

2.22

$$F(A,B,C,D) = A'BC + AD + AC$$

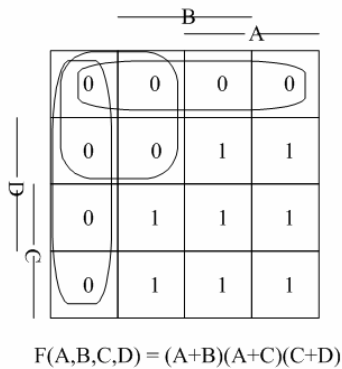
(a)

Truth table

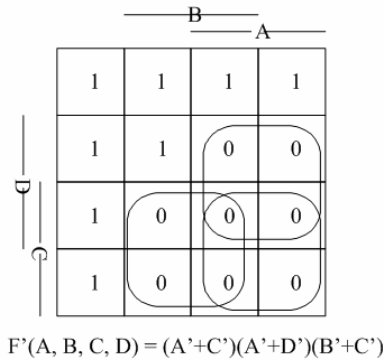
id	A	B	C	D	F	
0	0	0	0	0	0	$A+B+C+D$
1	0	0	0	1	0	$A+B+C+D'$
2	0	0	1	0	0	$A+B+C'+D$
3	0	0	1	1	0	$A+B+C'+D'$
4	0	1	0	0	0	$A+B'+C+D$
5	0	1	0	1	0	$A+B'+C+D'$
6	0	1	1	0	1	
7	0	1	1	1	1	
8	1	0	0	0	0	$A'+B+C+D$
9	1	0	0	1	1	
10	1	0	1	0	1	
11	1	0	1	1	1	
12	1	1	0	0	0	$A'+B'+C+D$
13	1	1	0	1	1	
14	1	1	1	0	1	
15	1	1	1	1	1	

$$F(A, B, C, D) = \prod M(0,1,2,3,4,5,8,12)$$

(b) K-map of F



(c) K-map of F'



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

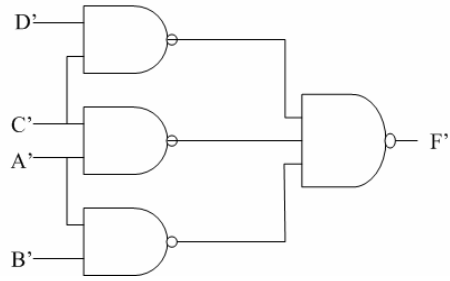
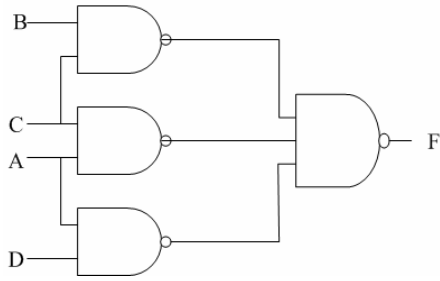
(e)

$$F(A,B,C,D) = A'BC + AD + AC = BC + AD + AC = ((BC+AD+AC))'$$

$$= ((BC)'(AD)'(AC))'$$

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

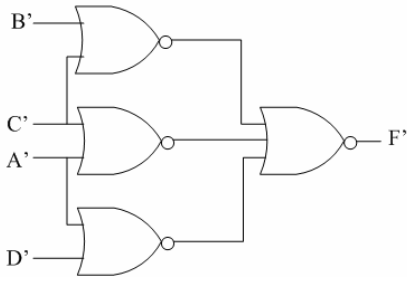
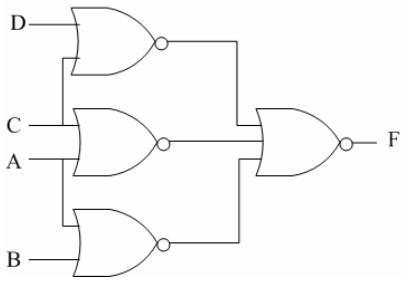
$$= ((A'B')'(A'C')'(C'D'))'$$



(f)

