80學年度 机研所 材料力學 共1頁

1. A thin-walled cylindrical pressure vessel of radius 100 cm is subject to an internal pressure of 700 kN/m². If the material has a yield point of 250 MN/m², determine the required wall thickness according to (a) maximum stress theory, (b) von Mises' theory and (c) Tresca theory. Use a factor of safety of 2. (25%)

2. The following two dimensional displacement field describes the movement of a body under load:

    $u_x = x^2 + y^2$　　　　　$u_y = 3 + xy$　　　　(x 10^{-2} ft)

    Compute the normal strain at (0,1) in a direction s given as

    $s = 0.60\ i + 0.80\ j$ (15%)

3. Explain why the magnitude of Poisson ratio v for isotropic materials has to be in the following range:

    $0. < v < 0.5$ (10%)

4. A simple beam AB having a rectangular cross section (width b and height h) and span length L is loaded by a force P acting at the end of an arm of length a (see Fig. 1), Draw the bending moment diagram of the beam and also determine the maximum tensile and compressive stresses in the beam. (15%)

5. A hollow circular shaft and a solid circular shaft of the same material and of same length are to be designed to transmit the same torque. The inner radius of the hollow shaft is to be 0.8 times the outer radius. Find the ratio of outer diameter of hollow shaft to diameter of solid shaft,
    (a) if two shafts have the same maximum shear stress.
    (b) if the angles of twist between two ends for hollow and solid shafts are the same. (15%)
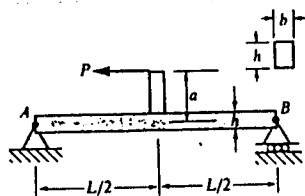

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Fig. 1