

It is necessary to design an overheat alarm for an oil-fired steam boiler. Three sensors are available. One sensor monitors the water temperature in the boiler, one monitors the chimney temperature, and one follows the on-off state of the burner. Figure P3-14 describes the logic operation of these sensors. An alarm signal should be generated whenever the burner is on and either the chimney or water temperature is too hot. Following the design process illustrated in Figure 3-26,

- (a) Obtain a truth table that completely describes the operation of the alarm circuit.
- (b) Transfer the truth table to a Karnaugh map and obtain a minimal equation.
- (c) Construct the minimal circuit using any type of two-input gate.

#### Boiler Water

'0' Means Water is Within Normal Temperature Range

'1' Means Water is Too Hot

#### Chimney

'0' Means Chimney is Within Normal Temperature Range

'1' Means Chimney is too Hot

#### Oil Burner

'0' Means Burner is Off

'1' Means Burner is On

**FIGURE P3-14**