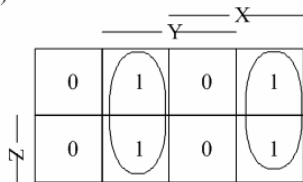
$$F(A,B,C,D) = (A+B)(A+C)(C+D) = (((A+B)(A+C)(C+D)))' \\ = ((A+B)' + (A+C)' + (C+D)')'$$

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



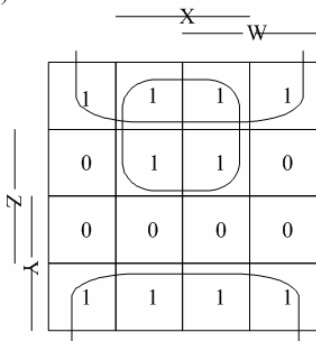
2.25

(a)



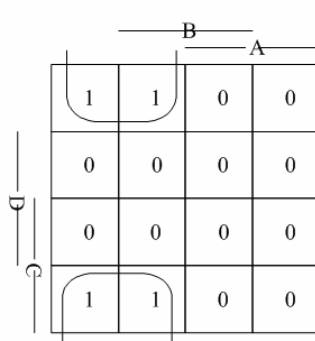
$$f(X,Y,Z) = X'Y + XY'$$

(b)



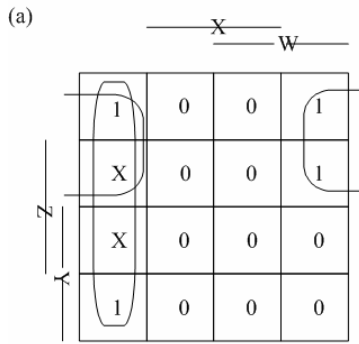
$$F(W,X,Y,Z) = Z' + XY'$$

(c)

