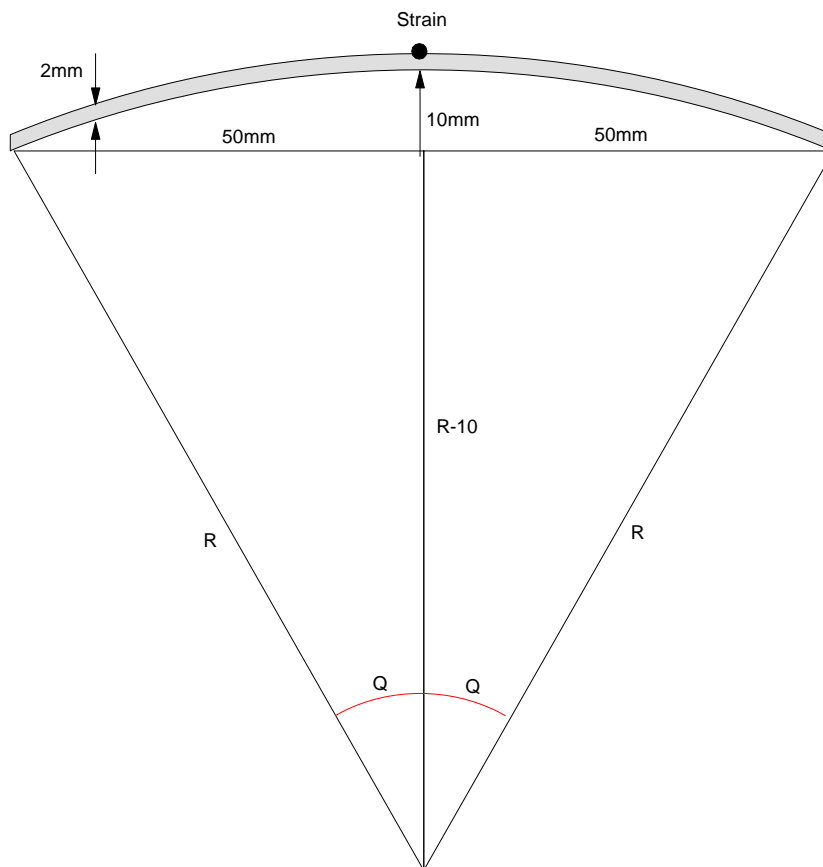


ECE 321 - Quiz #2 - Name _____

Push-Pull Amplifiers, Op-Amp Amplifiers, November 8, 2018

1) An accelerometer uses the deflection of a beam to measure acceleration. Calculate the strain on the beam when the deflection is 10mm. Assume the beam is 100mm long and 2mm thick.

Radius R	Arc Length 2Q	Length of Deflected Beam (L)	Strain dL / L

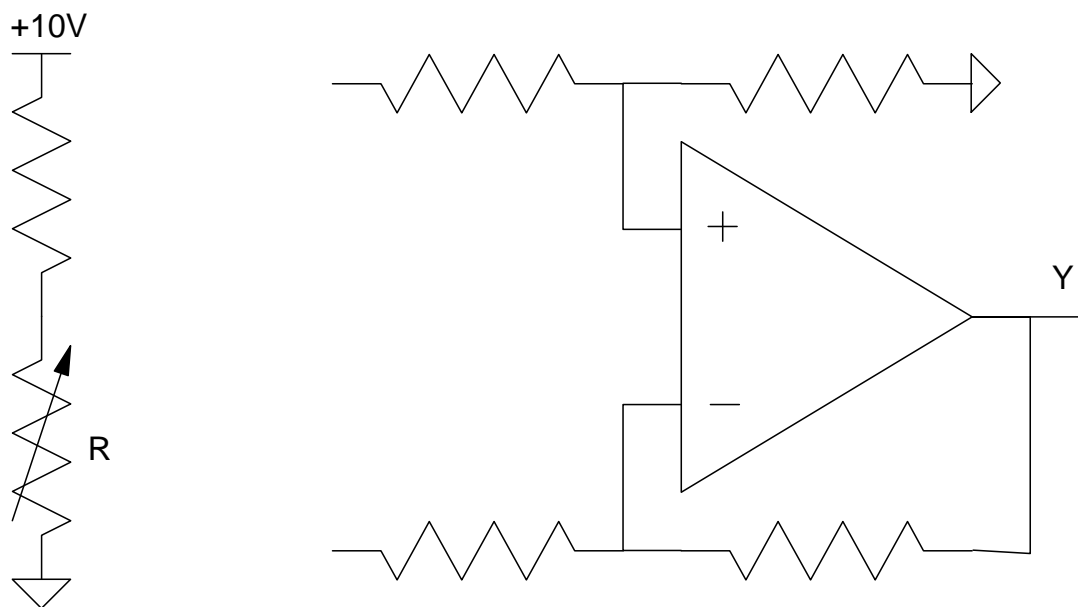


2) Assume the strain goes from 0 .. 0.03. Design a circuit which has an output of

- $Y = 10V$ for $\epsilon = 0.03$
- $Y = 0V$ for $\epsilon = 0$

Assume the strain sensor has a resistance of

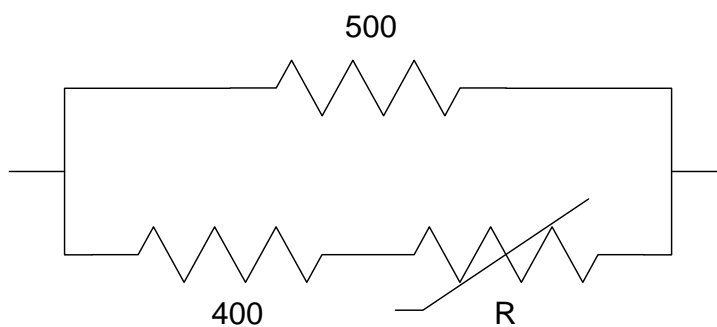
$$R = 120 \cdot (1 + 2.14\epsilon) \Omega$$



