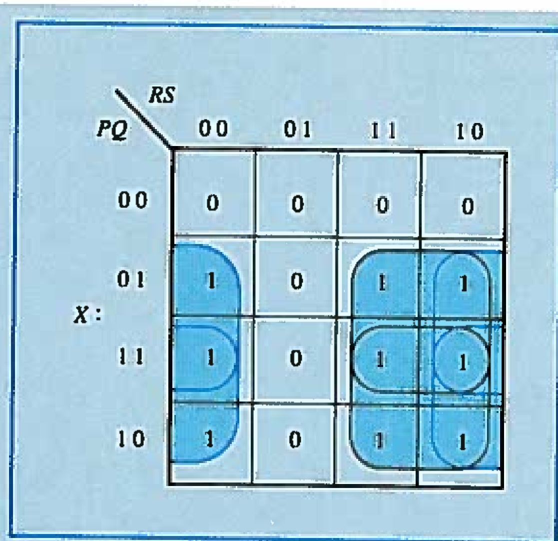

Figure 3–63
Using a K-map to convert from product-of-sums to sum-of-products form.

This section has examined an important technique used in the simplification of logic equations and circuits—the Karnaugh map technique. The Karnaugh map simplification is not designed to be a complete replacement of the Boolean algebra techniques of simplification but is a quick and effective substitute in many cases. Unlike Boolean simplification, the K-map approach can directly indicate whether simplification is possible and if so provide the simplest logic equation. Boolean algebra can still be an effective means of reducing a logic circuit even beyond the capabilities of a K-map. Besides, the function of a K-map is based on the laws of Boolean algebra, and therefore a good understanding of the laws of Boolean algebra is an important prerequisite to the efficient use of a Karnaugh map. The techniques of simplification examined in this chapter will be applied to many of the circuits that will be designed and analyzed in subsequent chapters; the specific simplification procedure used however, will always be the one that best fits the application.

Review questions

1. In what way is a K-map similar to a truth table?
2. What determines adjacency between cells in a K-map?
3. What is the number of cells in a K-map based on?
4. How does one recognize that there is no simplification possible in a K-map?
5. What are the largest group of adjacent 1- and 0-cells that can exist in two-, three-, and four-variable K-maps?
6. What are the differences between the sum-of-products and the product-of-sums procedures of using a K-map?