

## EXAMPLE 5-23

Simplify the following SOP equation using the Karnaugh mapping technique:

$$X = \overline{A}B + \overline{A}BC + A\overline{B}C + A\overline{B}\overline{C}$$

**Solution:**

1. Construct an eight-cell K-map (see Figure 5-69), and fill in a 1 in each cell that corresponds to a term in the original equation. (Notice that  $\overline{A}B$  cell has no C variable in it. Therefore,  $\overline{A}B$  is satisfied whether C is HIGH or LOW, so  $\overline{A}B$  will fill in two cells:  $\overline{A}BC + \overline{A}B\overline{C}$ .)

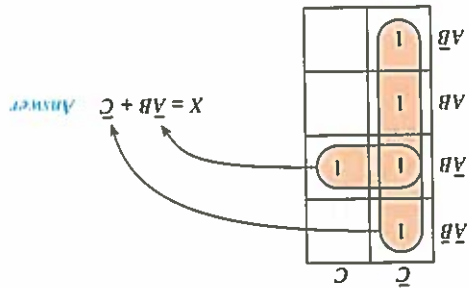


Figure 5-69 Karnaugh map and final equation for Example 5-23.

2. Encircle adjacent cells in the largest group of two or four or eight.
3. Identify the variables that remain the same within each circle, and write the final simplified SOP equation by ORing them together.

## EXAMPLE 5-24

Simplify the following equation using the Karnaugh mapping procedure:

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

**Solution:** Because there are four different variables in the equation, we need a 16-cell map ( $2^4 = 16$ ), as shown in Figure 5-70.

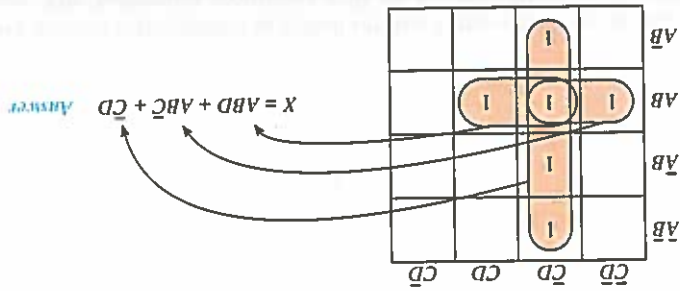


Figure 5-70 Solution to Example 5-24.