# ECE 320 - Homework #8

Comparitors, Schmitt Triggers. Due Monday March 6th, 2017

## **Term Project**

- i) Design a digital circuit
- ii) Split this into three sections each being a circuit we covered in ECE 320
- iii) Design and test each section separately (separate requirements / analysis / test / validation)

Suggestion (if you don't like this one, it's OK to do your own thing)

#### Light-Controlled Fan

#### Input:

- Light Sensor
- On/Off Switch. 0V / 5V capable of driving 1mA

#### Output:

• DC Motor (Fan) drawing up to 1A @ 10V

#### Relationship

- When the On/Off switch is off (0V), the motor is off.
- When the on/off switch is on (5V)
  - The fan turns off when the light level drops below 10 Lux
  - The fan turns on when the light level goes above 15 Lux, and
  - The fan remains unchanged (on/off) inbetween 10 and 15 lux
- "On" means 10V to the DC motor

#### Tolerances:

- +/- 1 Lux
- +/- 1 Volt to the DC motor



- A, B, X are a 0V / 5V signal capable of driving 1mA

Problem 1) Specify the overall system requirements (OK to use the above or to modify as you see fit)

Assume you have a light sensor where

$$R = \frac{100,000}{Lux} \ \Omega$$

2) Design a circuit which can drive a 1k Ohm load which outputs

- 0V when the light level is less than 10 Lux
- 5V when the light level is more than 10 Lux
- 2) Verify your design in PartSim
- 3) Design a circuit which can drive a 1k Ohm load which outputs
  - 0V when the light level is less than 10 Lux
  - 5V when the light level is more than 15 Lux
  - Remains unchanged between 10 Lux and 15 Lux
- 4) Verify your design in PartSim

### Lab

5) Build the circuit for problem #3. Verify that

- The output (A) is 5V when the light level is less than 10 Lux (10k Ohms)
- The output (A) is 0V when the light level is more than 15 Lux (6666 Ohms)
- The output switches at 10 Lux and 15 Lux (100k and 6666 Ohms)

note: The lab is a little more fun if you add in a transistor switch to turn on and off a DC motor....