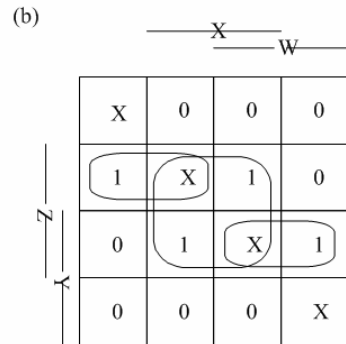


$$F'(A,B,C,D) = A'D'$$

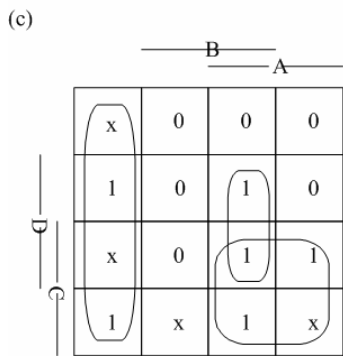
2.26



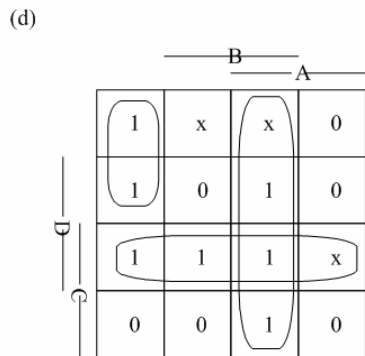
$$f(W,X,Y,Z) = W'X' + X'Y'$$



$$f(W,X,Y,Z) = XZ + W'Y'Z + WYZ$$

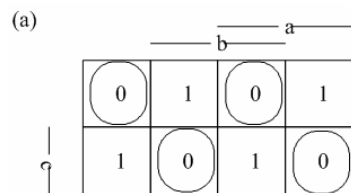


$$F(A,B,C,D) = A'B' + AC + ABD$$

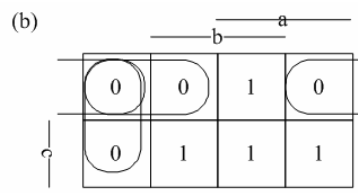


$$F'(A,B,C,D) = AB + CD + A'B'C'$$

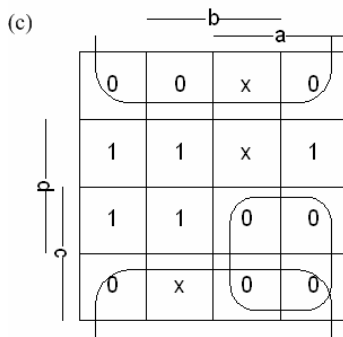
2.27



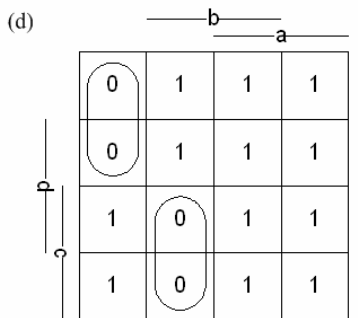
$$f(A,B,C) = (A'+B'+C)(A+B'+C')(A'+B+C')(A+B+C)$$



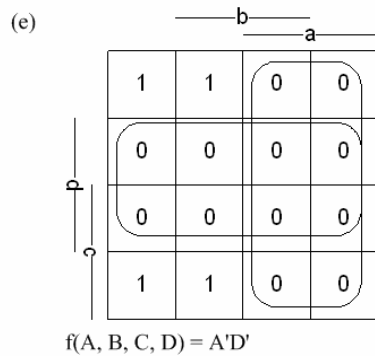
$$f(A,B,C) = (A+B)(B+C)(A+C)$$



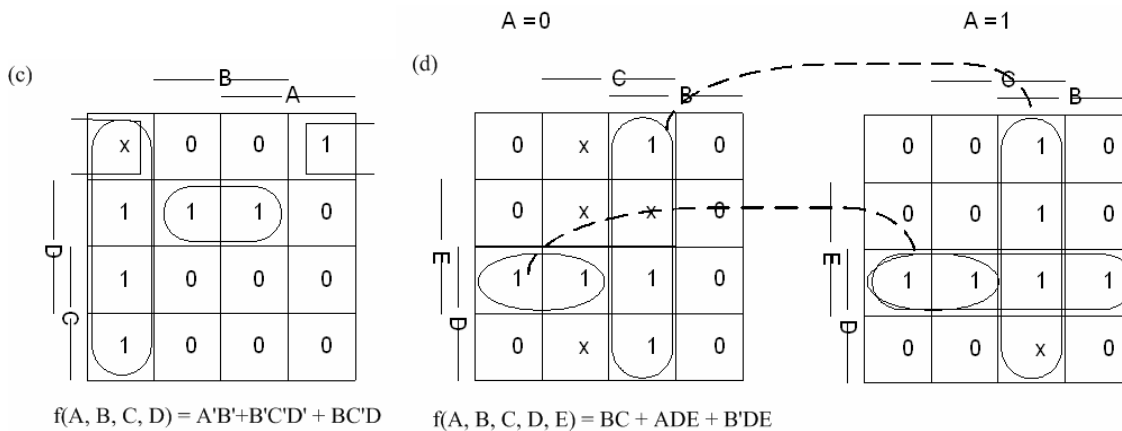
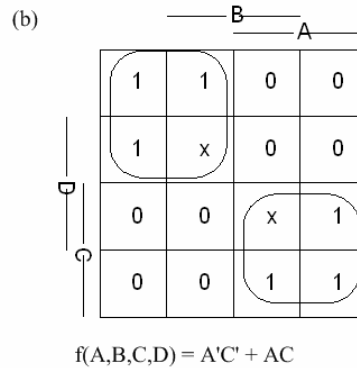
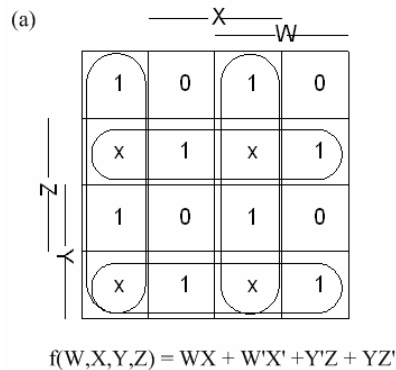
$$f(A,B,C,D) = D(A'+C')$$



$$f(A,B,C,D) = (A+B+C)(A+B'+C')$$



3.3



3.4

3.3 (a):

Prime implicants are $WX, W'X', Y'Z, YZ'$.

