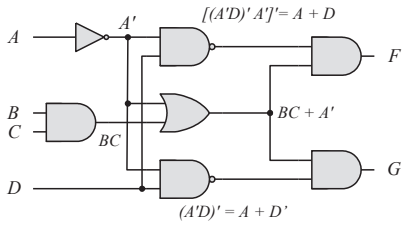
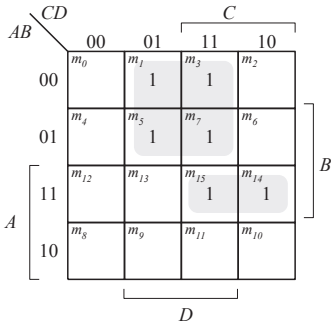
4.2

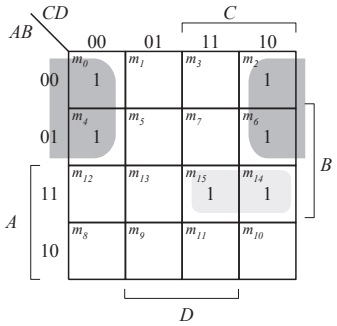


$F = (A + D)(A' + BC) = A'D + ABC + BCD + += A'D + ABC$

$F = (A + D')(A' + BC) = A'D' + ABC + BCD' = A'D' + ABC$



$F = A'D + ABC + BCD = A'D + ABC$



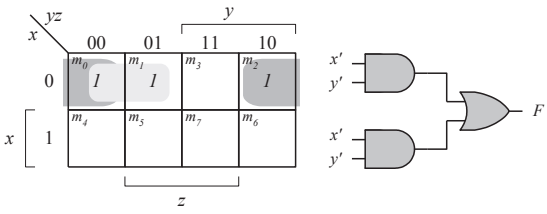
$G = A'D' + ABC + BCD' = A'D' + ABC$

4.3 **(a)** $Y_i = (A_iS' + B_iS)E'$ *for* $i = 0, 1, 2, 3$

(b) 1024 rows and 14 columns

4.4 **(a)**

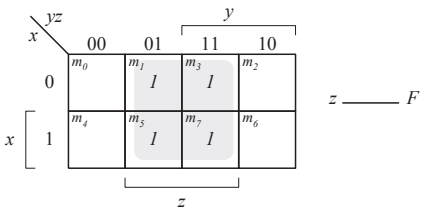
xyz	F
000	1
001	1
010	1
011	0
100	0
101	0
110	0
111	0



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

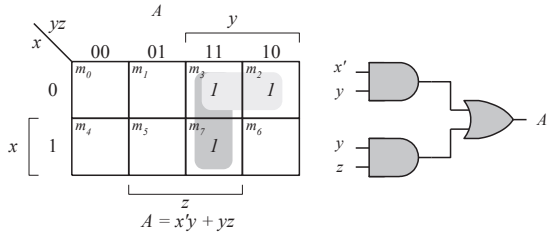
(b)

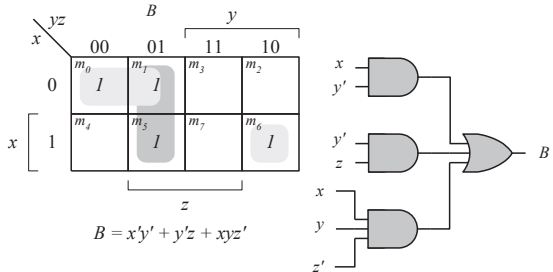
xyz	F
000	0
001	1
010	0
011	0
100	0
101	0
110	0
111	0

