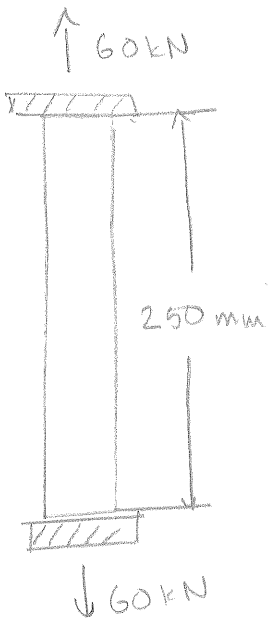
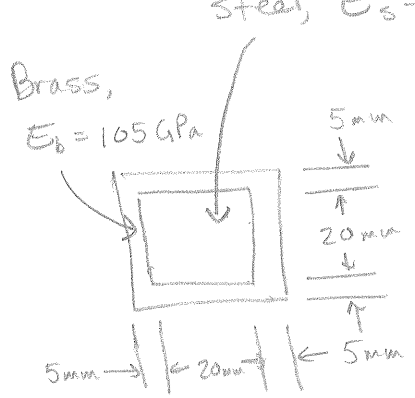
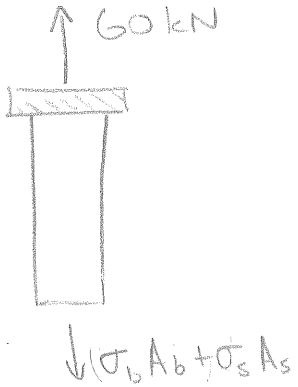
9.25) Find stress in brass and deflection







$$\Sigma F_y = 60\,kN - \sigma_b A_b - \sigma_s A_s = 0, \quad \delta_b = \delta_s$$

$$\delta_b = \epsilon_b L = \frac{\sigma_b L}{E_b}, \quad \delta_s = \epsilon_s L = \frac{\sigma_s L}{E_s}$$

$$\begin{cases} \sigma_b A_b + \sigma_s A_s = 60\,kN \\ \sigma_b \frac{L}{E_b} - \sigma_s \frac{L}{E_s} = 0 \end{cases}$$

$$\begin{cases} \sigma_b (500\,mm^2) + \sigma_s (400\,mm^2) = 60\,kN \\ \frac{\sigma_b}{105\,GPa} - \frac{\sigma_s}{200\,GPa} = 0 \end{cases}$$

$$\sigma_s = \sigma_b \left(\frac{200\,GPa}{105\,GPa}\right)$$

$$\sigma_b = 60 \cdot 10^3\,N \left[(500 \cdot 10^{-6}\,m^2) + (400 \cdot 10^{-6}\,m^2)\left(\frac{200\,GPa}{105\,GPa}\right)\right]^{-1}$$

$$\sigma_b = 47.5 \cdot 10^6\,Pa$$

$$\delta_s = \delta_b = \frac{\sigma_b L}{E_b} = \frac{\left(47.5 \cdot 10^6\,\frac{N}{m^2}\right)(0.250\,m)}{\left(105 \cdot 10^9\,\frac{N}{m^2}\right)} = 1.13 \cdot 10^{-4}\,m$$

$$\boxed{\sigma_b = 47.5\,MPa, \quad \delta = 0.113\,mm}$$