ECE3204 D2015
HW Set 4

Due in class Friday April 10. Note that, since you have Exam 1 this week, the set has been reduced to a compassionate 7 problems.

To make life easier on the graders:

- Be sure your NAME and ECE MAILBOX NUMBER are prominently displayed on the upper right of what you hand in.
- When appropriate, indicate answers with a box or underline
- Work as neatly as possible

All textbook problems from 6th edition.

1) Text 17.25 (p. 1390) [Noninverting Schmitt trigger]

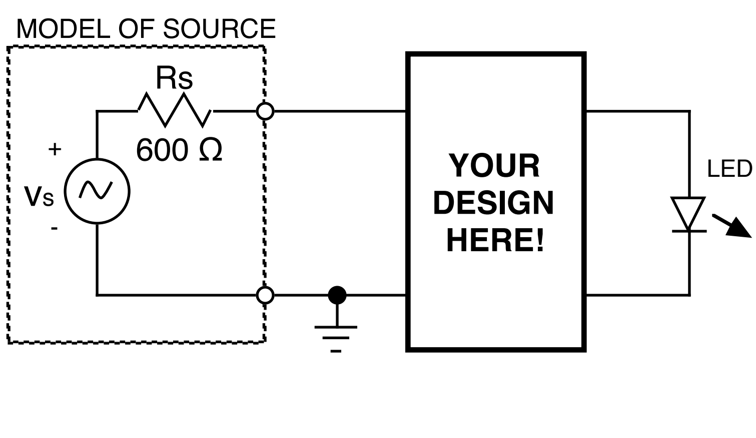
2) Text 17.26 (p. 1390) [Inverting Schmitt trigger]

3) Text 17.27 (p. 1390) [Simpler inverting Schmitt trigger]

4) Text 17.30 (p. 1391) [Square wave oscillator]

5) [Design: audio overload indicator]

Design a circuit that will monitor the amplitude of an audio waveform, and light an LED when the amplitude exceeds 1V. The LED should remain on for as long as the signal exceeds 1V. To avoid voltage drop in the source resistance R_s, your circuit should not load the audio source. When the LED is on, assume a forward voltage drop of 2V at a current of 10mA.



6) [Temperature sensor design]

The AD590 is a temperature sensing transducer that acts as a current source with an output current proportional to absolute temperature. The scale factor is 1µA/K. It can be used to develop a voltage proportional to temperature in °F, as shown in the figure below. For example, with a scale factor of 10mV/°F, a temperature of T=60°F would produce an output of +600mV.

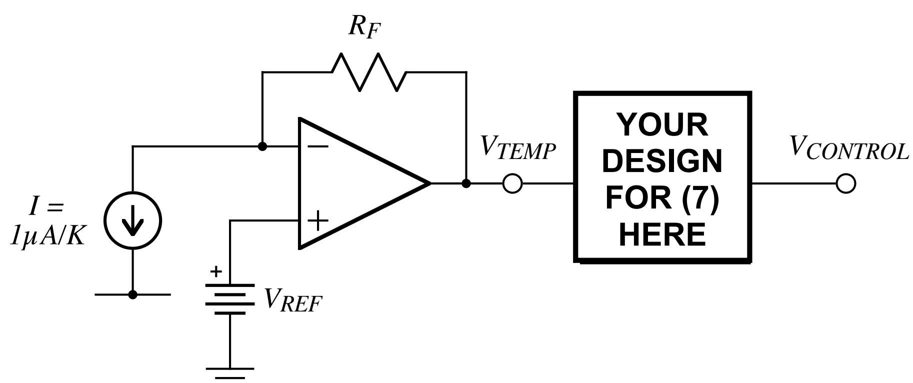
Determine values for V_{REF} and R_F so that V_{TEMP} is proportional to temperature in °F with a scale factor of 10mV/°F.

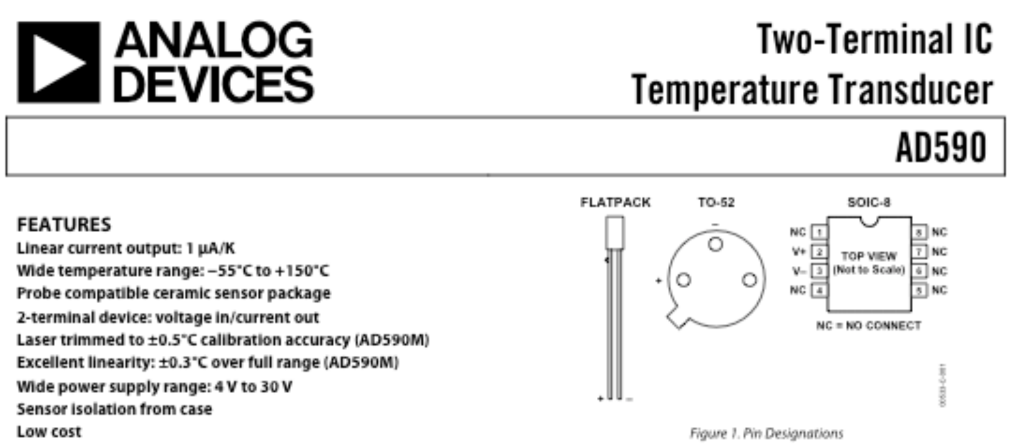
7) [Temperature control system design]

Given the V_{TEMP} from the previous problem, design a circuit that would produce a logic output $V_{CONTROL}$ to control a heating system:

logic HIGH (+5V): furnace ON
logic LOW (0V): furnace OFF

The furnace should turn ON when the temperature drops below 65°F, and OFF when the temperature goes above 70°F. Specify relevant performance parameters for any circuits or components used in your system.




ANALOG DEVICES

Two-Terminal IC Temperature Transducer

AD590

FEATURES
Linear current output: 1 µA/K
Wide temperature range: −55°C to +150°C
Probe compatible ceramic sensor package
2-terminal device: voltage in/current out
Laser trimmed to ±0.5°C calibration accuracy (AD590M)
Excellent linearity: ±0.3°C over full range (AD590M)
Wide power supply range: 4 V to 30 V
Sensor isolation from case
Low cost

Figure 1. Pin Designations