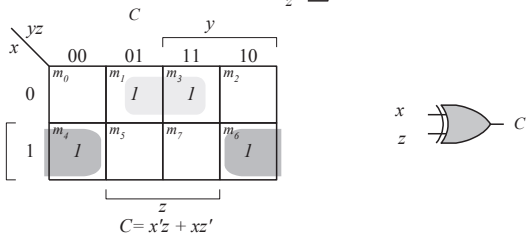


4.5

xyz	ABC
000	010
001	011
010	100
011	101
100	001
101	010
110	011
111	100

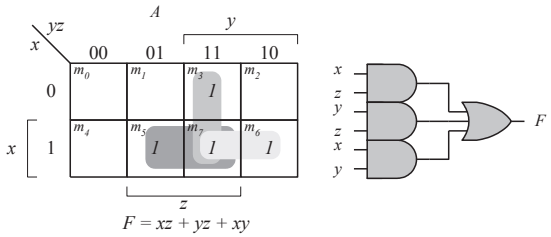






4.6

xyz	F
000	0
001	0
010	0
011	1
100	0
101	1
110	1
111	1

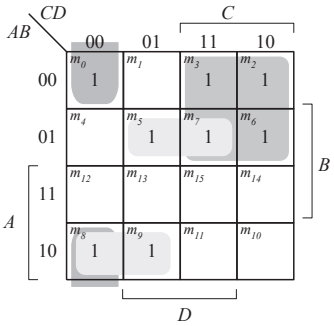


$F = xz + yz + xy$

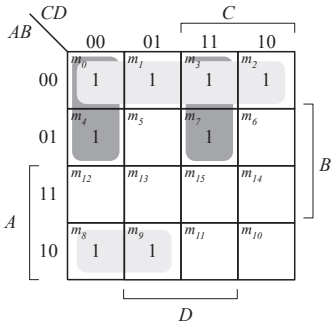
```
module Prob_4_6 (output F, input x, y, z);
  assign F = (x & z) | (y & z) | (x & y);
endmodule
```

4.9

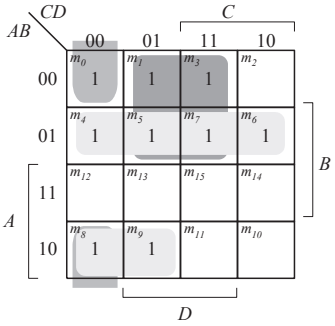
ABCD	a	b	c	d	e	f	g
0000	1	1	1	1	1	1	0
0001	0	1	1	0	0	0	0
0010	1	1	0	1	1	0	1
0011	1	1	1	1	0	0	1
0100	0	1	1	0	0	1	1
0101	1	0	1	1	0	1	1
0110	1	0	1	1	1	1	1
0111	1	1	1	0	0	0	0
1000	1	1	1	1	1	1	1
1001	1	1	1	1	0	1	1



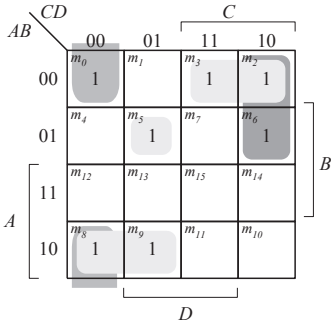
$a = A'C + A'BD + B'C'D' + AB'C'$



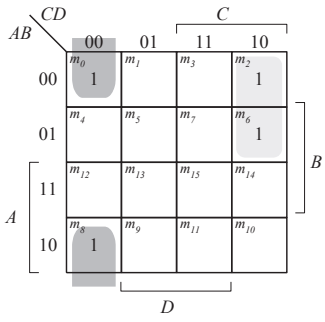
$b = A'B' + A'C'D' + A'CD + AB'C'$



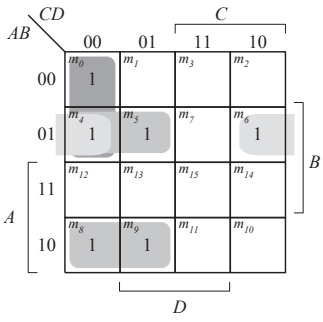
$c = A'B + A'D + B'C'D' + AB'C'$



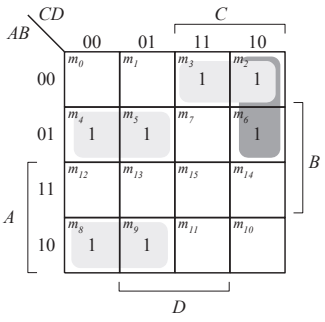
$d = A'CD' + A'B'C + B'C'D' + AB'C' + A'BC'D$



$e = A'CD' + B'C'D'$



$f = A'BC' + A'C'D' + A'BD + AB'C'$



$g = A'CD' + A'B'C + A'BC' + AB'C'$

4.13

	Sum	*C*	*V*
(a)	1101	0	1
(b)	0001	1	1
(c)	0100	1	0
(d)	1011	0	1
(e)	1111	0	0

4.14 xor AND OR XOR

10 + 5 + 5 + 10 = 30 ns

4.15 $C_4 = G_3 + P_3C_3 = G_3 + P_3(G_2 + P_2G_1 + P_2P_1G_0 + P_2P_1P_0C_0)$

$= G_3 + P_3G_2 + P_3P_2G_1 + P_3P_2P_1G_0 + P_3P_2P_1P_0C_0$

4.16 **(a)**

$(C'G'_i + p'_i)' = (C_i + G_i)P_i = G_iP_i + P_iC_i$
$= A_iB_i(A_i + B_i) + P_iC_i$
$= A_iB_i + P_iC_i = G_i + P_iC_i$
$= A_iB_i + (A_i + B_i)C_i = A_iB_i + A_iC_i + B_iC_i = C_{i+1}$
$(P_iG'_i) \oplus C_i = (A_i + B_i)(A_iB_i)' \oplus C_i = (A_i + Bi)(A'_i + B'_i) \oplus C_i$
$= (A'_iB_i + A_iB'_i) \oplus C_i = A_i \oplus B_i \oplus C_i = S_i$

