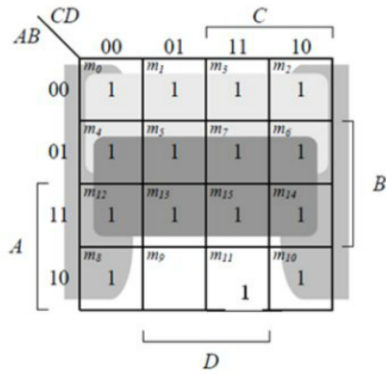
$$F = C' + A'D'$$

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

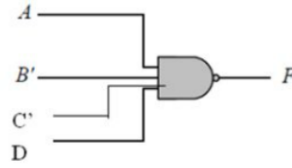
$$F = (C(A'D)')'$$



(d)



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



3.18

$$F = (A \oplus B)(C \oplus D) = (AB' + A'B)(CD' + C'D)$$
$$= (AB + A'B')(CD' + C'D) = ABCD' + ABC'D + A'B'CD' + A'B'C'D$$
$$F' = (AB + A'B)' + (CD' + C'D)'$$
$$F' = ((A' + B)' + (A + B)')' + ((C' + D)' + (C + D)')'$$