Essential primes are $WX, W'X', Y'Z, YZ'$.

No.

4 don't cares are set to 1.

3.3(b):

Prime implicants are $A'C', AC$.

Essential primes are $A'C'$, AC .

No.

2 don't cares are set to 1.

3.3(c)

Prime implicants are $A'B'$, $B'C'D'$, $BC'D$, $A'C'D$.

Essential primes are $A'B'$, $B'C'D'$, $BC'D$.

Yes.

1 don't care is set to 1.

3.3(d)

Prime implicants are BC , ADE , $B'DE$, $A'C$, CDE .

Essential primes are BC , ADE , $B'DE$.

Yes.

2 don't cares are set to 1.

3.6

(a)

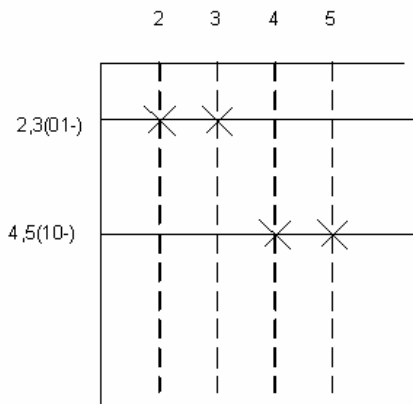
Column I Column II

010 (v) 01- (*)

100 (v) 10- (*)

011 (v)

101 (v)



$$f = X'Y + XY'$$

(b)

Column I Column II Column III

0001 (v) 0-01 (v) --01 (*)

0100 (v) -001 (v) -10- (*)

1000 (v) 010- (v) 1-0- (*)

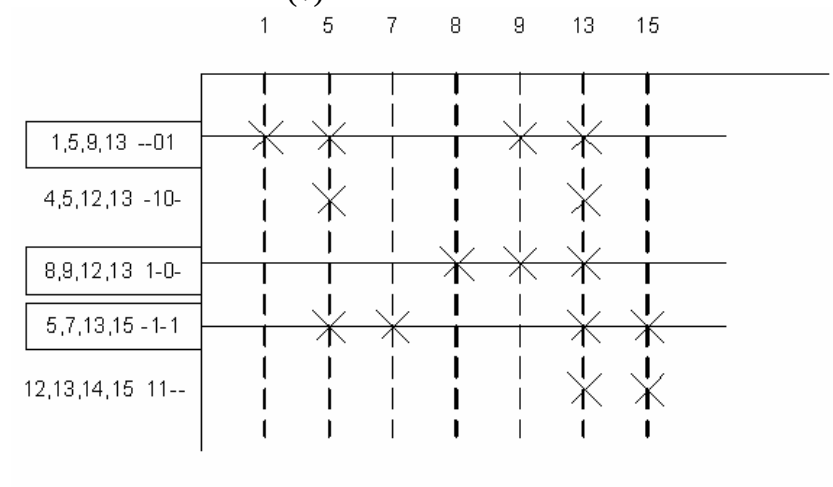
-100 (v)

0101 (v) 100- (v) -1-1 (*)

1001 (v) 1-00 (v) 11- - (*)

1100 (v)

