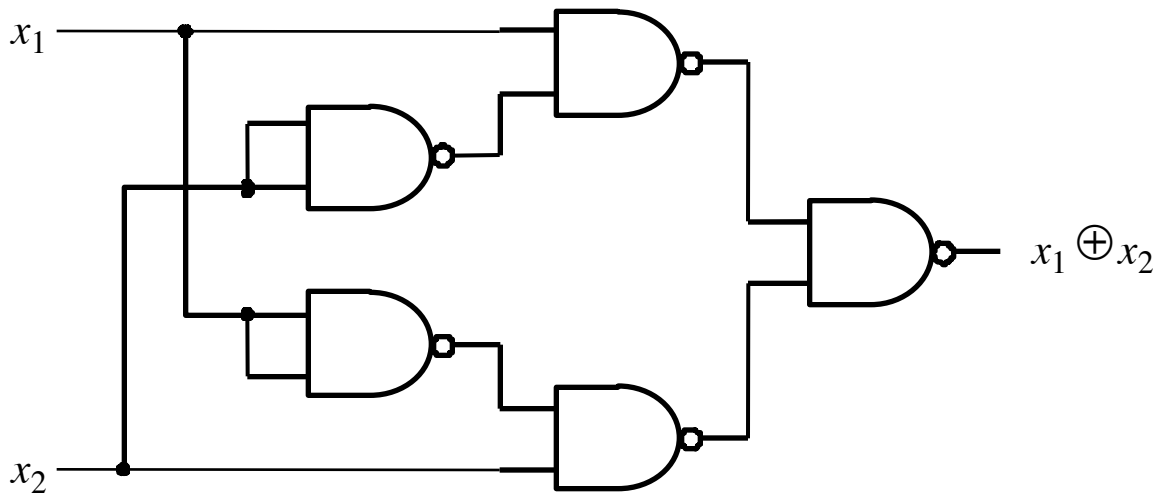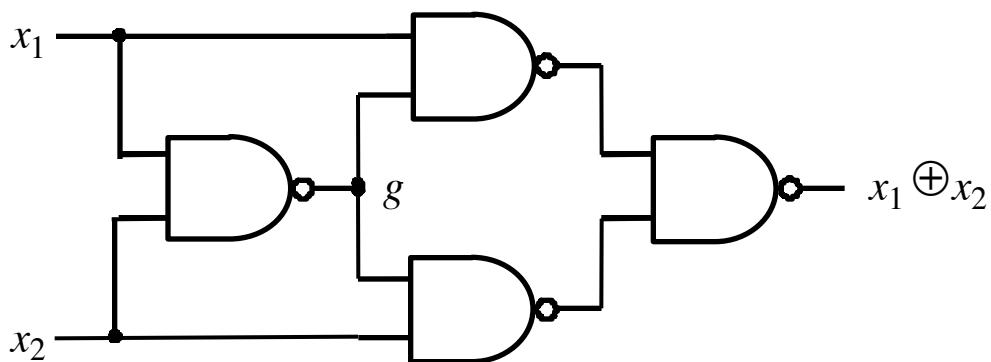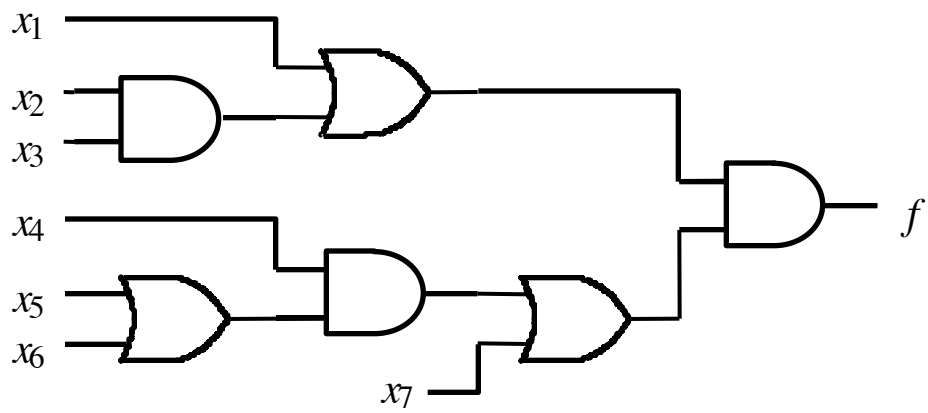(a) Sum-of-products implementation
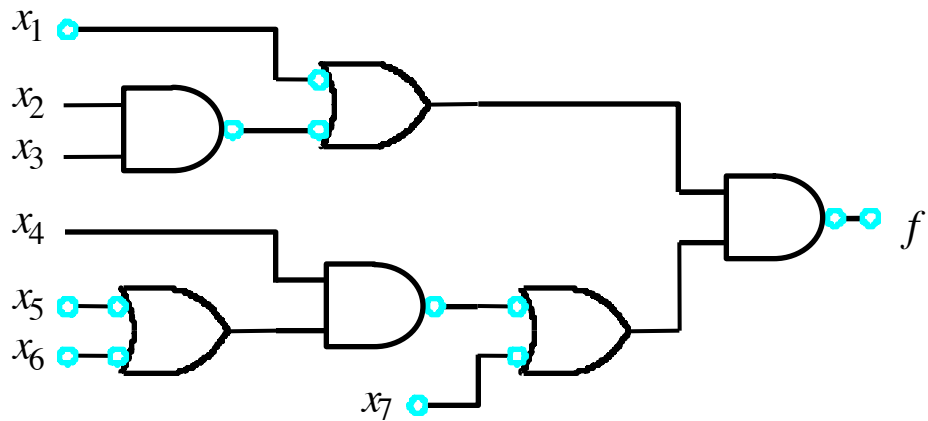
(b) NAND gate implementation

