
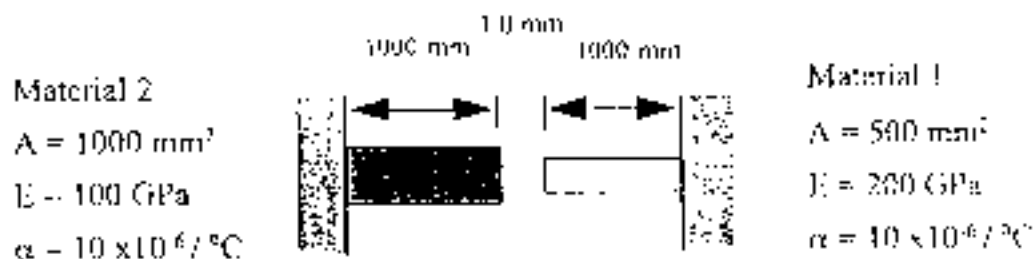


八十六學年度 材料科學工程學系(所)  組碩士班研究生入學考試

工程力學(II)

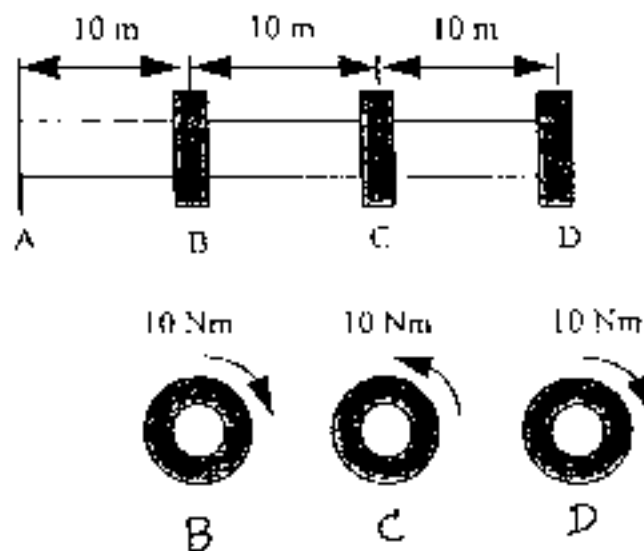
科號 ²⁴⁰² 2502 共 2 頁第 1 頁 *請在試卷【答案卷】內作答

1. (a) What's stress concentration? Give an example (5%)
- (b) At room temperature (20 °C) a 1.0 mm gap exists between the ends of the rods shown. At a later time when the temperature reaches 120 °C, determine the stress in material 2 (20%)



2. Knowing that each portion of the shaft AD consists of a solid circular rod with radius $r = 0.1 \text{ m}$, determine

- (a) the torque in shaft AB (5%)
 (b) the maximum shearing stress caused in the shaft by the loading shown (10%)
 (c) the angle of twist at point D (10%)

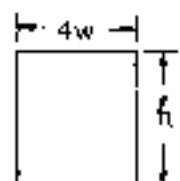
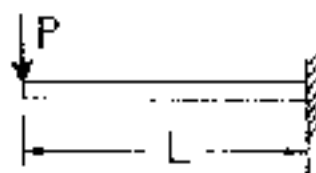


Shear modulus:

$$G = \frac{1}{\pi} \text{ GPa}$$

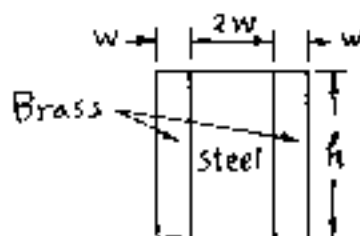
3.

- (a) Describe the elastic flexure formula to obtain the flexural stress for a beam under pure bending (10%)
- (b) For the following cantilever beam of Young's modulus E , find the maximum compressive and shearing stresses in the beam when it is under a tip load P (10%)



Cross section

- (c) For the problem in part (b), if the cross section of the beam is bonded together by steel and brass materials as shown, determine the maximum tensile stress in the steel and in the brass. Assume that the Young's modulus of steel is E_s and the Young's modulus of brass $E_b = 0.5 E_s$ (10%)



Cross section

4.

- (a) Describe the "maximum shearing stress criterion" in the principal stress plane $\sigma_a - \sigma_b$. Is this yield criterion for ductile materials? (5%)
- (b) Describe the "maximum normal stress criterion" in the principal stress plane $\sigma_a - \sigma_b$. Is this yield criterion for brittle materials? (5%)
- (c) Construct Mohr's circle to find the two principal stresses and maximum shearing stress for the following plane stress state (15%)

