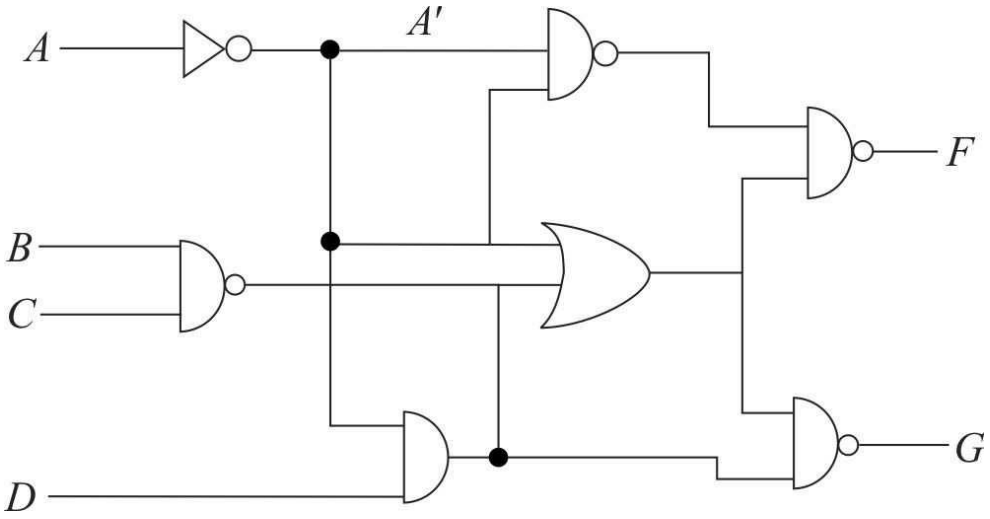
4.2



$F(A, B, C, D) = ((A′D)′ (A′ + BC))′$

$= A′D + (A′ + BC)′$

$= A′D + A (BC)′$

$= A′D + AB′ + AC′$

$C1(A, B, C, D) = ((A′D) (A′ + BC))′$

$= (A′D)′ + (A′ + BC)′$

$= (A + D′) + A (BC)′$

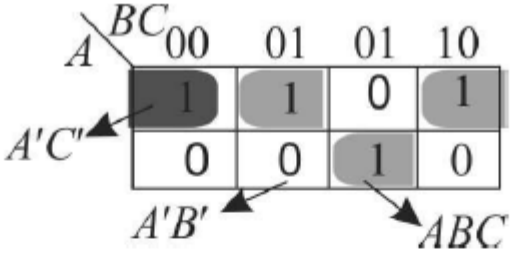
$= A + D′ + AB′ + AC′$

$= A (1 + B′ + C′) + D′$

$= A + D′$

4.4

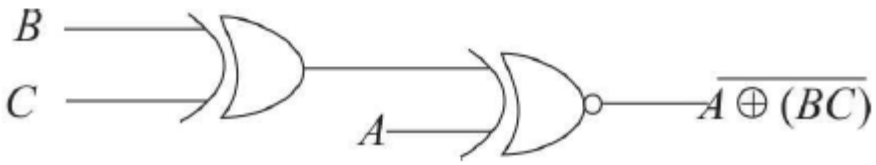
(a) $F(A, B, C) = \Sigma(0, 1, 2, 7)$



Simplified SOP form:

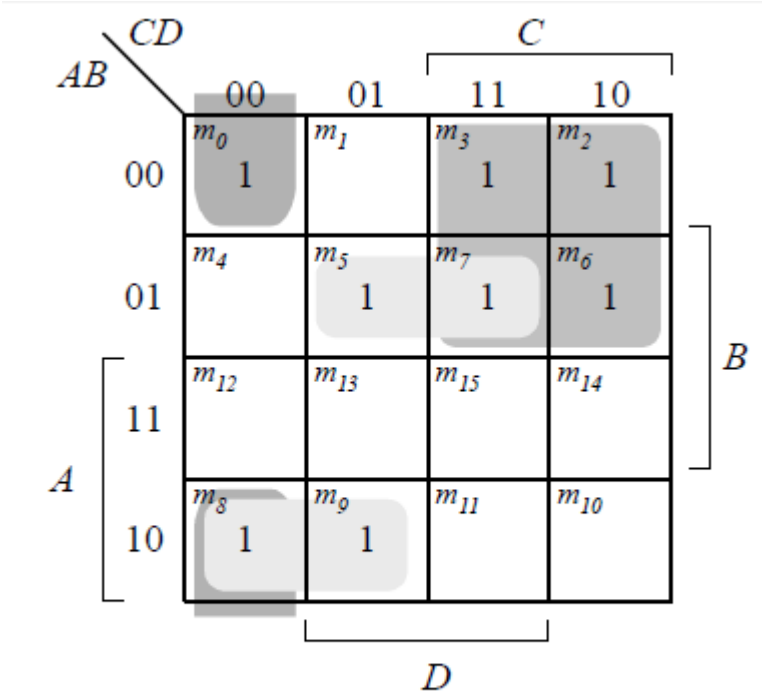
$$F(A, B, C) = A'C' + A'B' + ABC$$
$$= A'(B' + C') + ABC$$
$$= A'(BC)' + ABC$$
$$= A \text{ XNOR } (BC)$$

