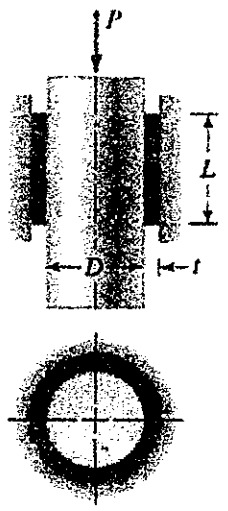
題號： 289　　國立臺灣大學 112 學年度碩士班招生考試試題

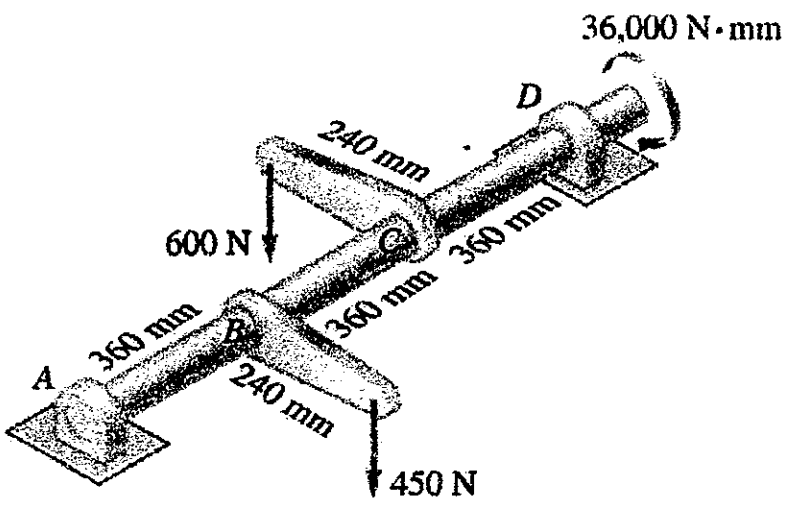
科目： 材料力學(D)

節次： 2

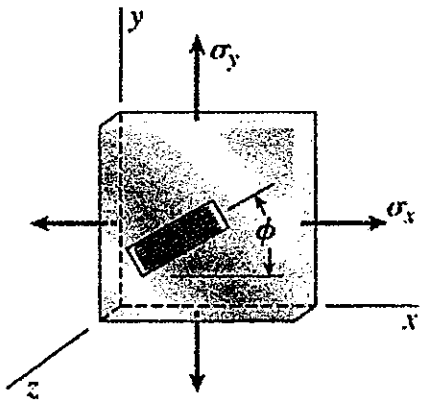
1. (25 Points) The steel shaft of diameter D is cemented to the thin rubber sleeve of thickness t and length L. The outer surface of the sleeve is bonded to a rigid support. When the axial load P is applied, show that the axial displacement of the shaft is $\delta = Pt/(\pi GDL)$, where G is the shear modulus of rubber. Assume that $t << D$.
2. (25 Points) The shaft, supported by bearings at A and D, is loaded as shown in the figure. Determine the smallest allowable radius of the shaft if the normal stress is not to exceed 18 MPa. Neglect the stress due to the transverse shear force.
3. (25 Points) A brass plate with a modulus of elasticity 110 GPa and Poisson's ratio 0.34 is loaded in biaxial stress by normal stresses σ_x and σ_y. A strain gage is bonded to the plate at an angle $\phi = 35°$. If the stress σ_x is 74 MPa and the strain measured by the gage is $\varepsilon = 390 \times 10^{-6}$, what is the maximum in-plane shear stress $(\tau_{max})_{xy}$ and shear strain $(\gamma_{max})_{xy}$?
4. (25 Points) A 600 N/m uniformly distributed load is applied to the left half of the cantilever beam ABC as shown in the figure. Determine the magnitude of force P that must be applied as shown so that the displacement at A is zero.



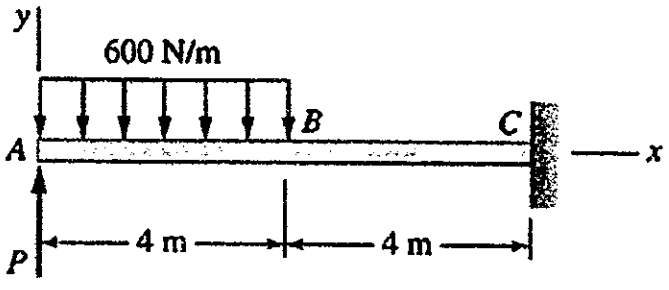
Problem 1



Problem 2



Problem 3



Problem 4

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