

淡江大學 98 學年度碩士班招生考試試題

57-1

系別：機械與機電工程學系

科目：材 料 力 學

准帶項目請打「V」	
✓	簡單型計算機

本試題共 2 頁，4 大題

1. A sign of dimensions 2.0m x 1.2m is supported by a hollow circular pole having outer diameter 220mm and inner diameter 180mm as shown in Fig.1. The sign is offset 0.5m from the centerline of the pole and its lower edge is 6.0m above the ground. Determine the principal stresses and maximum shear stresses at point A and B at the base of the pole due to a wind pressure of 2.0kPa against the sign. Note: the shear force formula for a circular tube is $\tau = \frac{4V}{3A} \frac{(r_2^2 + r_2r_1 + r_1^2)}{(r_2^2 + r_1^2)}$ in which r_2 and r_1 are the outer and inner radii, respectively. V is the shear force and A is the cross sectional area. (25%)

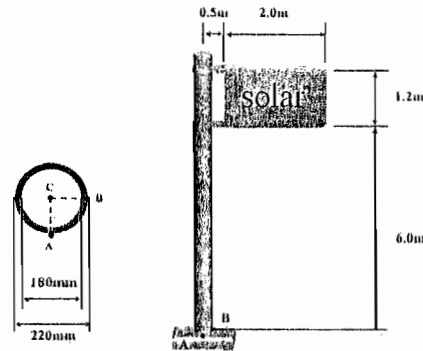


Fig.1

2. A compressed-air tank is supported by two cradles as shown in Fig.2; one of the cradles is designed so that it does not exert any longitudinal force on the tank. The cylindrical body of the tank has a 30-in. outer diameter and is fabricated from a $\frac{3}{8}$ -in. steel plate by butt welding along a helix that forms an angle of 25° with a transverse plane. The end caps are spherical and have a uniform wall thickness of $\frac{5}{16}$ -in. For an internal gage pressure of 180psi, determine (a) the normal stress and the maximum shearing stress in the spherical caps. (b) the stresses in the directions perpendicular and parallel to the helical weld. (25%)

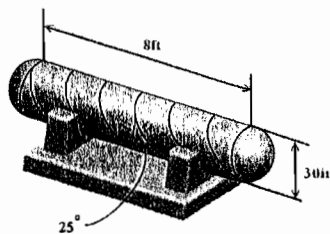


Fig.2

◀ 注意背面尚有試題 ▶

本試題雙面印製

3. For the beam and loading as shown in Fig.3, determine the magnitude and location of the largest deflection. Use $E=200\text{GPa}$. Note: the moment of inertia is $28.9 \times 10^{-6} \text{m}^4$ (25%)

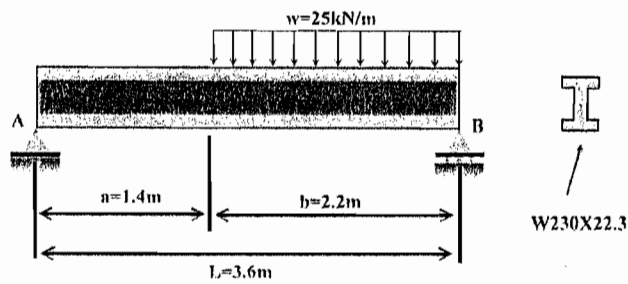


Fig.3

4. A structural steel ($E=29,000\text{ksi}$) column 10ft long must support an axial compressive load P as shown in Fig.4. The column has a width=1-in and a height=2-in rectangular cross section. The left end of the column is fixed; the pin and bracket arrangement at the right end allows rotation about the pin, but prevents rotation about a vertical axis. Determine the maximum safe load for the column if a factor of safety of 2 with respect to failure by buckling is specified. (25%)

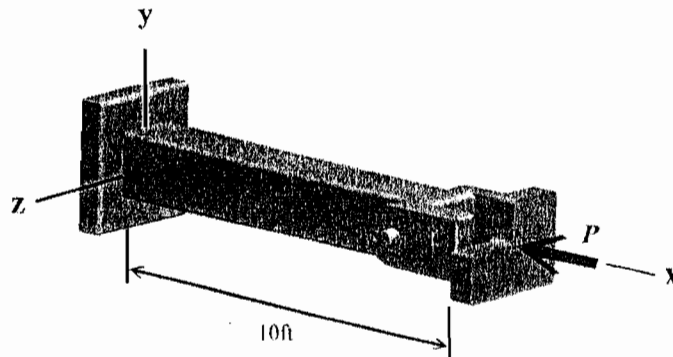


Fig.4