$$= A \oplus (BC)$$

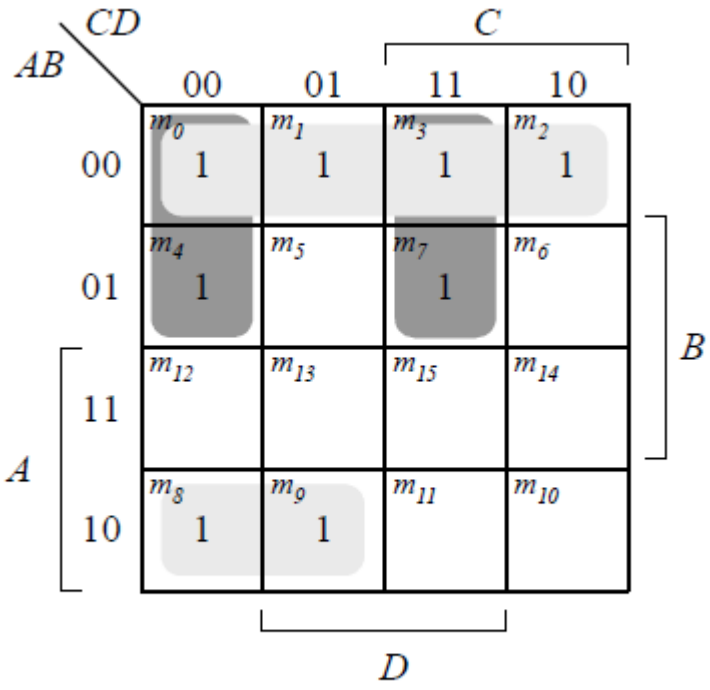


4.9

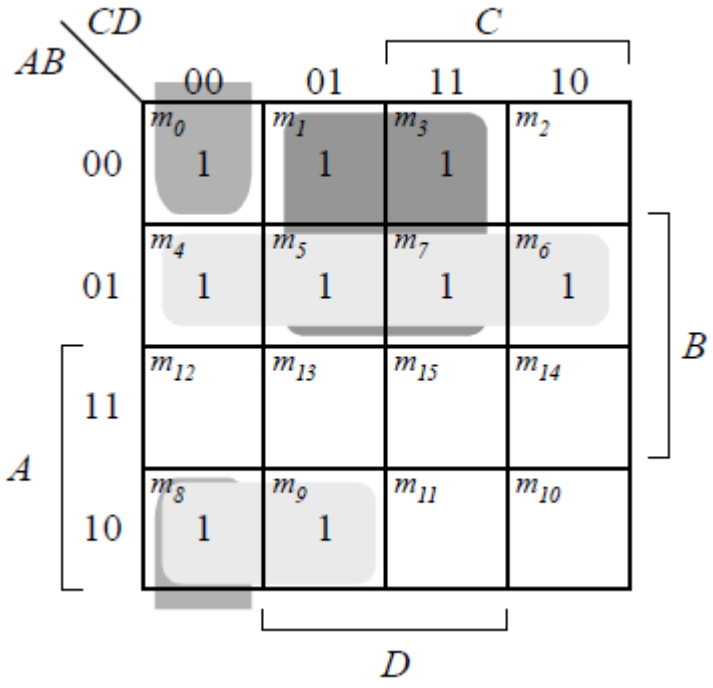
ABCD	*a*	*b*	*c*	*d*	*e*	*f*	*g*
0000	1	1	1	1	1	1	0
0001	0	1	1	0	0	0	0
0010	1	1	0	1	1	0	1
0011	1	1	1	1	0	0	1
0100	0	1	1	0	0	1	1
0101	1	0	1	1	0	1	1
0110	1	0	1	1	1	1	1
0111	1	1	1	0	0	0	0
1000	1	1	1	1	1	1	1
1001	1	1	1	1	0	1	1



