Solutions to Problem Set of chapter 4

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

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

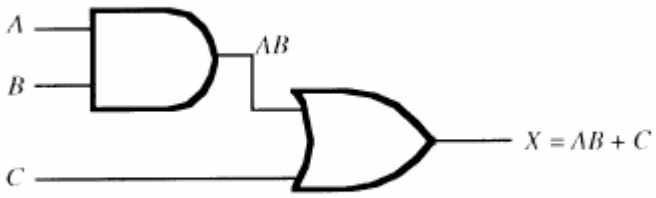
$= \overline{A\overline{B}\overline{C}D} + \overline{\overline{A} + B + C + \overline{D}} = \overline{\boldsymbol{A}} + \boldsymbol{B} + \boldsymbol{C} + \boldsymbol{D} + \boldsymbol{A}\overline{\boldsymbol{B}}\overline{\boldsymbol{C}}\boldsymbol{D}$

(e) $\overline{\overline{AB}(CD + \overline{E}F)(\overline{AB} + \overline{CD})} = \overline{\overline{AB}} + \overline{(CD + \overline{E}F)} + \overline{(\overline{AB} + \overline{CD})}$

$= AB + (\overline{CD})(\overline{\overline{E}F}) + (\overline{\overline{AB}})(\overline{\overline{CD}})$

$= \boldsymbol{AB} + (\overline{\boldsymbol{C}} + \overline{\boldsymbol{D}})(\boldsymbol{E} + \overline{\boldsymbol{F}}) + \boldsymbol{ABCD}$

14.



(c)

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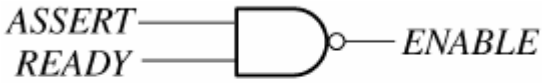
16.



(a)

20.

(b) $\overline{A}B + \overline{A}B\overline{C} + \overline{A}BCD + \overline{A}B\overline{C}\overline{D}E = \overline{A}B(1 + \overline{C} + CD + \overline{C}\overline{D}E) = \overline{A}B(1)$

$= \overline{\boldsymbol{A}}\boldsymbol{B}$

(d) $(A + \overline{A})(AB + AB\overline{C}) = AAB + AAB\overline{C} + \overline{A}AB + \overline{A}AB\overline{C}$

$= AB + AB\overline{C} + 0 + 0 = AB(1 + \overline{C}) = \boldsymbol{AB}$

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

$= AB + \overline{AB}C = \boldsymbol{AB} + \boldsymbol{C}$

22.

(a) See Figure 4-5.

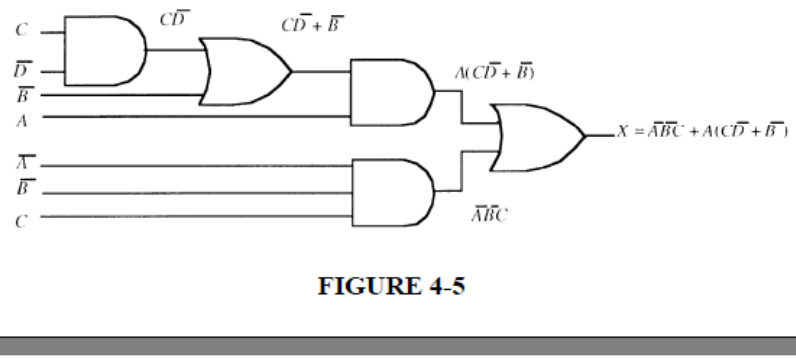


FIGURE 4-5

$$X = \overline{A}\,\overline{B}C + A(C\overline{D} + \overline{B}) = \overline{A}\,\overline{B}C + AC\overline{D} + A\overline{B} = \overline{B}(A + \overline{A}C) + AC\overline{D}$$
$$= \overline{B}(A + C) + ACD = \boldsymbol{A\overline{B} + \overline{B}C + AC\overline{D}}$$

26.

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

(c) $A + BD = A\overline{B}\,\overline{C}\,\overline{D} + A\overline{B}\,\overline{C}D + A\overline{B}C\overline{D} + A\overline{B}CD + AB\overline{C}\,\overline{D} + AB\overline{C}D$
$+ ABC\overline{D} + ABCD + \overline{A}B\overline{C}D + \overline{A}BCD$

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

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

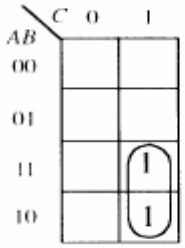
$X = (A + B + C)(A + \overline{B} + C)(A + \overline{B} + \overline{C})(\overline{A} + \overline{B} + C)$

(d) $X = \overline{A}\overline{B}C\overline{D} + \overline{A}\overline{B}C\overline{D} + \overline{A}\overline{B}\overline{C}D + \overline{A}BCD + A\overline{B}CD + AB\overline{C}\overline{D} + ABCD$

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

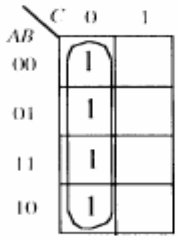
40.

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



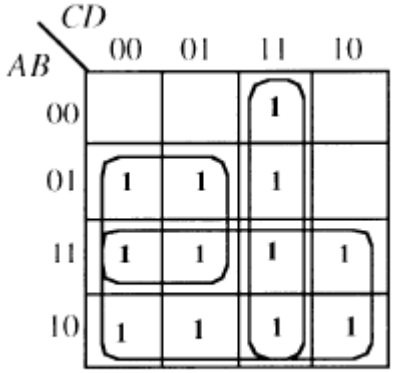
$X = AC$

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

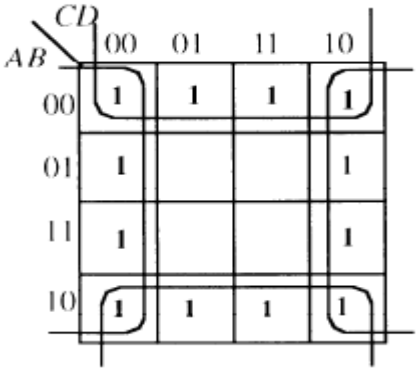


$X = \overline{C}$

44.



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



(e) $X = \overline{B} + \overline{D}$

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

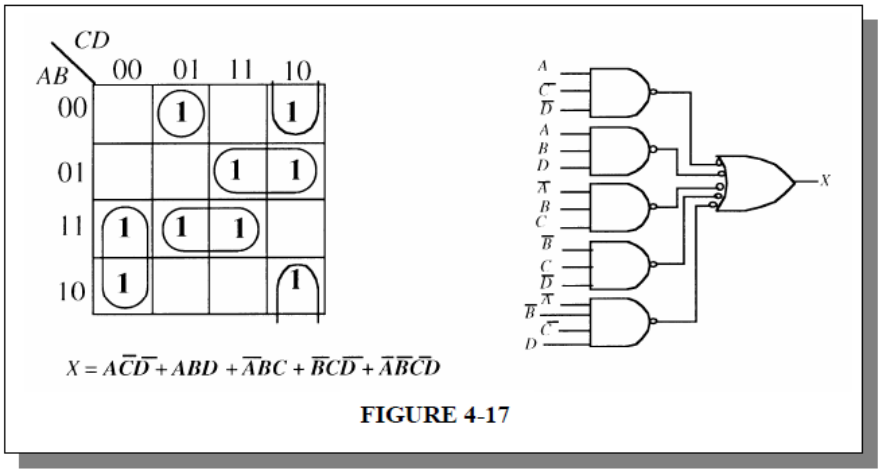


FIGURE 4-17