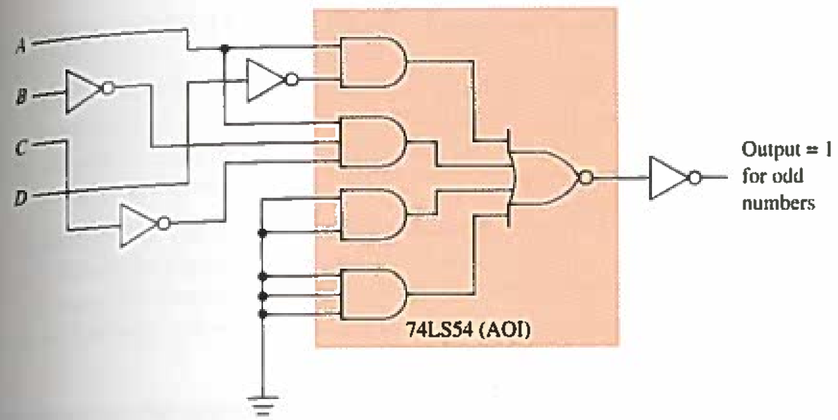

(b)

Figure 5–76 *(Continued)* (b) implementation of the odd-number decoder using an AOI.

Solution: First, build a truth table (Table 5–7) to identify which hex codes from 0 to 9 produce odd numbers. (Use the variable A to represent the 2^0 hex input, B for 2^1, C for 2^2, and D for 2^3.) Next, reduce this equation into its simplest form by using a Karnaugh map, as shown in Figure 5–76(a). Finally, using an AOI with inverters, the circuit can be constructed as shown in Figure 5–76(b).

SYSTEM DESIGN 5–2

A chemical plant needs a microprocessor-driven alarm system to warn of critical conditions in one of its chemical tanks. The tank has four HIGH/LOW (1/0) switches that monitor temperature (T), pressure (P), fluid level (L), and weight (W). Design a system that will notify the microprocessor to activate an alarm when any of the following conditions arise:

1. High fluid level with high temperature and high pressure
2. Low fluid level with high temperature and high weight
3. Low fluid level with low temperature and high pressure
4. Low fluid level with low weight and high temperature

Solution: First, write in Boolean equation form the conditions that will activate the alarm:

$$\text{alarm} = LTP + \overline{L}TW + \overline{L}\,\overline{T}P + \overline{L}\,\overline{W}T$$

Next, factor the equation into its simplest form by using a Karnaugh map, as shown in Figure 5–77(a). Finally, using an AOI with inverters, the circuit can be constructed as shown in Figure 5–77(b).