國立中央大學102學年度碩士班考試入學試題卷

所別：機械工程學系碩士班 甲組(固力與設計)(一般生)　科目：材料力學　共 1 頁 第 1 頁
機械工程學系光機電工程碩士班 乙組(光機)(一般生)

本科考試可使用計算器，廠牌、功能不拘　　＊請在試卷答案卷（卡）內作答

參考用

1. As shown in **Fig. 1**, a rigid block with a weight of 100 kN is supported by 3 solid rods. Each rod has a cross-sectional area of 2000 mm^2. Rod A and Rod B are both made of AISI 1015 steel, and Rod C is made of Al 6061-T6. The 3 rods have the same original length L at room temperature (20 °C) before they are loaded by the block. If Rod C is heated to 40 °C, determine the average normal stress in Rod A and Rod C. (Assume the coefficient of thermal expansion of Al 6061-T6 is 24 x 10^{-6}/°C, the coefficient of thermal expansion of AISI 1015 is 12 x 10^{-6}/°C, the Young's modulus of Al 6061-T6 is 70 GPa, and the Young's modulus of AISI 1015 is 200 GPa.) **(25%)**

2. As shown in **Fig. 2**, the thin-walled tube is used as a beam to support the uniformly distributed load of intensity w_0. w_0 is in unit of N/m. (a) Draw the shear force and bending moment diagrams in terms of w_0. (b) Find the largest allowable value of w_0 if the allowable bending stress is of 200 MPa. (c) Compute the corresponding maximum shear stress in the beam for the value of w_0 obtained in part (b). **(25%)**

3. For the double-beam structure shown in **Fig. 3**, please determine (a) the reaction forces at points A, B, C, and D, and (b) the equations of deflection for beams DB and AC. (Points will be given **only if** using free body diagram to analyze the problem). Beams DB and AC both have a flexural rigidity of EI. **(25%)**

4. As shown in **Fig. 4**, the crow bar is used to pull out the nail at A. If a force of 40 N is required, determine the stress components and draw Mohr's circles in the bar at points D and E. Show the results on a volume element located at each of these points. The bar has a circular cross section with a diameter of 10 mm. No slipping occurs at B. **(25%)**

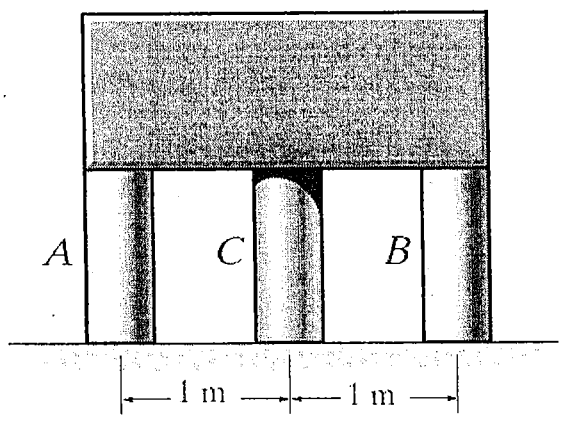
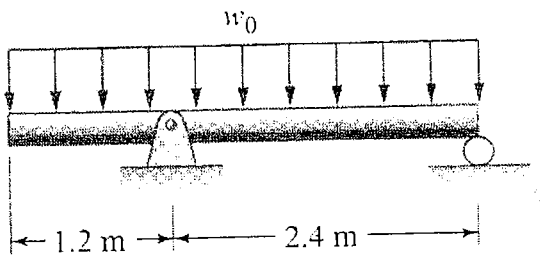


Fig. 1



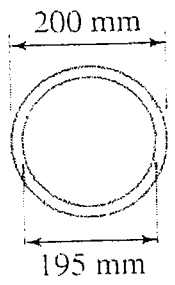


Fig. 2

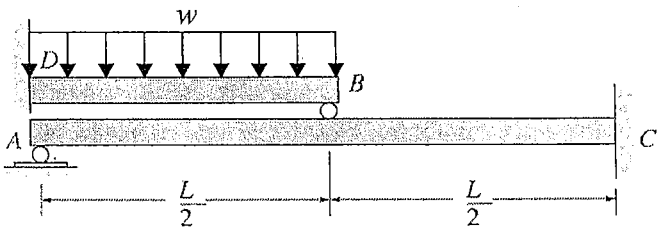


Fig. 3

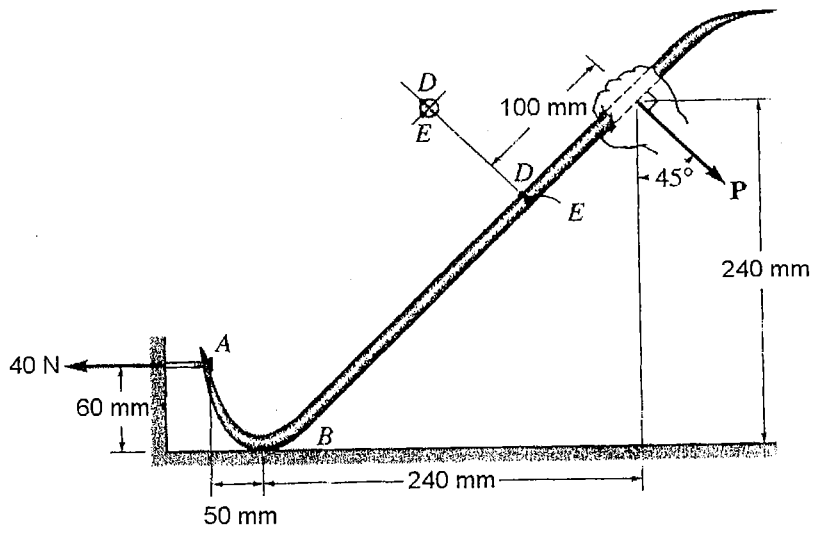


Fig. 4