國立中央大學104學年度硕士班考試入學試題

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　　＊請在答案卷（卡）內作答

1. As shown in **Fig. 1**, a slightly tapered bar AB of circular cross section and length L is supported at end B and subjected to a tensile load P at the free end A. The diameters of the bar at ends A and B are d_1 and d_2, respectively. (a) Derive a formula for the strain energy U of the bar. (b) Derive a formula for the elongation δ of the bar due to the load P. **(25%)**

2. As shown in **Fig. 2**, assume the reaction on the railway tie is uniformly distributed over its length. (a) Draw the shear and moment diagram for the railway tie; and (b) If the maximum allowable bending stress of the wood is 6 MPa, determine the minimum thickness h of the rectangular cross sectional area of the tie. **(25%)**

3. As shown in **Fig. 3**, a simply supported beam is loaded by a noncentral load P. Suppose that the flexural rigidity of the beam EI has been known already.
   (a) Construct the bending moment diagram for the beam. **(10%)**
   (b) **Use the moment-area method** (sometimes called area-moment method) to determine the end slopes, the displacement at the load and the maximum displacement. **(15%)**

4. As shown in **Fig. 4**, the cylindrical tank is fabricated by welding a strip of thin plate helically and making an angle θ with the longitudinal axis of the tank. The strip has a width w and thickness t. The gas within the tank of diameter d is pressured to p. Please determine the normal stress developed along the strip. **(25%)**

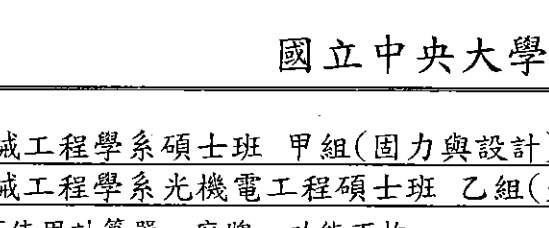

Fig. 1

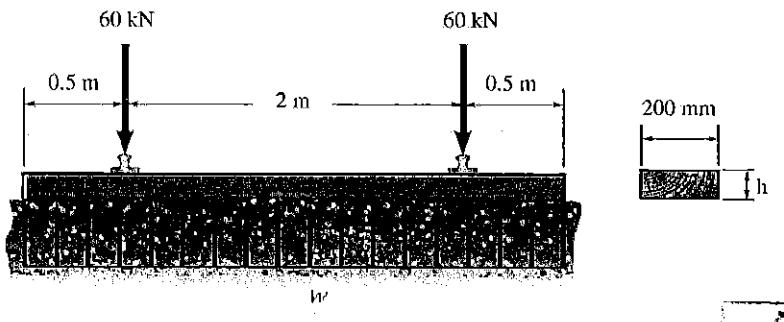

Fig. 2

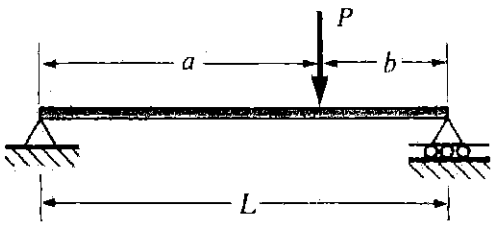

Fig. 3

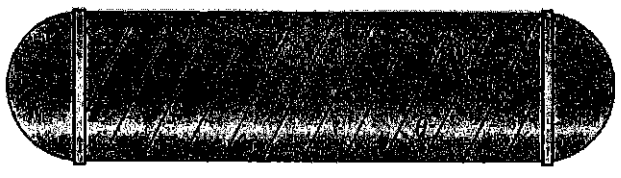

Fig. 4

參考用