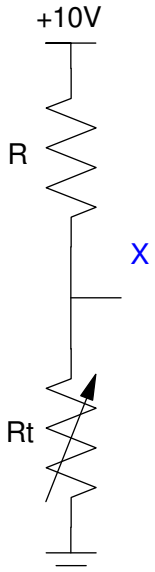
ECE 321 - Quiz #2 - Name _____

Sensors & Calibration

1) A thermistor has a temperature-resistance relationship of (Digikey part number P1010TR-ND) where T is the temperature in degrees C.

$$R_t = 3000 \cdot \exp\left(\frac{4000}{T+273} - \frac{4000}{298}\right)\ \Omega$$



Assume

R = 900 + 100*(your birth month) + (your birth day)

If X = 4.00V, determine the resistance, R, and the temperature, T

R 1100 + 100*mo + day	X volts	Rt Ohms	T degrees C
	2.20V		

2) A thermistor has a temperature-resistance relationship of (Digikey part number P`1010TR-ND) where T is the temperature in degrees C.

$$R_t = 3000 \cdot \exp\left(\frac{4000}{T+273} - \frac{4000}{298}\right)\ \Omega$$

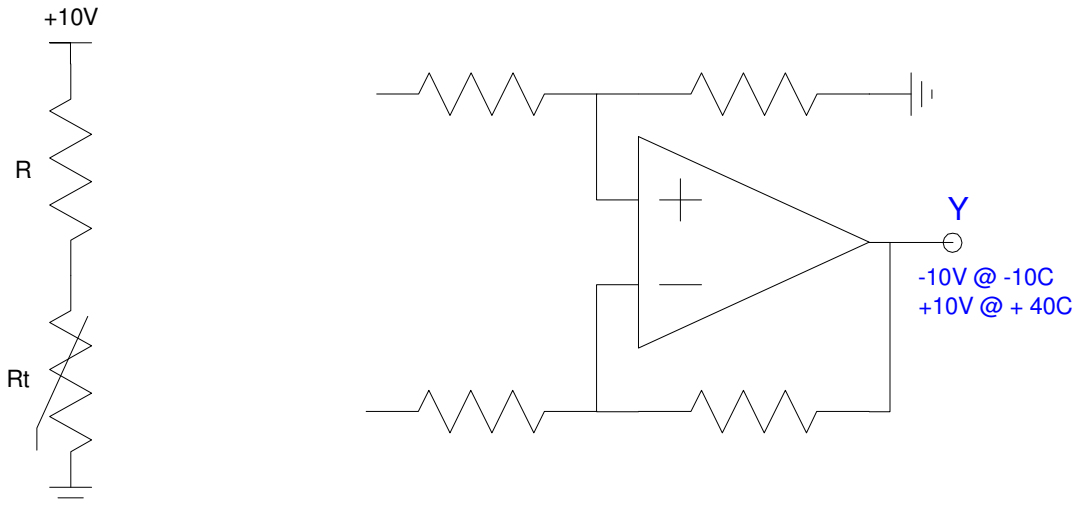
Design a circuit which outputs

- -10V at -10C and
- +10V at +40C

Assume

R = 900 + 100*(your birth month) + (your birth day)

note: A linearizing circuit isn't required.



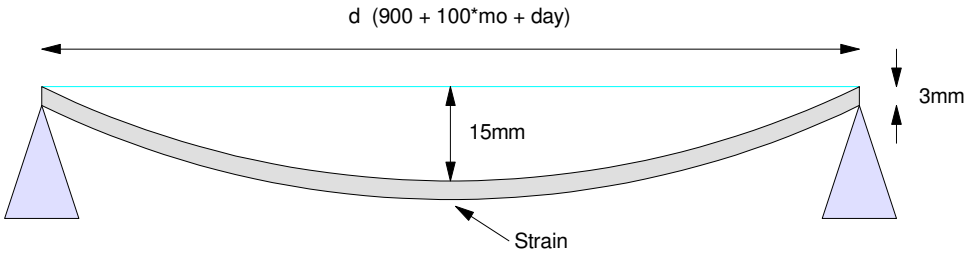
3) Strain Sensor: A beam of length d deflects by 15mm. Determine the

- The radius of curvature,
- Strain on the inside of the beam, and
- Strain on the outside of the beam.

