

3.4

(a) $F(x, y, z) = \Sigma(0, 1, 4, 5)$

$x \backslash yz$				
	00	01	11	10
0	1	1	0	0
1	1	1	0	0

$$F = y'$$

(b) $F(A, B, C) = \Sigma(0, 2, 3, 7)$

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

$$F = BC + A'C'$$

(c) $F(A, B, C, D) = \Sigma(1, 5, 9, 12, 13, 15)$

$AB \backslash CD$				
	00	01	11	10
00	0	1	0	0
01	0	1	0	0
11	1	1	1	0
10	0	1	0	0

$$F = C'D + ABC' + ABD$$

(d) $F(w, x, y, z) = \Sigma(0, 2, 3, 8, 10, 11)$

$wx \backslash yz$				
	00	01	11	10
00	1	0	1	1
01	0	0	0	0
11	0	0	0	0
10	1	0	1	1

$$F = x'y + x'z'$$

(e) $F(w, x, y, z) = \Sigma(11, 12, 13, 14, 15)$

$wx \backslash yz$				
	00	01	11	10
00	m_0	m_1	m_3	m_2
01	m_4	m_5	m_7	m_6
11	m_{12}	m_{13}	m_{15}	m_{14}
10	m_8	m_9	m_{11}	m_{10}

$$F = wx + wyz$$

(f) $F(w, x, y, z) = \Sigma(8, 10, 12, 13, 14)$

$wx \backslash yz$				
	00	01	11	10
00	m_0	m_1	m_3	m_2
01	m_4	m_5	m_7	m_6
11	m_{12}	m_{13}	m_{15}	m_{14}
10	m_8	m_9	m_{11}	m_{10}

$$F = wz' + xy'w$$

3.8

(a) $wxy + yz + xy'z + wz'$

$$wxy \rightarrow 111_ \rightarrow 1110(14), 1111(15)$$

$$yz \rightarrow _ _ 11 \rightarrow 0011(3), 0111(7), 1011(11), 1111(15)$$

$$xy'z \rightarrow _ 101 \rightarrow 0101(5), 1101(13)$$

$$wz' \rightarrow 1 _ _ 0 \rightarrow 1000(8), 1010(10), 1100(12), 1110(14)$$

$wx \backslash yz$				
	00	01	11	10
00	0	0	1	0
01	0	1	1	0
11	1	1	1	1
10	1	0	1	1

$$F = \Sigma(3, 5, 7, 8, 10, 11, 12, 13, 14, 15)$$

(b) $AC'D + BC'D + ACD' + A'B'D + A'D'$

$AB \backslash CD$					
		00	01	11	10
00	1	0	0	1	$A'D'$
01	1	1	0	1	
11	0	1	0	1	ACD'
10	0	1	1	1	

$BC'D$ $AC'D$ $AB'D$

$F = \Sigma(0, 2, 4, 5, 6, 9, 10, 11, 13, 14)$

3.9

(b) $F(A, B, C, D) = \Sigma(0, 2, 3, 5, 6, 8, 9, 11, 12, 14, 15)$

$AB \backslash CD$		00	01	11	10
		1	0	1	1
01	0	1	0	1	
11	1	0	1	1	
10	1	1	1	0	

Prime Implicants: $A'BC'D, A'B'D', B'C'D', A'B'C,$

$A'CD', AB'C', AC'D', B'CD, AB'D, ABD', ACD, ABC, BCD'$

Essential Prime Implicants: $A'BC'D, B'CD, AB'C', A'B'D', BCD', ABC, AB'C'$

(c) $F(A, B, C, D) = \Sigma(2, 3, 4, 5, 6, 7, 9, 11, 12, 13)$

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

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

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

Non-Essential: $A'B$

3.12

(a) $F(A, B, C, D) = \pi(0, 2, 4, 6, 8, 10, 12, 14)$

$AB \backslash CD$					
		00	01	11	10
AB	00	0	1	1	0
	01	0	1	1	0
	11	0	1	1	0
	10	0	1	1	0

$$F = D$$

(b) $F(A, B, C, D) = \pi(1, 3, 5, 7, 9, 11, 13, 15)$

$AB \backslash CD$					
		00	01	11	10
00	1	0	0	1	
01	1	0	0	1	
11	1	0	0	1	
10	1	0	0	1	

$\rightarrow D'$

$$F = D'$$

3.13

(a) $F = xz' + y'z' + yz' + xy' = \Sigma(0, 2, 4, 5, 6)$

$x \backslash yz$	00	01	11	10
0	1	0	0	1
1	1	1	0	1

$$F = z' + xy' \quad (\text{Sum of Product})$$

$$F = (x + z')(y' + z') \quad (\text{Product of Sum})$$

(b) $F = AC'D' + C'D + AB' + AB'CD$

$$= \Sigma(1, 5, 8, 9, 10, 11, 12, 13)$$

$$= \pi(0, 2, 3, 4, 6, 7, 14, 15)$$

$AB \backslash CD$	00	01	11	10
00	0	1	0	0
01	0	1	0	0
11	1	1	0	0
10	1	1	1	1

$$F = AC' + C'D + AB' \quad (\text{Sum of Product})$$

$$F = (A + D)(A + C')(B' + C') \quad (\text{Product of Sum})$$

3.18

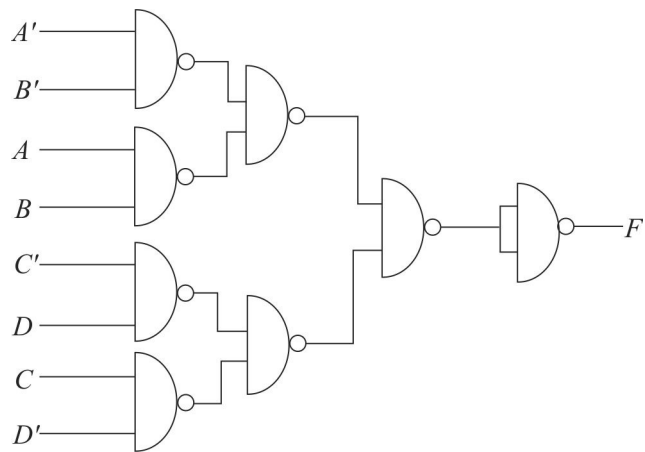
$$F(A, B, C, D) = (A \oplus B)'(C \oplus D)$$

$$= (A'B + AB')'(C'D + CD')$$

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

$$= (A'B' + AB)(C'D + CD')$$

$$= [(A'B')'(AB)]' + [(C'D)'(CD)']'$$



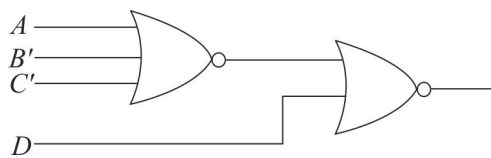
3.23

$$F(A, B, C, D) = \Sigma(0, 2, 4, 12, 14) + d(1, 5, 8, 10)$$

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

$$F = C'D' + AD' + B'D' \quad \text{OR} \quad F' = D + A'BC$$

$$F = [D + A'BC]' = [D + (A + B' + C)']'$$



3.30

$$F = A'B'C'D' + ABC'D' + A'B'CD + ABCD$$

$$= \overline{C'D'} (A \oplus B) + CD(A \oplus B)$$

$$= (A \oplus B) (C \oplus D)$$

