臺灣綜合大學系統 105 學年度學士班轉學生聯合招生考試試題

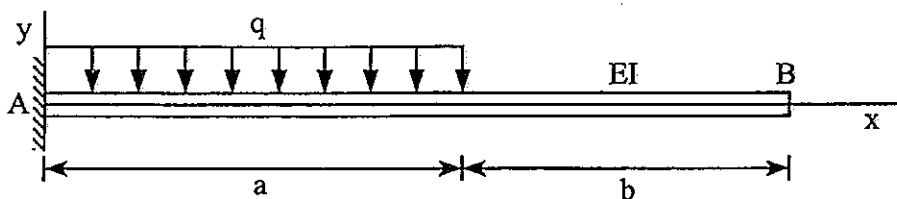| 科目名稱	材料力學	類組代碼	D09
		科目碼	D0993
※本項考試依簡章規定各考科均「不可以」使用計算機		本試題共計 2 頁	

1. A hollow tube of length L = 4 ft and thickness t = 0.1 in. is subjected to a torque T = 2400 lb-in. If G = 30 Msi and the shear stress in the tube cannot exceed 750 psi, determine: (i) the largest distance d, and (ii) the associated angle of twist ϕ of the tube. (20%)
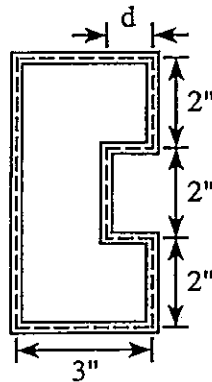
2. A material A (modulus of elasticity E, Poisson's ratio v, thermal expansion coefficient α) of initial dimensions $L \times L \times L$ is confined in a rigid box of inner dimensions $L \times (L+\delta) \times L$. If the temperature of the material is increased by ΔT and $\alpha \Delta T L < \delta$, calculate σ_x, σ_y, σ_z, ε_x, ε_y, ε_z and absolute maximum shear stress τ_{max} in the material. Assume there is no friction between the material and the rigid box. (20%)

side view cross section
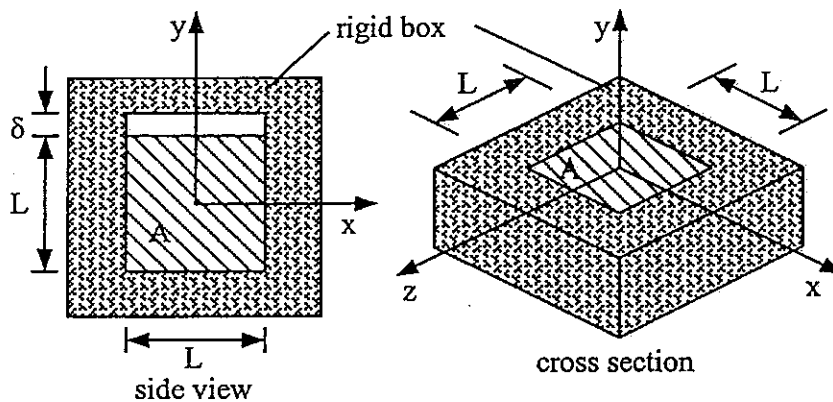
3. Use the moment differential equation EI(x)v(x)" = M(x) to obtain the equations of the deflection curve for a cantilever beam AB carrying a uniform load of intensity q over part of the span (a + b = L). Also, determine the deflection δ_B at the end of the beam. (20%)

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4. A cantilever beam supports an inclined load P at its free end. It is known that the neutral axis n-n lie along a diagonal of the cross section and the load P is perpendicular to the neutral axis. (i) Determine the height h of the beam. (ii) If the maximum normal stress in the beam cannot exceed 8 MPa, find the largest load of P that can be applied to the beam. (20%)
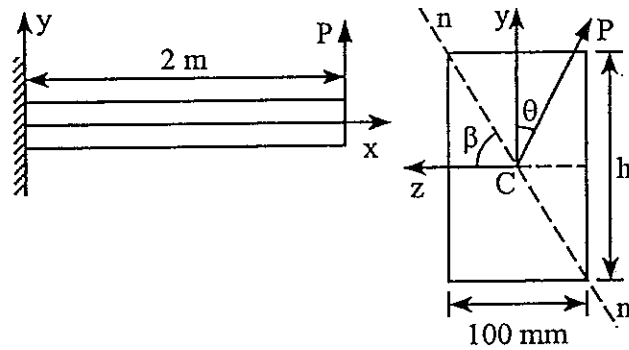
5. What are the critical buckling loads P_{cr} for the following columns. Assume all columns have the same EI. (20%) (You are not supposed to carry out a lot of calculations)