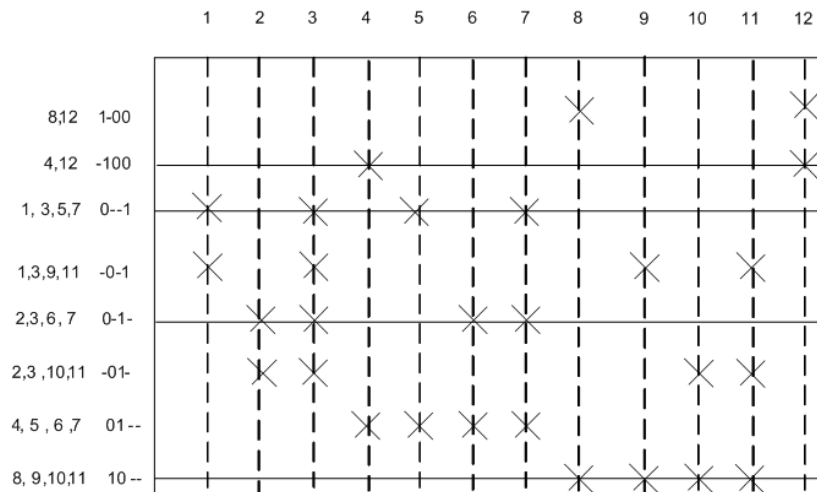
0111 (v) 01-1 (v)
 1011 (v) -101 (v)
 1101 (v) 1-01 (v)
 1110 (v) 110- (v)
 11-0 (v)
 1111 (v)
 -111 (v)
 11-1 (v)
 111- (v)



$$f(A,B,C,D) = C'D + AC' + BD$$

(c)

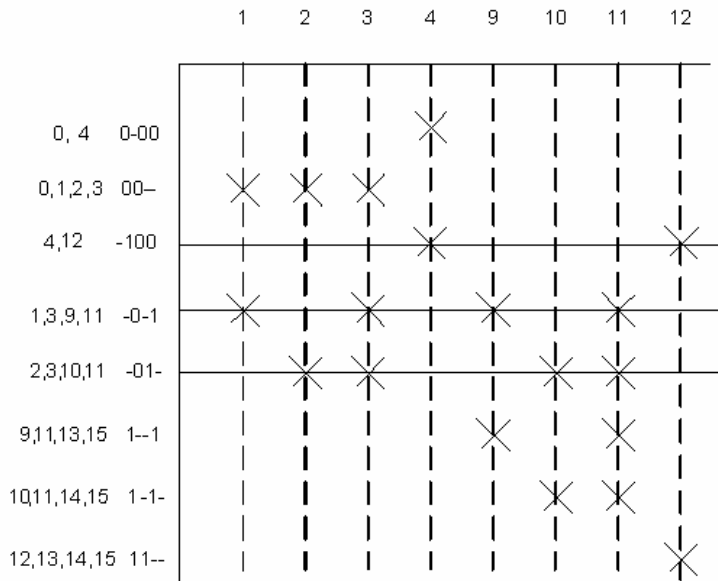
Column I	Column II	Column III
0001 v	00-1 v	0--1 *
0010 v	0-01 v	-0-1 *
0100 v	-001 v	0-1- *
1000 v	001- v	-01- *
	0-10 v	01-- *
0011 v	-010 v	10-- *
0101 v	-100 *	
0110 v	1-00 *	
1001 v	010- v	
1010 v	01-0 v	
1100 v	100- v	
	10-0 v	
0111 v		
1011 v	0-11 v	
	-011 v	
	01-1 v	
	011-v	
	10-1 v	
	101- v	



$$f(A, B, C, D) = A'D + A'C + AB' + BC'D'$$

(d)

Column I	Column II	Column III
0000 v	000- v	00-- *
	00-0 v	
0001 v	0-00 *	-0-1 *
0010 v		-01- *
0100 v	00-1 v	
	-001 v	1- -1 *
0011 v	001- v	1-1- *
1001 v	-010 v	11- - *
1010 v	-100 *	
1100 v		
	-011 v	
	10-1 v	
1011 v	1-01 v	
1101 v	101- v	
1110 v	1-10 v	
	110- v	
1111 v	11-0 v	
	1-11 v	
	11-1 v	
	111- v	

