a. For the given Load cell if a Load of 5000kg was Applied calculate the wheat stone output voltage. if R_s had a gauge factor of (k=20)

Solution

$$V_o = V_i \left(\frac{R_s}{R_s + R_4} - \frac{R_2}{R_2 + R_3} \right)$$

to find V_o we need to evaluate R_s first.

$$\boxed{\frac{\Delta R}{R} = \epsilon K}$$ ⇐ we need to evaluate ϵ.

Using Stress - Strain Relations (Hooks' Law)

$$\sigma = \epsilon E \Rightarrow \frac{F}{A} = \epsilon E$$

$$\Rightarrow \epsilon = \frac{F}{AE}$$

$$= \frac{-5000(9.81)}{\left(\frac{0.01^2 \pi}{4}\right) 210 \times 10^9} = -2.97 \times 10^{-3}$$

(Compression.