

**UNC Charlotte, Department of Electrical and Computer Engineering  
ECGR 2181, Fall 2008, Homework #3  
Due: 9/17/2008, at the beginning of class (100 points)**

**Show all of your work!!!!**

1. How long did this assignment take you? (Answer truthfully!)
2. Consider the following real-world problem.

I have an alarm system that has sensors all over the house. When a sensor reads “1”, then the door or window with the sensor is open. The system is organized into four zones. Each of my three doors is a separate zone, and all of the windows make up the final zone. Also, I have three smoke alarms that make up another input, they read “1” when smoke (fire) is detected. I have a keypad that registers “1” when armed and “0” when not armed. There is a device that will delay 15 seconds after a door is opened to allow me to disarm the alarm system. After 15 seconds, it will read “1”. It will then return to “0” after the alarm is disarmed.

I have several outputs:

- i) An inside chime should chirp if a door or a window is opened.
  - ii) The siren should sound if the alarm system is armed, a door opens, and 15 seconds have passed without disarming the alarm.
  - iii) The siren should sound if the alarm system is armed and a window opens.
  - iv) The siren should sound if a fire detected (with the system armed or not).
  - v) I have a dialing device that calls the monitoring company if the system detects someone breaking into my home or if a fire is detected. This device will dial if a signal is “0” (active low).
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- a) Define and express each input as a variable (think - does each window or door need to be a different variable?).
  - b) Express the outputs as separate Boolean equations, similar to what you have seen in class.
  - c) Draw the circuit for each of the equations.