

國立中正大學 108 學年度碩士班招生考試試題

科目名稱：材料力學

本科目共 2 頁 第 1 頁

系所組別：機械工程學系-甲組

1. (a) Draw the conventional stress-strain diagram, and explain the behaviors in different regions. (15%)
 (b) Describe and explain the fatigue behaviors for ductile and brittle materials (10%)
2. Two bars, each made of a different material, are connected and placed between walls when the temperature is $T_1 = 10^\circ\text{C}$. Determine the force exerted on the (rigid) supports (the walls) when the temperature becomes $T_2 = 20^\circ\text{C}$. The material properties and cross-sectional area of each bar are given in Figure 1, where E is the Young's modulus, α is the thermal expansion coefficient, and A is the cross-sectional area. (25%)

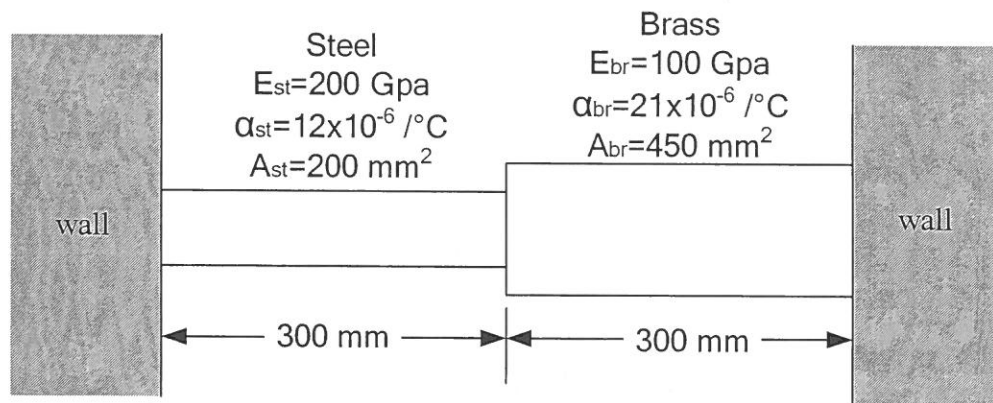


Figure 1

3. A circular solid cantilever bar has a diameter of 0.12 m subjected to a downward loading of 2.0 kN, a torsional torque of 18 kN·m and a bending moment of 8.1 kN·m on the free end as shown in Figure 2.
 - (a) Determine the stresses at point A and point B on top and on right side of cross-section a. Plot the stresses on volume element for point A and point B. (10%)
 - (b) Determine the principal stresses and maximum shear stress at point A. (8%)
 - (c) Plot Mohr's circle to express the stress state at point A and indicate the results of (b) on the Mohr's circle. (7%)

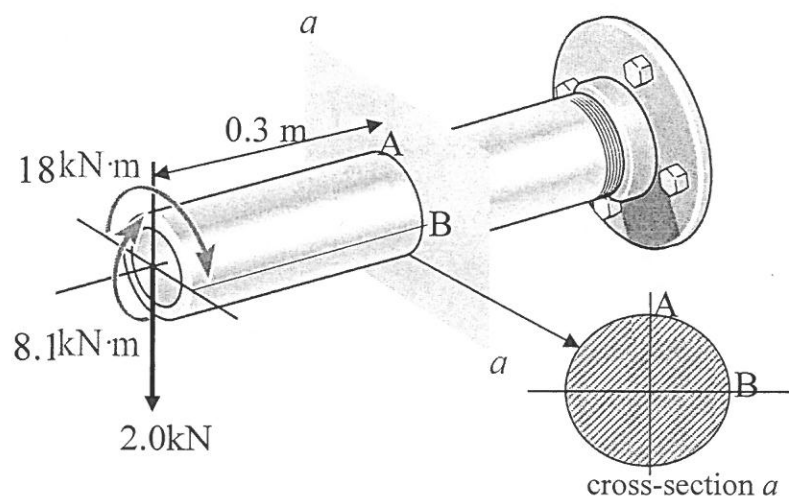


Figure 2

4. A beam is subjected to the load shown in Figure 3. The Young's modulus is E and the moment of inertia is I .
- Determine the equation of the deflection curve of the beam by using discontinuity functions. (13%)
 - Determine the value of a in terms of L by using moment-area theorems so that the slope at A is equal to zero. (12%)

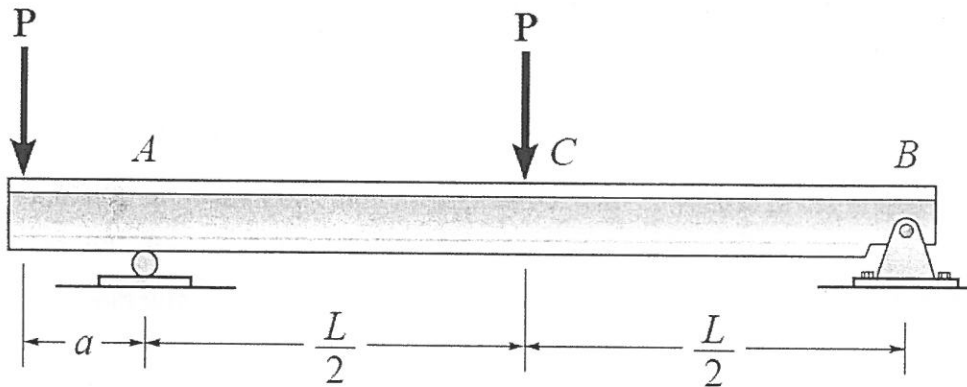


Figure 3