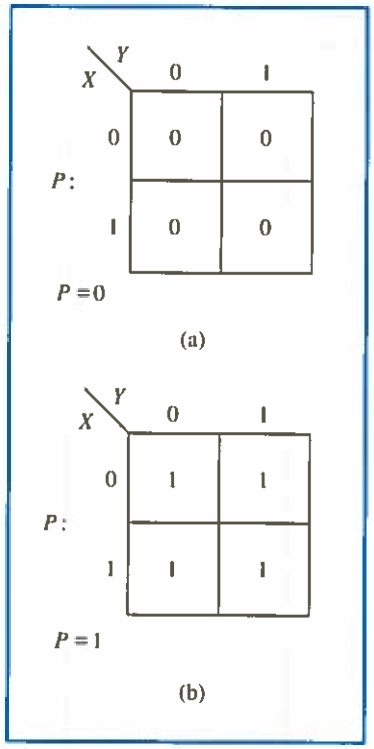

Figure 3–48
(a) K-map with all 0-cells; (b) K-map with all 1-cells.

and for the K-maps in Figure 3–47c and d, $P = X + \overline{Y}$ and $P = \overline{X} + \overline{Y}$, respectively.

If a K-map contains all 0's as shown in Figure 3–48a, then it is obvious that the dependent variable has a value of 0 permanently and does not depend on the states of the independent variables. Similarly in Figure 3–48b the dependent variable P has a value of 1 regardless of the independent variables X and Y.

Two-variable K-maps are not very beneficial in the simplification of logic equations since in most cases the simplified equation for a two-variable truth table can be obtained by inspection or by applying some elementary Boolean algebra rules. However, the advantage of using K-maps becomes evident when they are used to obtain simplified equations for three- and four-variable truth tables.

Three-variable Karnaugh maps

Three-variable K-maps map a dependent variable against three independent variables. Therefore the number of cells in a three-variable K-map will be 2^3 or 8. Since the number of independent variables is an odd number, there are two ways in which a three-variable K-map can be drawn as shown in Figure 3–49a and b. Again, notice that each cell is assigned a number corresponding to the binary combination of the independent variables (A, B, and C), assuming that A is the MSB and C is the LSB. Also, notice that the cells are arranged such that in going from one cell to another both vertically and horizontally, only one variable changes. Therefore, cell no. 0 is adjacent to cells nos. 1, 4, and 2; cell no. 1 is adjacent to cells nos. 3, 5, and 0; cell no. 3 is adjacent to cells nos. 2, 7, and 1; cell no. 2 is adjacent to cells nos. 0, 3, and 6; cell no. 4 is adjacent to cells nos. 0, 5, and 6, and so on. As in two-variable K-maps,