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科目： 材料力學(C)
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國立臺灣大學 112 學年度碩士班招生考試試題

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1. The assembly of steel (G = 80GPa) comprises a tube with an outer radius of 25 mm and a wall thickness of 3 mm. By means of a rigid plate at B, it is attached to the solid 25-mm-diameter shaft AB. If a torque of 50 N·m. is applied to the tube at its end C, determine the rotation of the tube's end C. The end A of the shaft is fixedly supported. (10%)
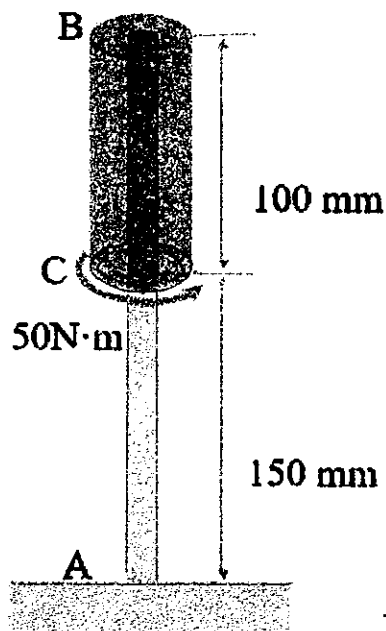
B

100 mm

C

50N·m

150 mm

A

Figure P1

2. The thin-walled cylinder may be supported in one of two ways as shown (a) and (b). If the piston P produces an internal pressure of 0.7 MPa. The wall has a thickness of 6mm, and the inner diameter of the cylinder is 200mm. Determine the state of stress in the wall and the find maxima of normal stress and shear stress using Mohr's circle for (a) (10%) and b (10%).
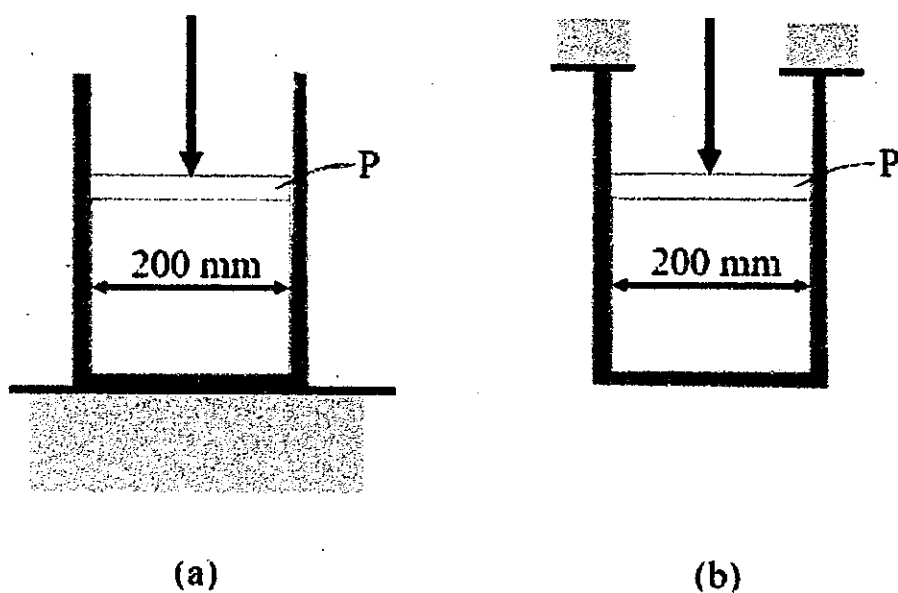
P

200 mm

P

200 mm

(a)   (b)   **Figure P2**

見背面

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3. The drill pipe, as shown in figure, has an outer diameter of 80 mm., a wall thickness of 8 mm., and a weight of 1kN/m. It is subjected to a torque and axial load as shown, please determine (a) the principal stress (10%) and (b) the maximum in-plane shear stress at a point on its surface at section a. (10%)
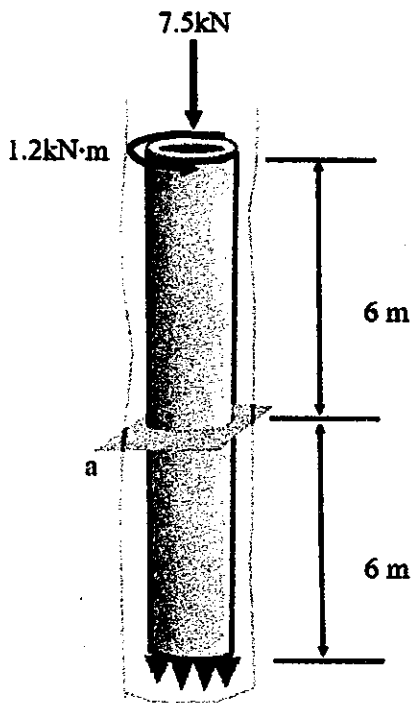

Figure P3

4. The stress-strain curve of an aluminum material is shown in the figure. The original diameter and gage length of a specimen made by this aluminum material are 12.7 mm and 50.8 mm, respectively. Please answer the following two separate questions:

(a) If the new diameter of the specimen is 12.67494 mm after a load of 50 kN is applied to the specimen along its longitudinal axis, determine the Poisson's ratio, modulus of elasticity, and shear modulus of elasticity of the aluminum material. (15%)

(b) If a load of 60 kN is applied to the specimen along its longitudinal axis and assuming that the Poisson's ratio of the aluminum material is 0.32, determine the new diameter and gage length of the specimen. (10%)
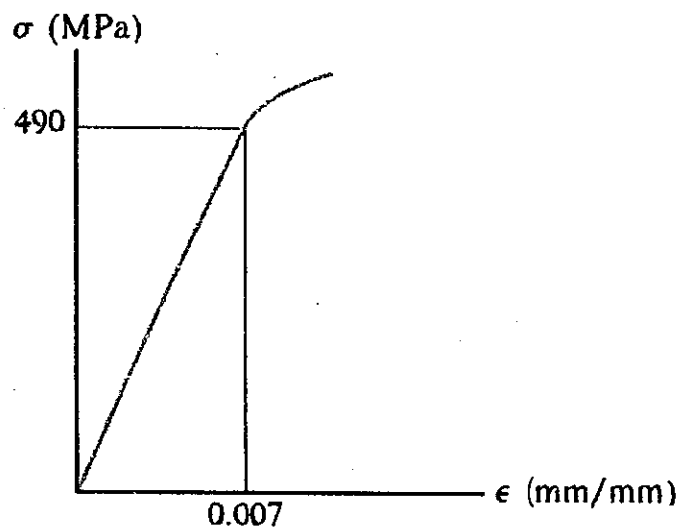

Figure P4

5. Consider a bar having a square cross-sectional area, subjected to a bending moment of 10 kN·m. The material for making the bar has a yield stress of $\sigma_Y = 840$ MPa. The safety factor with respect to yielding of 1.5 is used for designing the bar. Please answer the following two questions (12.5% for each question):

(a) Determine the required size of the bar according to the maximum-distortion-energy theory.

(b) Determine the required size of the bar according to the maximum-shear-stress theory.

試題隨卷繳回