

# Introduction to Computer Engineering (E85)

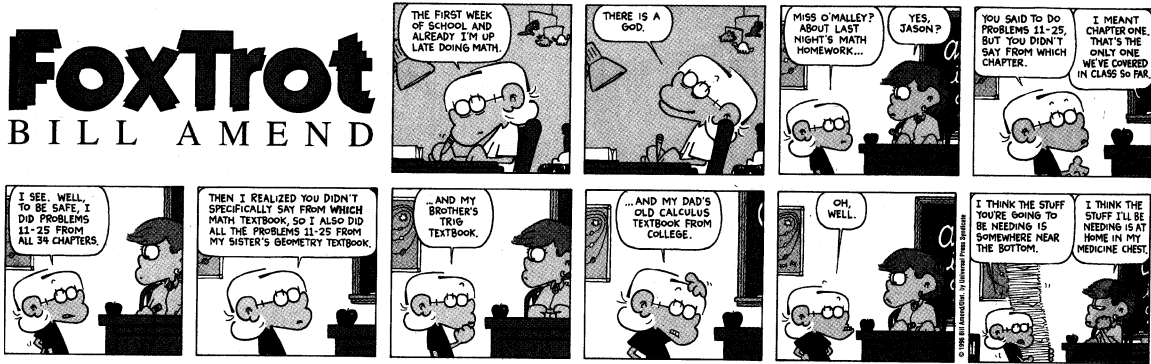
Harris

Spring 2001

Problem Set 1

Due: Friday, January 26

**FoxTrot**  
BILL AMEND



## 1) Static Discipline

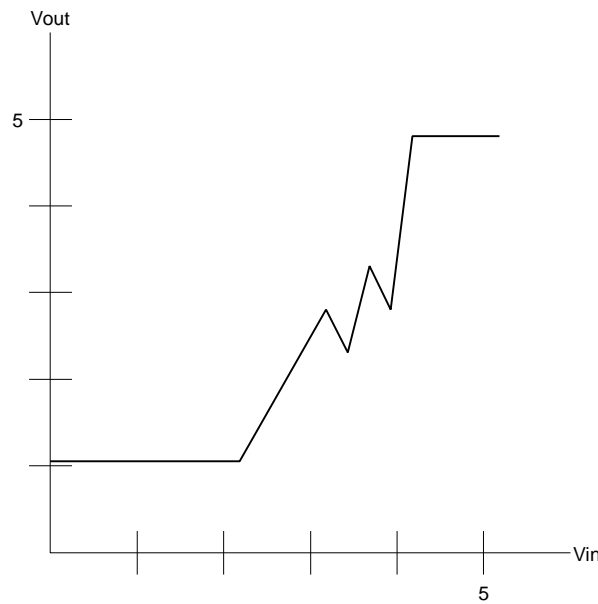


Figure 1

Is it possible to assign valid logic levels and noise margin boundaries so that a device with the transfer characteristics shown in Figure 1 would serve as a buffer? If so, what are the input and output high and low levels ( $V_{oh}$ ,  $V_{il}$ ,  $V_{ih}$ , and  $V_{oh}$ ) and the high and low noise margins?

## 2) Combinational Logic Design

Wally Wort would like to predict the outcome of the 5-Class Competition. Based on historical data, he determines that the freshmen only win once in a Blue Moon when Hell Freezes Over and nobody else has cause to win. The Fifth Years win when they Cheat Successfully and the moon is also Blue. Juniors win when the moon isn't blue and Hell doesn't freeze. Otherwise the seniors win. Sophomores had best wait until next year.

Given a set of three inputs B, H, and C indicating that the moon is Blue, Hell is frozen, and that the fifth-years Cheated, construct a truth table with five outputs indicating who will win the competition.

Sketch such a circuit. Because Wally only has \$0.73 to buy chips to build the circuit, simplify your design to use as few logic gates as possible.

## 3) Truth Tables and Logic Gates

- a) How many different Boolean functions of two inputs exist? Remember that a truth table is a representation of a Boolean function.
- b) List all the two-input logic gates that have been given names in class or in a good book on combinational logic gates. How many gates did you list?
- c) Why are there fewer two-input logic gates than two-input Boolean functions?

## 4) Time

Please indicate how many hours you spent on this problem set. This will not affect your grade, but will be helpful for calibrating the workload for next semester's class.