(b)

Output of NOR gate = $(A_0 + B_0)' = P'_0$
Output of NAND gate = $(A_0B_0)' = G'_0$
$S_1 = (P_0G'_0) \oplus C_0$
$C_1 = (C'_0G'_0 + P'_0)'$ as defined in part (a)

4.17 **(a)**

$(C'_iG'_i + P'_i)' = (C_i + G_i)P_i = G_iP_i + P_iC_i = A_iB_i(A_i + B_i) + P_iC_i$
$= A_iB_i + P_iC_i = G_i + P_iC_i$
$= A_iB_i + (A_i + B_i)C_i = A_iB_i + A_iC_i + B_iC_i = C_{i+1}$

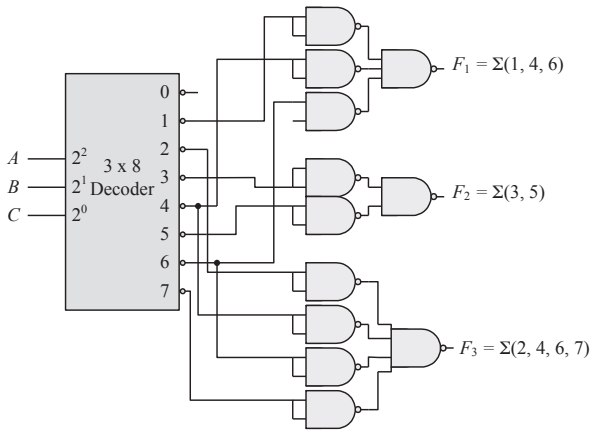
$(P_iG'_i) \oplus C_i = (A_i + B_i)(A_iB_i)' \oplus C_i = (A_i + B_i)(A'_i + B'_i) \oplus C_i$
$= (A'_iB_i + A_iB'_i) \oplus C_i = A_i \oplus B_i \oplus C_i = S_i$

(b)

Output of NOR gate = $(A_0 + B_0)' = P'_0$
Output of NAND gate = $(A_0B_0)' = G'_0$

$S_0 = (P_0G'_0) \oplus C_0$
$C_1 = (C'_0G'_0 + P'_0)'$ as defined in part (a)

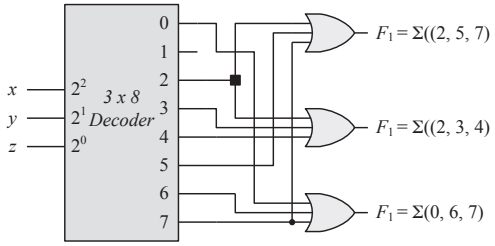
4.27



4.28 **(a)**

$F_1 = x(y + y')z + x'yz' = xyx + xy'z + x'yz' = \Sigma(2, 5, 7)$
$F_2 = xy'z' + x'y = xy'z' + x'yz + x'yz' = \Sigma(2, 3, 4)$
$F_3 = x'y'z' + xy(z + z') = x'y'z' + xyz + xyz' = \Sigma(0, 6, 7)$

(b)



4.30

Inputs								*Outputs*			
D_0	D_1	D_2	D_3	D_4	D_5	D_6	D_7	x	y	z	V
0	0	0	0	0	0	0	0	x	x	x	0
1	0	0	0	0	0	0	0	0	0	0	1
x	1	0	0	0	0	0	0	0	0	1	1
x	x	1	0	0	0	0	0	0	1	0	1
x	x	x	1	0	0	0	0	0	1	1	1
x	x	x	x	1	0	0	0	1	0	0	1
x	x	x	x	x	1	0	0	1	0	1	1
x	x	x	x	x	x	1	0	1	0	0	1
x	x	x	x	x	x	x	1	1	1	1	1

If $D_2 = 1$, $D_6 = 1$, all others = 0
Output xyz = 100 and V = 1

4.31