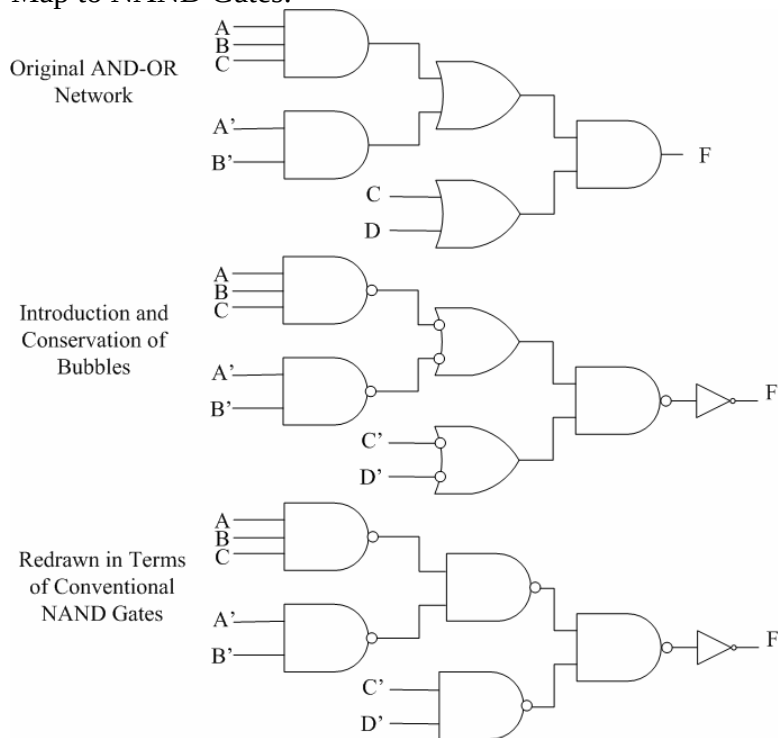


$$f(A, B, C, D) = B'D + B'C + BC'D'$$

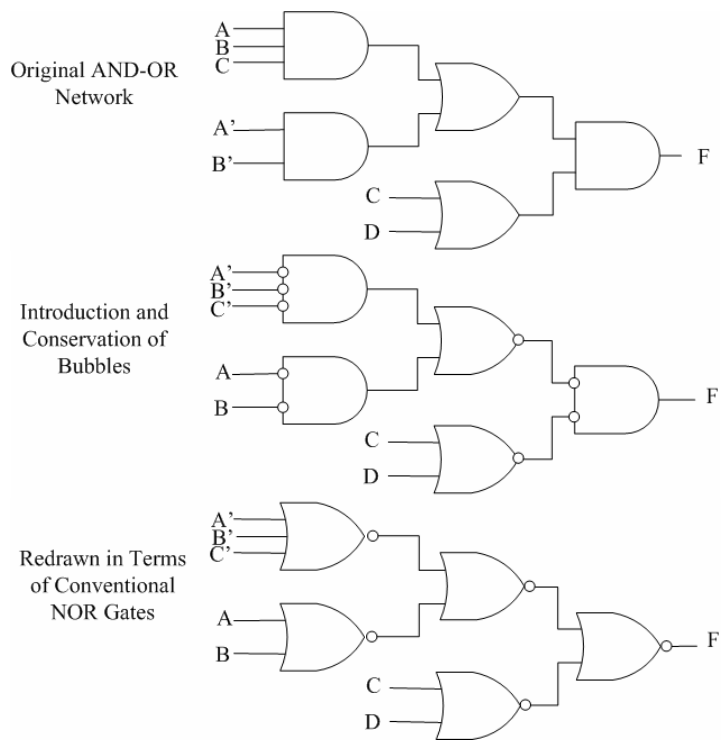
3.8

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

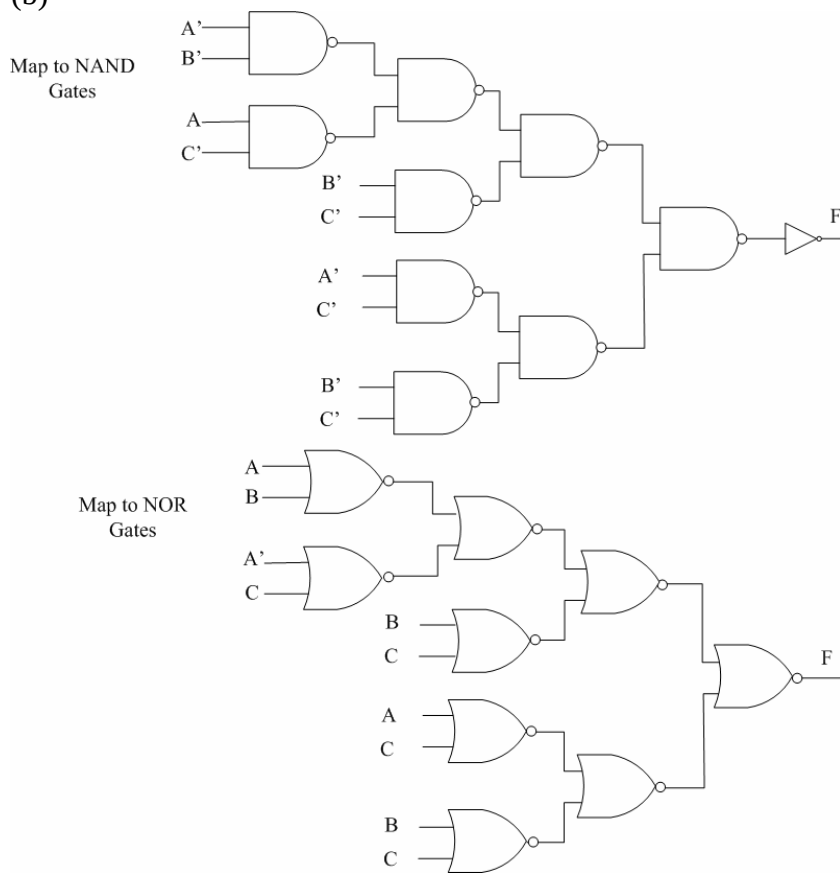
Map to NAND Gates.



