MECHANICAL PROPERTIES

Problem No. 1

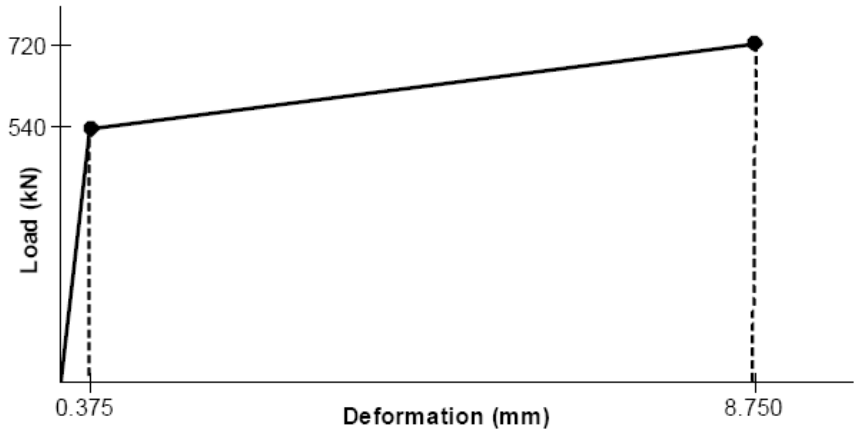
A cylindrical rod with a length of 380 mm and a diameter of 10 mm is to be subjected to a tensile load of 30 kN. The rod must not experience plastic deformation or an increase in length of more than 0.9 mm when the load is applied. Which of the four materials listed below are possible candidates? Justify your answer.

Material	Elastic Modulus (GPa)	Yield Strength (MPa)
Copper	110	248
Aluminum alloy	70	225
Steel	200	448
Brass alloy	101	345

MECHANICAL PROPERTIES

Problem No. 2

A tension test on a specimen made of an elastoplastic material and loaded along its long axis produced the following load-deformation curve. Knowing that the specimen has dimensions of 30 mm × 30 mm × 300 mm, and that deformation was measured using an extensometer with a 125-mm gauge length, estimate the following:



(a) Yield stress;

(b) Rupture stress;

(c) Modulus of elasticity;

(d) Modulus of resilience;

(e) Modulus of toughness;

(f) If a bar made out of this material is subjected to a tensile load of 600 kN, what would be its minimum cross-sectional area so that the material does not yield under the applied load?;

(g) Would you classify this material as brittle or ductile? Explain your answer.