(c) Optimal NAND gate implementation

Figure 8.9.   Implementation of XOR.

(a) Circuit with AND and OR gates
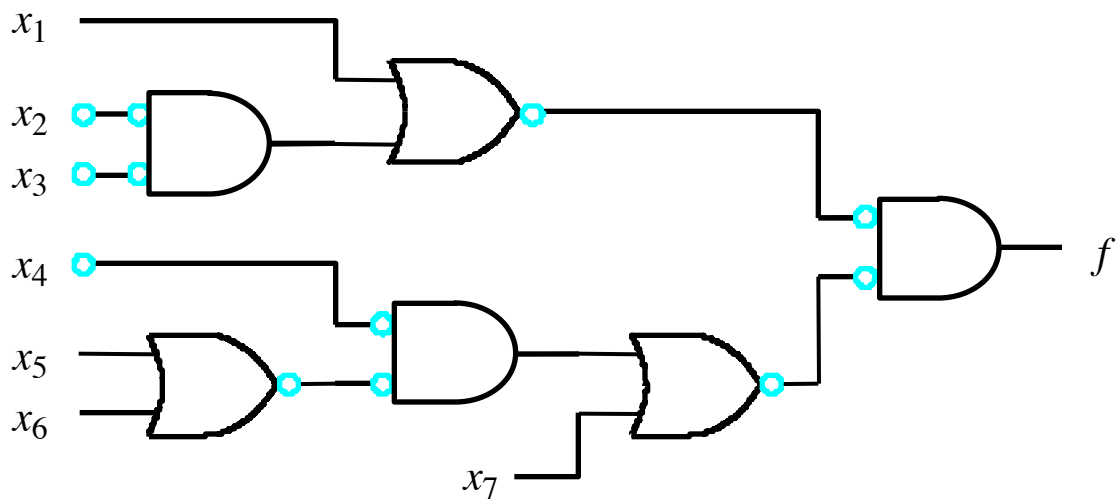