Assume

- The length of the beam is d (900 + 100*mo + day) mm
- The thickness of the beam is 3mm

length, d (mm) 900 + 100*m + day	Radius of Curvature (mm)	Strain inside edge	Strain outside edge



4) Strain Sensor. Assume a strain sensor has a resistance - strain relationship of

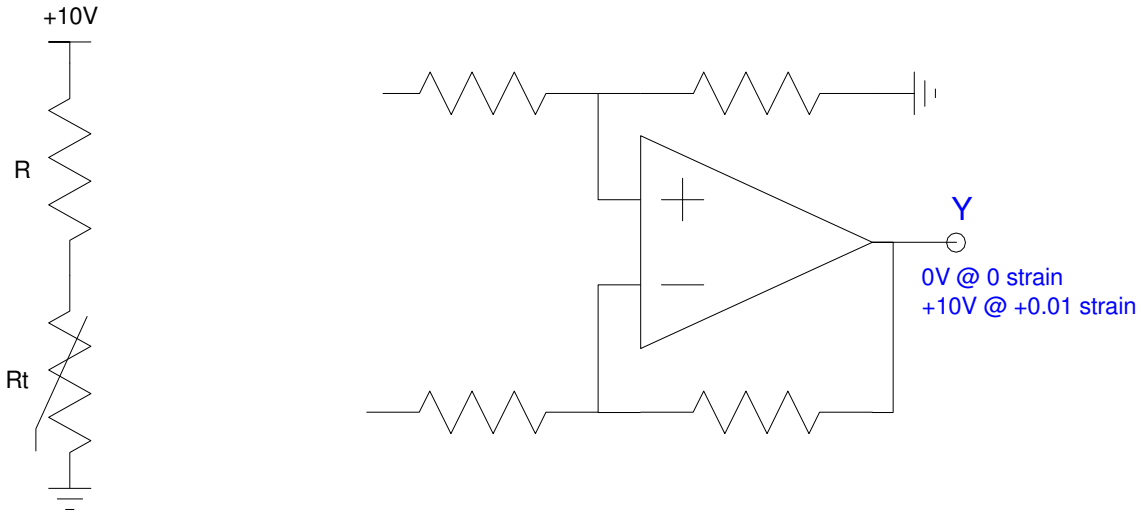
$$R_t = 1000 \cdot (1 + 2.14\varepsilon) \quad \Omega$$

where

- R = 900 + 100 * (your birth month) + (your birth date)

Design a circuit which outputs

- 0V at $\varepsilon = 0$ (zero strain) and
- +10V at $\varepsilon = 0.01$ (strain = 0.01)



5) A thermistor has a temperature-resistance relationship of

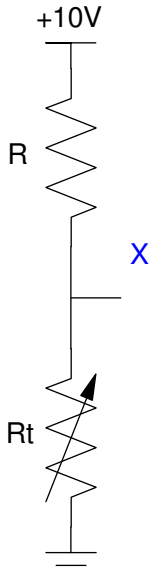
$$R_t = 3000 \cdot \exp\left(\frac{4000}{T+273} - \frac{4000}{298}\right)\ \Omega$$

where T is the temperature in degrees C. Assume the thermistor is used with a voltage divider so that

$$V = \left(\frac{R_t}{R_t+R}\right) 10V$$

where

R = 900 + 100*(your birth month) + (your birth day)



Determine the least squares curve fit for temperature as

$$T = aV + b$$

over the range of -10C to +40C.

6) A thermistor has a temperature-resistance relationship of

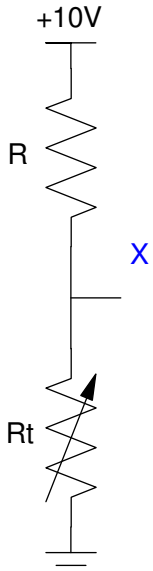
$$R_t = 3000 \cdot \exp\left(\frac{4000}{T+273} - \frac{4000}{298}\right)\ \Omega$$

where T is the temperature in degrees C. Assume the thermistor is used with a voltage divider so that

$$V = \left(\frac{R_t}{R_t+R}\right) 10V$$

where

R = 900 + 100*(your birth month) + (your birth day)



Determine the least squares curve fit for temperature as

$$T = aV^2 + bV + c$$

over the range of -10C to +40C.