

Problem 1: A transducer having response $H_t(x) = R_0(1 + kx)$ is placed in the lower left arm of a Wheatstone bridge, where $R_0 = 250 \text{ k}\Omega$ and $k = 0.002$. What is the maximum model error, expressed as percent error, of the *approximated* bridge response over the range $x \in [0, 10]$. (Note, the model error is for the approximation used in the one-transducer bridge configuration, not the transducer model function.)

Problem 2: Design a system to convert process variable x , the temperature in a room, to voltage $H(x) = x \frac{\text{V}}{5^\circ\text{C}}$ using two integrated temperature sensors of different types. The two temperature sensors are placed in different locations, the output should be based on the average of the temperatures at these locations. One sensor is a voltage type with response $H_{t1}(x) = x \frac{20 \text{ mV}}{\text{K}}$, the other is a current type with response $H_{t2}(x) = x \frac{\mu\text{A}}{\text{K}}$.