Map to NOR gates.

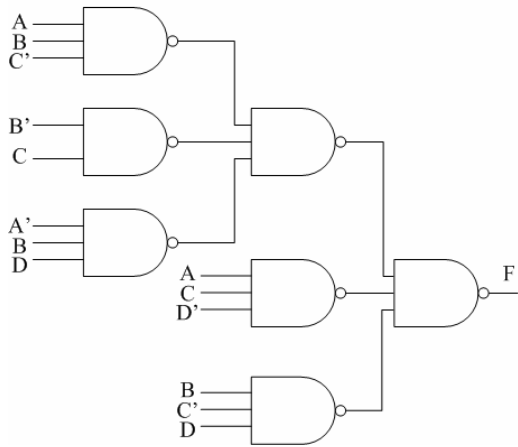


(b)

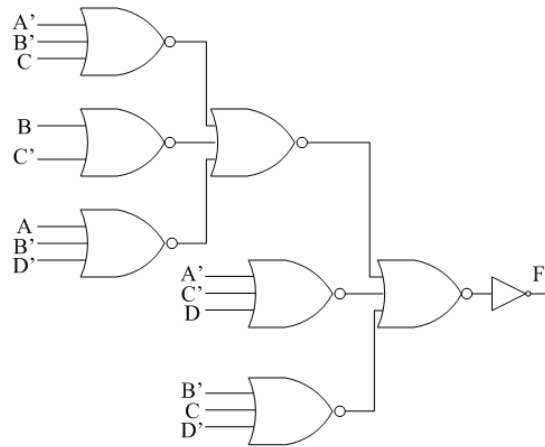


(c)

Map to NAND Gates

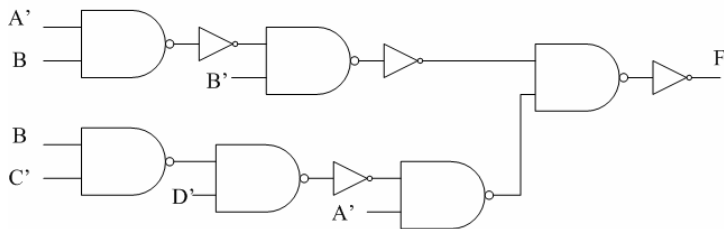


Map to NOR Gates



(d)

Map to NAND Gates



Map to NOR Gates