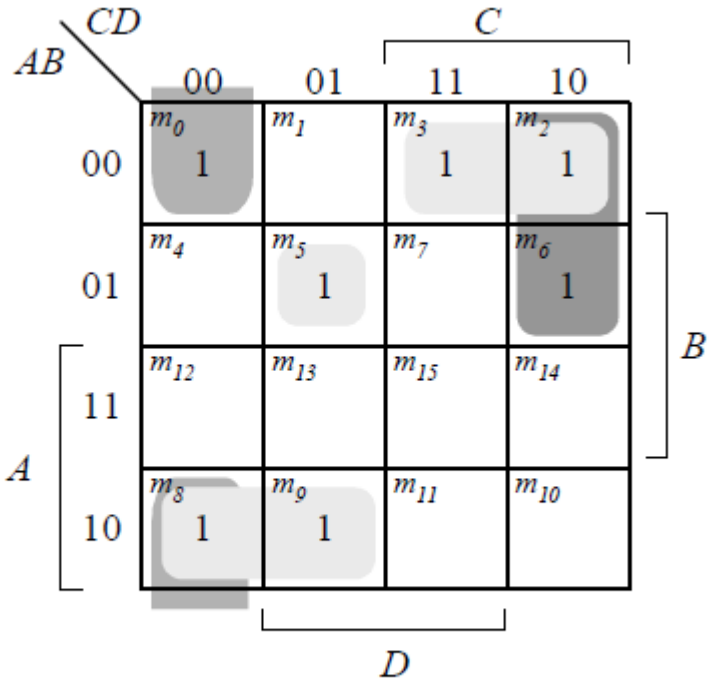
$$a = A'C + A'BD + B'C'D' + AB'C'$$



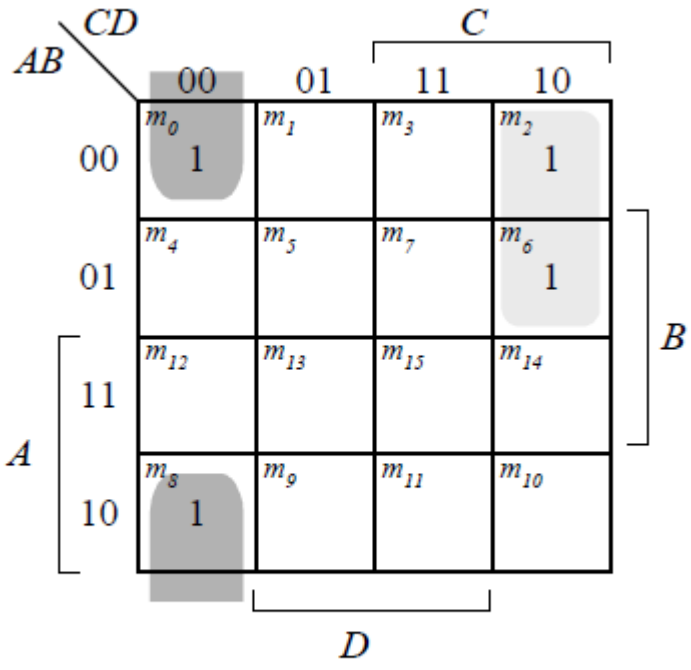
$$b = A'B' + A'C'D' + A'CD + AB'C'$$



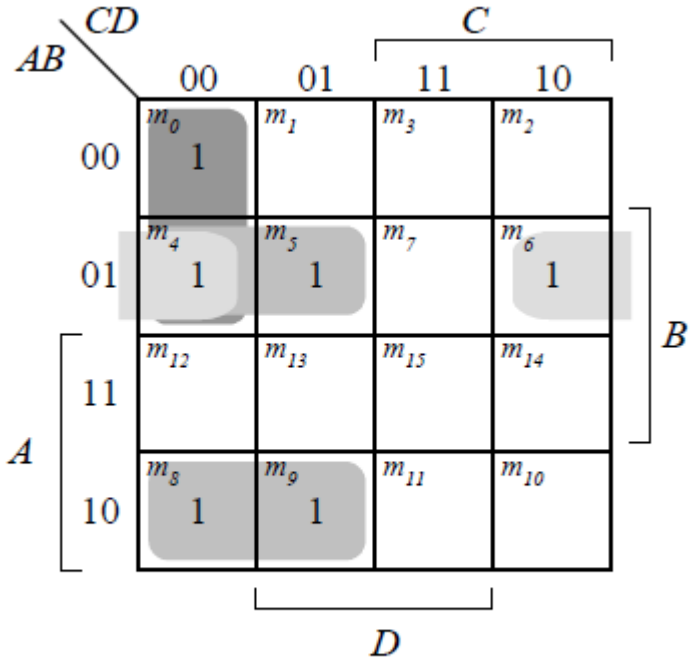
$$c = A'B + A'D + B'C'D' + AB'C'$$



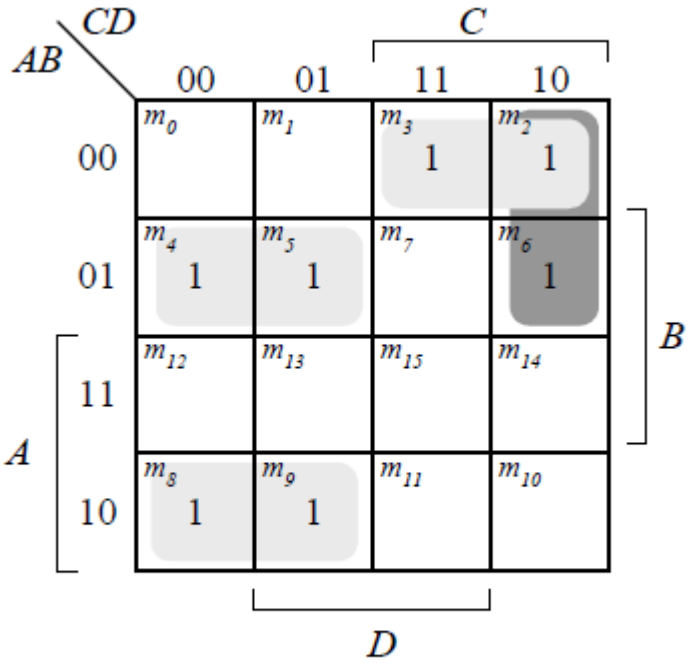
$$d = A'CD' + A'B'C + B'C'D' + AB'C' + A'BC'D$$



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



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



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

4.16

(a)

(C'G'i + p'i)' = (Ci + Gi)Pi = GiPi + PiCi

= AiBi(Ai + Bi) + PiCi

= AiBi + PiCi = Gi + PiCi

= AiBi + (Ai + Bi)Ci = AiBi + AiCi + BiCi = Ci+1