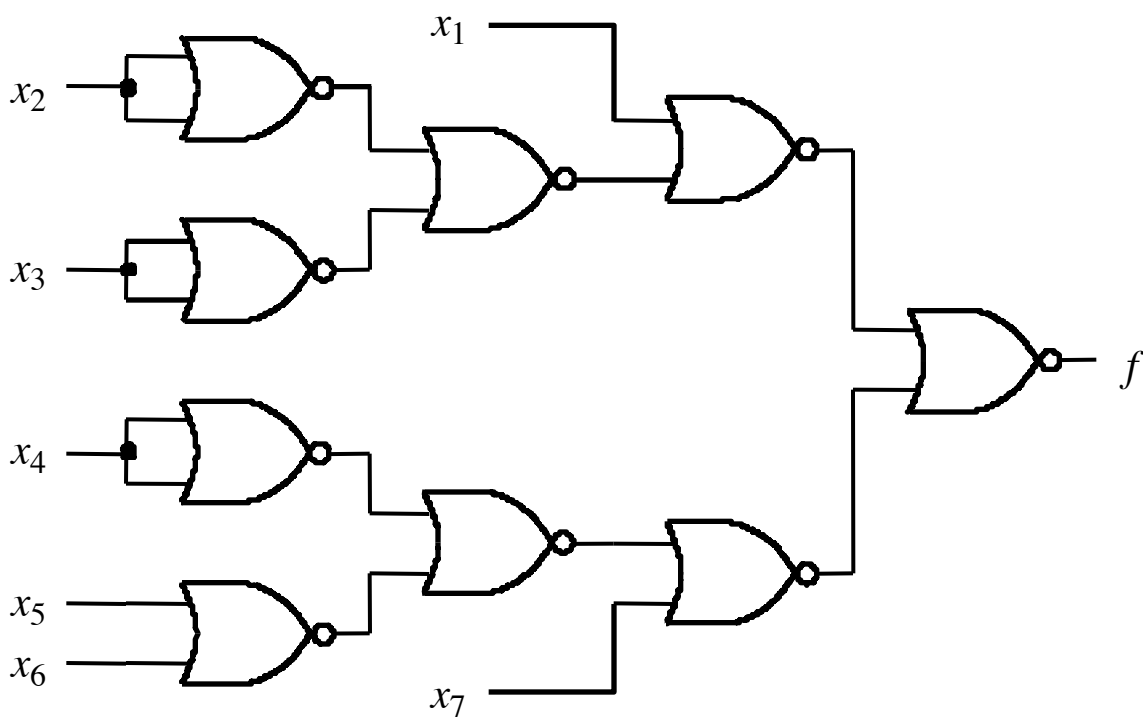(b) Inversions needed to convert to NANDs

(c) NAND-gate circuit

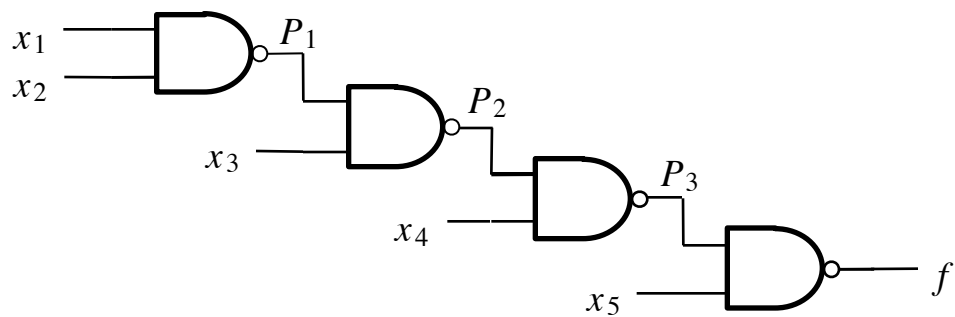Figure 8.10.   Conversion to a NAND-gate circuit.

