國立中央大學 105 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) 共 1 頁 第 1 頁

機械工程學系光機電工程 碩士班 光機組(一般生)

科目： 材料力學

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**, each member of the truss has a uniform cross-sectional area A and a constant Young's modulus E. The original lengths of [1] and [3] are L, while the original length of [2] is $\sqrt{2}L$. Assume each member is pin connected. This simply supported truss is subjected to a horizontal force P at point b. (a) Determine the force in each member of the truss. **(8%)**; (b) Determine the deformation in each member of the truss. **(8%)**; (c) Determine the displacements at points b and c. **(9%)**

2. As shown in **Fig. 2**, the beam is made from two boards. The supports at point B and C exert only vertical reactions on the beam. (a) Determine the shear stress in the glue necessary to hold the boards together at point D. **(15%)**; (b) Compute the maximum shear stress in the beam. **(10%)**

3. As shown in **Fig. 3**, the overhanging beam supports two concentrated loads P and Q. The beam has a flexural rigidity of EI. (a) Determine the deflection δ_D at point D. **(20%)**; (b) For what ratio P/Q will the deflection at D equal zero? **(5%)**

4. A pipe with closed ends has an outer diameter of 80 mm and wall thickness of 2 mm. It is subjected to an internal pressure of 10 MPa, a torque of 3 kN·m, and an axial compressive force of 100 kN. Determine the maximum normal stress and the maximum shear stress in the pipe. Neglect the localized effects of the end closure. **(25%)**

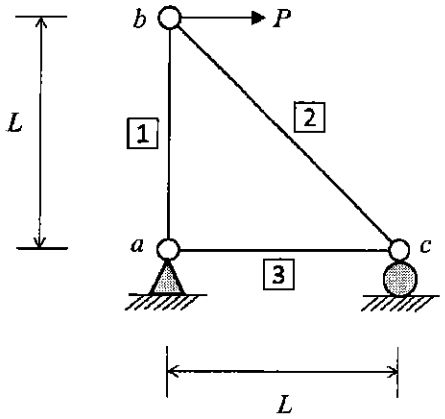

Fig. 1

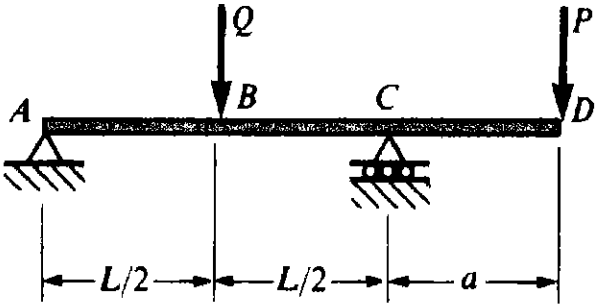

Fig. 3

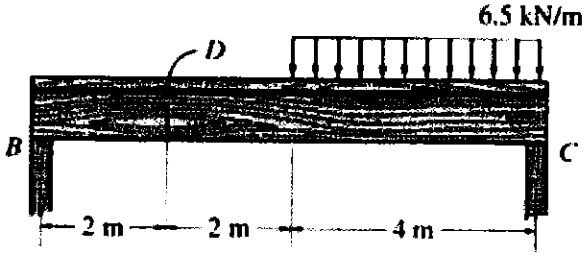

Fig. 2