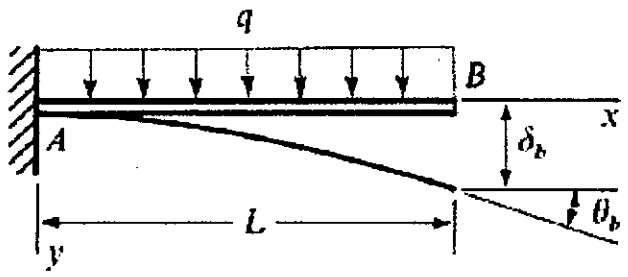
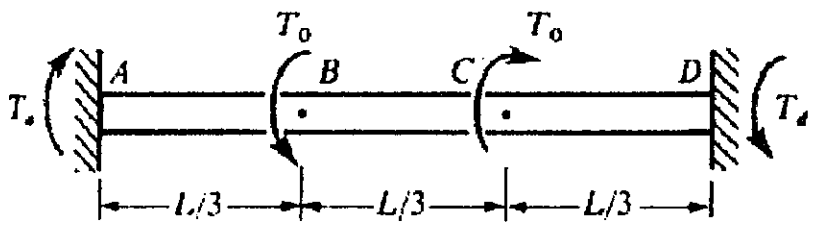
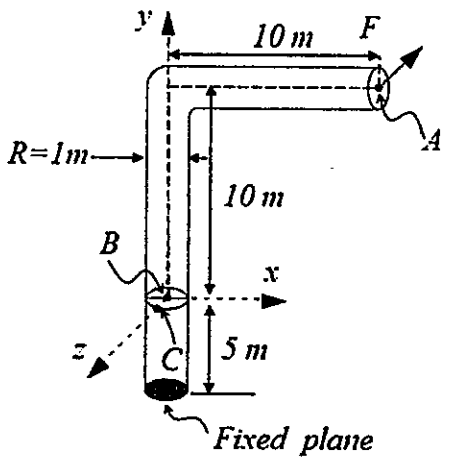
1. (25%) A cantilever beam AB is subjected to a uniform load of intensity q, as shown in the Figure. Please determine
(a) The general expression of the bending moment as a function of x (5%)
(b) The equation of the deflection curve as a function of x (10%)
(c) The angle of rotation θ_b at the free end of the beam (5%)
(d) The deflection δ_b at the free end of the beam (5%)
(Note: use following symbols in the expressions you derive. E: modulus of elasticity (Young's modulus); I: moment of inertia of the cross-sectional area)



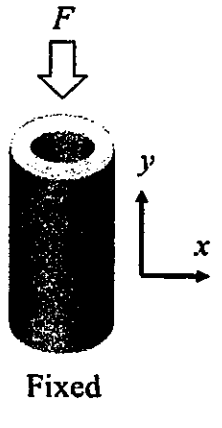
2. (25%) A solid circular bar with fixed ends is acted upon by two oppositely directed torques T_0, as shown in the Figure. Please obtain the formulas for
(a) Reactive torque T_a (5%)
(b) Reactive torque T_d (5%)
(c) The angle of twist ϕ_b at section B (5%)
(d) The angle of twist ϕ_m at the midsection of the bar (10%)
(Note: use following symbols in the expressions you derive. G: shear modulus of elasticity; I_p: polar moment of inertia)



3. (25%) Consider a L-shaped lever as shown in the figure, a force $F=312.5\pi\ N$ is applied to end A in parallel with z-axis.
Please determine and make drawings of the following questions:
(a) An equivalent force-couple system at the center point B of the transverse section passing through point C (6%)
(b) The normal stress σ_x, σ_y, and shear stress τ_{xy} at point C (8%)
(c) The principal stresses and principal planes at point C (11%)



4. (25%) Consider a metal pipe of length L=1.2 m with an outside diameter d_2=5cm and inner diameter d_1=3cm. One side of this pipe is fixed on the floor. The top side of this pipe has a compressive force $F = 4\pi \times 10^4$ N applied on its surface. The elasticity and poisson's ratio of this metal is E = 200 GPa and ν = 0.3, respectively.
Determine the following quantities for this pipe:
(1) The axial normal stress σ_y , strain ε_y and the shorting δ (9%)
(2) the lateral strain ε_x (3%)
(3)The change of outer diameter Δd_2 and inner Δd_1 (6%)
(4) the increase in wall thickness Δt (3%)
(5) the dilation e (4%)



試題隨卷繳回