6.19 We are asked to ascertain whether or not it is possible to compute, for brass, the magnitude of the load necessary to produce an elongation of 1.9 mm (0.075 in.). It is first necessary to compute the strain at yielding from the yield strength and the elastic modulus, and then the strain experienced by the test specimen. Then, if

$$\varepsilon(test) < \varepsilon(yield)$$

deformation is elastic, and the load may be computed using Equations 6.1 and 6.5. However, if

$$\varepsilon(test) > \varepsilon(yield)$$

computation of the load is not possible inasmuch as deformation is plastic and we have neither a stress-strain plot nor a mathematical expression relating plastic stress and strain. We compute these two strain values as

$$\varepsilon(test) \; = \; \frac{\Delta l}{l_0} = \; \frac{1.9 \;\; mm}{380 \;\; mm} = \; 0.005$$

and

$$\varepsilon(yield) \; = \frac{\sigma_y}{E} = \; \frac{240 \;\; MPa}{110 \times 10^3 \;\; MPa} = \; 0.0022$$

Therefore, computation of the load is *not possible* since $\varepsilon(test) > \varepsilon(yield)$.