3) Linearizing Circuit: The following circuit is intended to linearize the resistance between 0C and +40C. Determine the net impedance at 0C, 20C, and 40C as well as the "error" in this linearizing circuit

$$R = 1000 \cdot \exp\left(\frac{3905}{K} - \frac{3905}{298}\right)$$

Z(0C) (273K) (R = 3320 Ohms)	Z(20C) (293K) (R = 1250 Ohms)	Z(40C) (313K) (R = 534 Ohms)	Sum Squared Error $E = \left(Z_{20C} - \frac{Z_{0C} + Z_{40C}}{2}\right)^2$

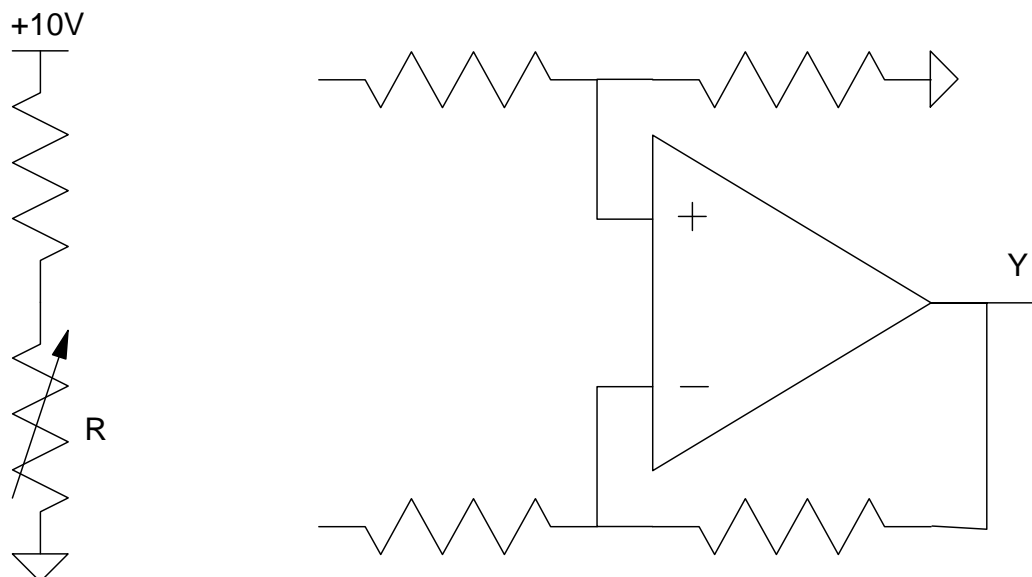


4) Assume an RTD has a resistance vs. temperature relationship of

$$R = 1000 \cdot (1 + 0.0043T) \Omega$$

where T is the temperature in degrees C. Design a circuit which outputs

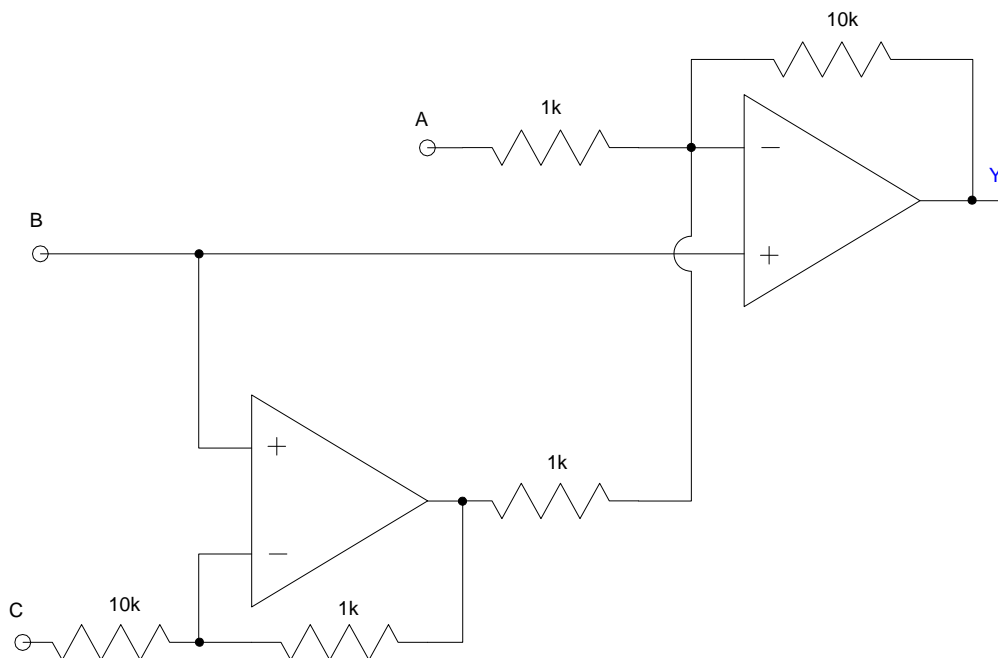
- $Y = -10V$ at $T = -10C$ and
- $Y = +10V$ at $T = +10C$



5) For the following amplifier, determine the gains {a, b, c}

$$Y = aA + bB + cC$$

a	b	d



Industrial Help Bonus! Hemp-based plastics take 3-6 months to decompose. How long do petroleum-based plastics to decompose?