

Solutions to Problem Set of chapter 4

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6. (a) $X = (A+B)C + B$

A	B	C	A+B	(A+B)C	X
0	0	0	0	0	0
0	0	1	0	0	0
0	1	0	1	0	1
0	1	1	1	1	1
1	0	0	1	0	0
1	0	1	1	1	1
1	1	0	1	0	1
1	1	1	1	1	1

(b) $X = \overline{(A+B)}C$

A	B	C	$\overline{A+B}$	X
0	0	0	1	0
0	0	1	1	1
0	1	0	0	0
0	1	1	0	0
1	0	0	0	0
1	0	1	0	0
1	1	0	0	0
1	1	1	0	0

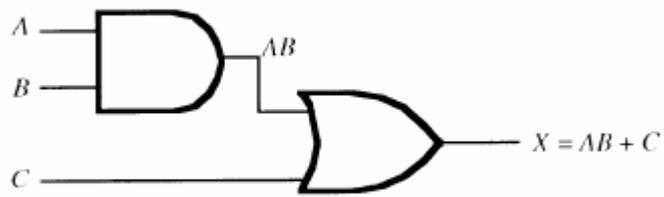
10.

(c) $\overline{\overline{(A+B+C+D)} + \overline{ABCD}} = \overline{ABCD} + \overline{A+B+C+D}$

(d) $\overline{\overline{(A+B+C+D)}(\overline{ABCD})} = \overline{\overline{ABCD}(\overline{A+B+C+D})}$
 $= \overline{\overline{ABCD} + \overline{A+B+C+D}} = \overline{A+B+C+D} + \overline{ABCD}$

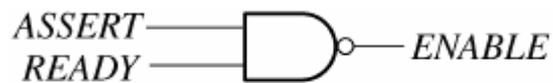
(e) $\overline{\overline{AB}(CD+\overline{EF})(\overline{AB}+\overline{CD})} = \overline{AB} + \overline{(CD+\overline{EF})} + \overline{(\overline{AB}+\overline{CD})}$
 $= \overline{AB} + \overline{(CD)(\overline{EF})} + \overline{(\overline{AB})(\overline{CD})}$
 $= \overline{AB} + \overline{(C+D)(E+F)} + \overline{ABCD}$

14.



(c)

16.



(a)

20.

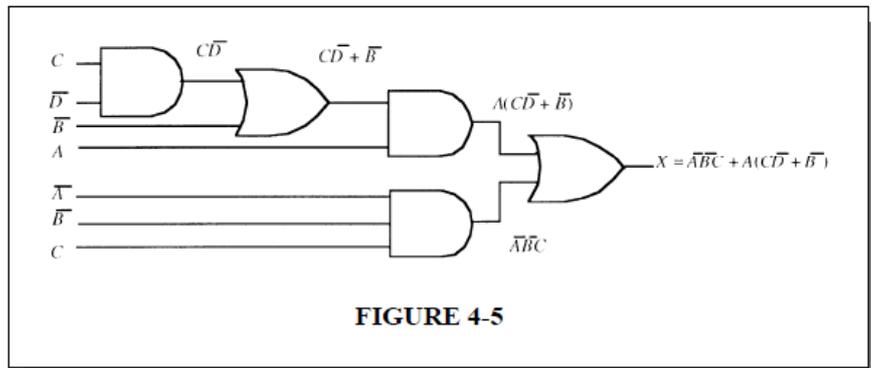
$$(b) \quad \overline{AB} + \overline{ABC} + \overline{ABCD} + \overline{ABCDE} = \overline{AB}(1 + \overline{C} + CD + \overline{CDE}) = \overline{AB}(1) \\ = \overline{AB}$$

$$(d) \quad (\overline{A} + \overline{A})(\overline{AB} + \overline{ABC}) = \overline{A}A\overline{B} + \overline{A}A\overline{BC} + \overline{A}A\overline{B} + \overline{A}A\overline{BC} \\ = \overline{AB} + \overline{ABC} + 0 + 0 = \overline{AB}(1 + \overline{C}) = \overline{AB}$$

$$(e) \quad \overline{AB} + (\overline{A} + \overline{B})C + \overline{AB} = \overline{AB} + \overline{A}C + \overline{B}C + \overline{AB} = \overline{AB} + (\overline{A} + \overline{B})C \\ = \overline{AB} + \overline{ABC} = \overline{AB} + C$$

22.

