編號： 108

國立成功大學 106 學年度碩士班招生考試試題

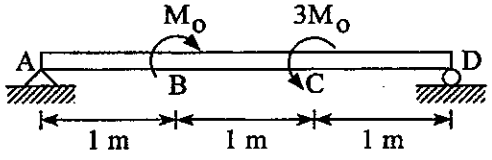
系　　所：土木工程學系

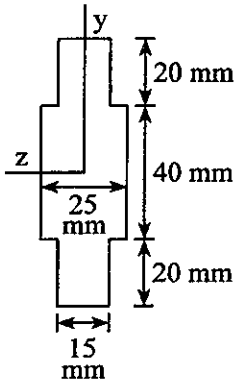
考試科目：材料力學

考試日期：0213，節次：1

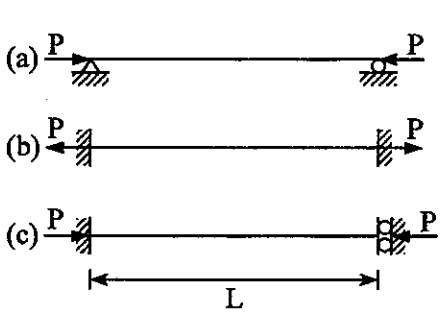
※ 考生請注意：本試題可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

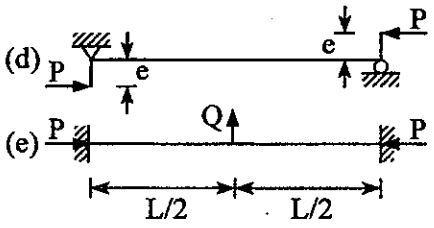
1. A simply supported beam is subjected to two concentrated moments as shown at the below left. The cross section of the beam is shown at the below right. Let the axial direction of the beam be the x axis. If the maximum shear stress τ_{xy} in the beam can't exceed 10 kPa, calculate the maximum value of M_o. (20%)



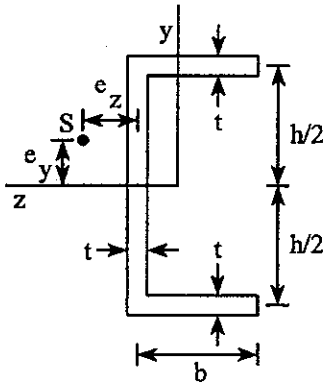


2. There are 5 beam-columns subjected to axial force P as shown. Let all the beam-columns have the same EI. In addition, let e be the eccentricity of the force P and Q be a very small lateral force. (i) Draw the buckling mode for each beam-column. (ii) Calculate their effective length L_e and critical buckling load P_{cr}. (20%)





3. The cross section of a thin-walled beam is shown below. Calculate the distances e_y and e_z to locate the shear center S of the beam. (20%)



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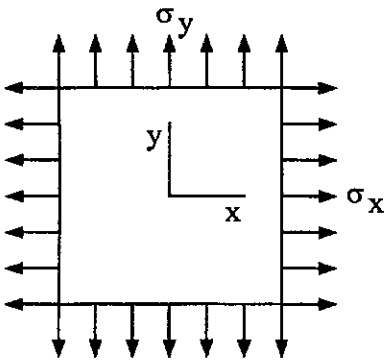
4. A square plate with uniform thickness t in the z direction is shown below. It is subjected to tri-axial stresses $\sigma_X = 40$ MPa, $\sigma_Y = 20$ MPa and $\sigma_Z = 0$ MPa. The measured normal strains are $\varepsilon_X = 17\times10^{-5}$ and $\varepsilon_Y = 4\times10^{-5}$. (i) Calculate the Yung's modulus E and the Poisson's ratio ν of the plate. (ii) Calculate the maximum shear stress $(\tau_{XY})_{max}$ in xy plane, the maximum shear stress $(\tau_{YZ})_{max}$ in yz plane and the maximum shear stress $(\tau_{XZ})_{max}$ in xz plane. (20%)



5. A tube has length L = 1 m and is subjected to a torque T = 10 kN-m. If the shear stress τ in the tube can't exceed 35 MPa, determine the minimum thickness t of the tube and the corresponding angle of twist ϕ of the tube. Use G = 76 GPa. (20%)