

國立臺灣科技大學

九十一學年度碩士班招生考試試題

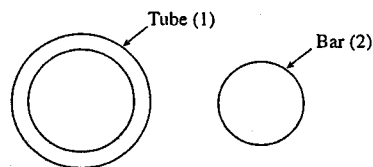
系所組別：機械工程系乙組

科目：材料力學

※總分：100分

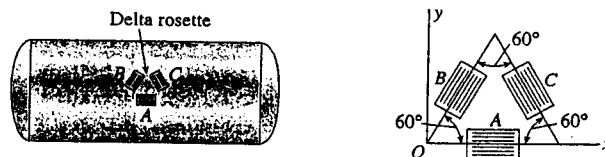
1. A thin-walled circular tube and a solid circular bar of the same material are subjected to torsion. The tube and bar have the same cross-sectional area and the same length.

What is the ratio of strain energy U_1 in the tube to the strain energy U_2 in the solid bar if the maximum shear stresses are the same in both cases? (For the tube, use the approximate theory for thin-walled bars.) (25%)

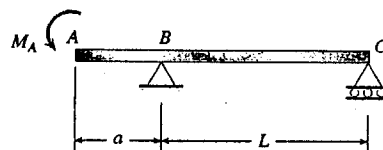


2. A 60° strain gage rosette (or delta rosette) is mounted on the outside of a cylindrical compressed air tank. The recorded strains are $\varepsilon_a = 80 \times 10^{-6}$ and $\varepsilon_b = \varepsilon_c = 275 \times 10^{-6}$.

If the tank has a diameter-to-thickness ratio (d/t) of 50 and the modulus of elasticity is 200 GPa, what is the air pressure p in the tank? (25%)



3. An overhanging beam ABC is subjected to a couple M_A at the free end. The length of the overhang and the main span are a and L , respectively. Determine the angle of rotation θ_A and deflection δ_A at end A . (25%)



4. A tubular shaft of outer diameter $d_o = 50\text{mm}$ and inner diameter $d_i = 40\text{mm}$ is subjected simultaneously to a specified torque $T = 250\text{N}\cdot\text{m}$ and to an axial load P . The maximum tensile stress allowed is $\sigma_{allow} = 40\text{MPa}$. Determine the maximum axial load P that can be applied without exceeding this allowable tensile stress. (25%)