(a) See Figure 4-5.



$$\begin{aligned} X &= \overline{A}\overline{B}C + A(C\overline{D} + \overline{B}) = \overline{A}\overline{B}C + AC\overline{D} + A\overline{B} = \overline{B}(A + \overline{A}C) + AC\overline{D} \\ &= \overline{B}(A + C) + AC\overline{D} = \overline{A}\overline{B} + \overline{B}C + AC\overline{D} \end{aligned}$$

26.

(b) $ABD = ABCD + AB\overline{C}D$

(c) $A + BD = \overline{A}\overline{B}\overline{C}\overline{D} + \overline{A}\overline{B}C\overline{D} + \overline{A}B\overline{C}\overline{D} + \overline{A}BC\overline{D} + A\overline{B}\overline{C}\overline{D} + A\overline{B}C\overline{D} + A\overline{B}\overline{C}D + A\overline{B}CD + A\overline{B}\overline{C}\overline{D} + A\overline{B}C\overline{D} + A\overline{B}CD + A\overline{B}\overline{C}D + A\overline{B}CD$

30. (a) $(A+B+C+D)(A+B+C+\overline{D})(A+B+\overline{C}+D)(A+\overline{B}+C+D)(A+\overline{B}+C+\overline{D})(A+\overline{B}+\overline{C}+D)(\overline{A}+B+C+D)(\overline{A}+B+C+\overline{D})(\overline{A}+B+\overline{C}+D)(\overline{A}+B+\overline{C}+\overline{D})$

32. (a) Table 4-5

A	B	C	D	X
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	0
1	0	0	0	0
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

34. (a) Table 4-9

A	B	C	X
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

36. (a) $X = \overline{\overline{A}BC} + \overline{A\overline{B}C} + \overline{A\overline{B}C} + \overline{ABC}$
 $X = (A + B + C)(A + \overline{B} + C)(A + \overline{B} + \overline{C})(\overline{A} + \overline{B} + C)$

(d) $X = \overline{ABC\overline{D}} + \overline{ABC\overline{D}} + \overline{ABC\overline{D}} + \overline{ABC\overline{D}} + \overline{ABC\overline{D}} + \overline{ABC\overline{D}} + \overline{ABC\overline{D}}$
 $X = (A + B + C + D)(A + B + C + \overline{D})(A + B + \overline{C} + \overline{D})(A + \overline{B} + \overline{C} + D)(\overline{A} + B + C + D)$
 $(\overline{A} + B + C + \overline{D})(\overline{A} + B + \overline{C} + D)(\overline{A} + \overline{B} + C + \overline{D})(\overline{A} + \overline{B} + \overline{C} + D)$

40.

(b) $X = AC(\bar{B} + C) = AC + A\bar{B}C$

		C	0	1
AB	00			
	01			
	11			1
	10			1

$X = AC$

(d) $X = \bar{A}\bar{B}\bar{C} + A\bar{B}\bar{C} + \bar{A}B\bar{C} + AB\bar{C}$

		C	0	1
AB	00	1		
	01	1		
	11	1		
	10	1		

$X = \bar{C}$

44.

		CD			
		00	01	11	10
AB	00			1	
	01	1	1	1	
	11	1	1	1	1
	10	1	1	1	1

(a) $X = A + B\bar{C} + CD$

		CD			
		00	01	11	10
AB	00	1	1	1	1
	01	1			1
	11	1			1
	10	1	1	1	1

(c) $X = \bar{B} + \bar{D}$

46. Plot the 1's from Table 4-12 in the text on the map as shown in Figure 4-17 and simplify.

