

國立中央大學 108 學年度碩士班考試入學試題

所別： 機械工程學系 碩士班 固力與設計組(一般生)
機械工程學系光機電工程 碩士班 光機組(一般生)

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科目： 材料力學

本科考試可使用計算器，廠牌、功能不拘

*計算題需計算過程

- As shown in Figure 1, the rigid horizontal bar ABC of negligible mass is connected to two vertical rods, one made of brass and the other made of copper. The length (L), cross sectional area (A), Young's modulus (E), and coefficient of thermal expansion (α) of each rod are given in the figure. If the system is initially stress-free, determine the temperature change that will cause a tensile stress of 120 MPa in the copper rod. Assume that both rods are subjected to the same change in temperature. (25%)

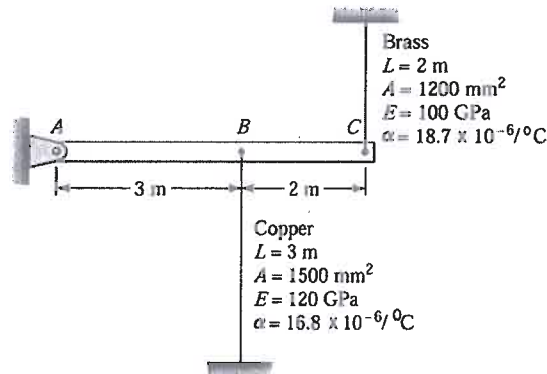


Figure 1

- Two forces are applied to the pipe AB as shown in Figure 2. Knowing that the pipe has inner and outer diameters equal to 35 and 42 mm, respectively, determine the normal and shearing stresses at point a . (25%)

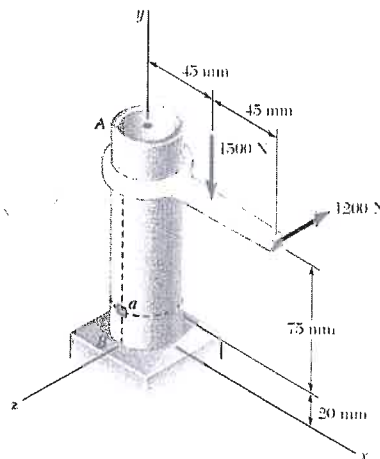


Figure 2

參考用

注意:背面有試題

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3. Determine the slope and deflection equations for the solid circular cross-section cantilevered beam subjected to the uniformly distributed load shown in the **Figure 3**. The beam has a constant bending stiffness, EI . After obtaining the slope and deflection equations in variable form let $w=200 \text{ N/m}$, $L=5 \text{ m}$, $r=100 \text{ mm}$, and determine the numeric slope and deflection at the free end. (25%)

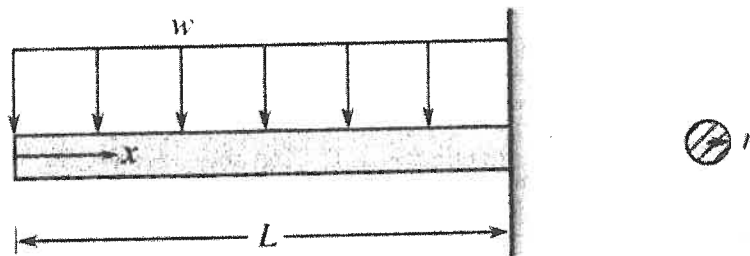


Figure 3

4. An element is subjected to stresses $\sigma_{xx} = 20.0 \text{ ksi}$, $\sigma_{yy} = 10.0 \text{ ksi}$, $\tau_{xy} = 5.0 \text{ ksi}$, and $\sigma_{zz} = \tau_{xz} = \tau_{yz} = 0.0 \text{ ksi}$. Using Mohr's circle, determine (a) the stresses acting on an element oriented at an angle $\theta = 30^\circ$, (b) the principle stresses, and (c) the maximum shear stresses. Show all above results on sketches of properly oriented elements. If σ_{zz} changes to 3.0 ksi, determine new maximum shear stresses. (25%)

注意:背面有試題