(PiG'i) ⊕ Ci = (Ai + Bi)(AiBi)' ⊕ Ci = (Ai + Bi)(A'i + B'i) ⊕ Ci

= (A'iBi + AiB'i) ⊕ Ci = Ai ⊕ Bi ⊕ Ci = Si

(b)

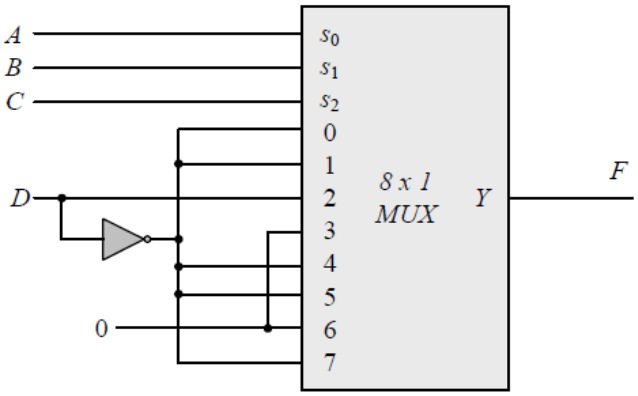
Output of NOR gate = (A0 + B0)' = P'0

Output of NAND gate = (A0B0)' = G'0

S1 = (P0G'0) ⊕ C0

C1 = (C'0G'0 + P'0)' as defined in part (a)

4.32

(a) F = S(0, 2, 5, 8, 10, 14)

Inputs ABCD	*Mux input line (ABC)*	*Value*	*F = Σ(0, 2, 5, 8, 10, 14)*
000 0	0	**0**	1
000 1	0	1	0 *F = D'*
001 0	1	**2**	1
001 1	1	3	0 *F = D'*
010 0	2	4	0
010 1	2	**5**	1 *F = D*
011 0	3	6	0
011 1	3	7	0 *F = 0*
100 0	4	**8**	1
100 1	4	9	0 *F = D'*
101 0	5	**10**	1
101 1	5	11	0 *F = D'*
110 0	6	12	0
110 1	6	13	0 *F = 0*
111 0	7	**14**	1
111 1	7	15	0 *F = D'*