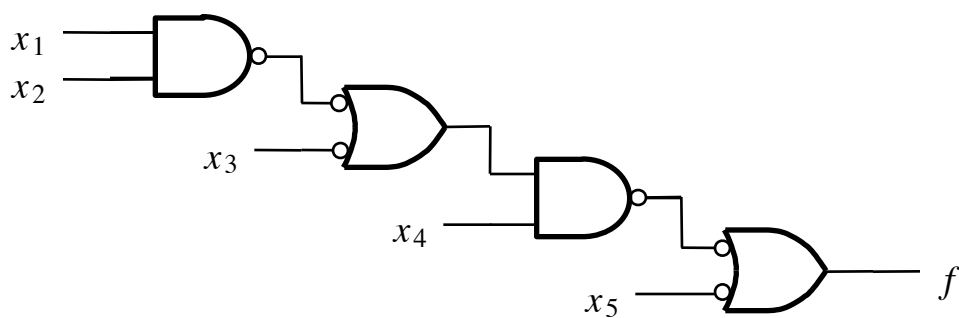(a) Inversions needed to convert to NORs

(b) NOR-gate circuit

Figure 8.11.   Conversion to a NOR-gate circuit.

(a) NAND-gate circuit

(b) Moving bubbles to convert to ANDs and ORs

(c) Circuit with AND and OR gates

Figure 8.14.   Circuit for Example 8.8.

Prime implicant		Minterm							
		0	4	8	10	11	12	13	15
p_1	= 1 0 x 0			✓	✓				
p_2	= 1 0 1 x				✓	✓			
p_3	= 1 1 0 x						✓	✓	
p_4	= 1 x 1 1					✓			✓
p_5	= 1 1 x 1							✓	✓
p_6	= x x 0 0	✓	✓	✓			✓		

(a) Initial prime implicant cover table

Prime implicant	Minterm			
	10	11	13	15
p_1	✓			
p_2	✓	✓		
p_3			✓	
p_4		✓		✓
p_5			✓	✓

(b) After the removal of essential prime implicants

Prime implicant	Minterm			
	10	11	13	15
p_2	✓	✓		
p_4		✓		✓
p_5			✓	✓

(c) After the removal of dominated rows

Figure 8.26. Selection of a cover for the function in Figure 2.58.

Prime implicant	Minterm							
	0	2	5	6	7	8	9	13
p_1 = 0 0 x 0	✓	✓						
p_2 = 0 x 1 0		✓		✓				
p_3 = 0 1 1 x				✓	✓			
p_4 = x 0 0 x	✓					✓	✓	
p_5 = x x 0 1			✓				✓	✓
p_6 = 1 x 0 x						✓	✓	✓
p_7 = x 1 x 1			✓		✓			✓

(a) Initial prime implicant cover table

Prime implicant	Minterm					
	0	2	5	6	7	8
p_1 = 0 0 x 0	✓	✓				
p_2 = 0 x 1 0		✓		✓		
p_3 = 0 1 1 x				✓	✓	
p_4 = x 0 0 x	✓					✓
p_5 = x x 0 1			✓			
p_6 = 1 x 0 x						✓
p_7 = x 1 x 1			✓		✓	

(b) After the removal of columns 9 and 13

Prime implicant	Minterm					
	0	2	5	6	7	8
p_1	✓	✓				
p_2		✓		✓		
p_3				✓	✓	
p_4	✓					✓
p_7			✓		✓	

(c) After the removal of rows p_5 and p_6

Prime implicant	Minterm	
	2	6
p_1	✓	
p_2	✓	✓
p_3		✓

(d) After including p_4 and p_7 in the cover

Figure 8.28.   Selection of a cover for the function in Example 8.12.

Prime implicant		Minterm 0	3	10	15
$P_1 = 0\ 0\ \text{x}\ \text{x}$		✓	✓		
$P_2 = \text{x}\ 0\ \text{x}\ 0$		✓		✓	
$P_3 = \text{x}\ 0\ 1\ \text{x}$			✓	✓	
$P_4 = \text{x}\ \text{x}\ 1\ 1$			✓		✓
$P_5 = 1\ \text{x}\ 1\ \text{x}$				✓	✓

(a) Initial prime implicant cover table

Prime implicant	Minterm 0	15
P_1	✓	
P_2	✓	
P_4		✓
P_5		✓

(b) After including p_3 in the cover

Prime implicant	Minterm 0	3	10	15
P_1	✓	✓		
P_2	✓		✓	
P_4		✓		✓
P_5			✓	✓

(c) After excluding p_3 from the cover

Figure 8.29.   Selection of a cover for the function in Example 8.13.