

PRE-LAB

Develop truth tables for the function listed below. Also, develop a logic implementation for the design problem.

LAB

Using the 7400 series logic gates available in the laboratory, implement the following logic function. Verify operation by comparing the circuit performance to your truth table.

1. $F(A, B, C) = AB + \overline{A}\overline{B}C + BC$

Now, minimize the function using Boolean algebra, and implement this reduced function. Verify operation by comparing the circuit performance to your truth table. Is Boolean algebra your friend?

DESIGN PROBLEM

You are working on a boiler system and have been tasked with implementing a safety circuit. The boiler is equipped with the following sensors:

- an active low pressure sensor that provides indication of excessive steam pressure
- an active high temperature sensor that provides indication of excessive operating temperature
- an active high inlet water sensor that provides indication of normal water flow into the boiler
- an active low flame sensor that provides indication of normal flame operation of the boiler

The safety circuit is to provide an alarm signal (active high logic) under the following conditions:

- excessive steam pressure exists –or–
- loss of inlet water while the boiler flame is lit –or–
- excess temperature while the boiler flame is lit

Develop a logic expression, truth table, and implement your design using the 7400 series components. Demonstrate your design to your instructor.