**1.** An LVDT with associated signal conditioning will be used to measure work-piece motion from –20 to +20 cm. The static transfer function is 2.5 mV/mm. The output will be interfaced to a computer via an ADC.   
  
a. What is the range of output voltage?   
b. If the desired resolution is 0.5 mm, how many bits must the ADC have?  
c. Design analog signal conditioning to provide interface to a bipolar ADC with a 5-V reference.

**2.** We will weigh objects by a strain gauge of R = 120Ω, GF= 2.02 mounted on copper column of 6-inch diameter. Find the change in resistance per pound placed on the column. Is this change an increase or decrease in resistance?

**3.** The bellows, diaphragm, and Bourdon tube pressure sensors all exhibit second order time response. This means that a sudden change in pressure will cause an oscillation in the displacement and, therefore in the sensor output. Consider a bellows with an effective spring constant of 3500 N/m and a mass of 50 g. The effective area against which the pressure acts is 0.5 square inch. Calculate:   
  
a. The bellows deflection for a pressure of 20 psi, and   
b. The natural frequency of oscillation.