

科目名稱	材料力學	類組代碼	D37
		科目碼	D3793
※本項考試依簡章規定所有考科均「不可」使用計算機。		本科試題共計 2 頁	

1. A brass sleeve (S) is fitted over a steel bolt (B) as shown in Fig. 1, and the nut is tightened until it is just snug. The bolt has a diameter d_B , and the sleeve has inside and outside diameters d_1 and d_2 , respectively. Calculate the temperature rise ΔT that is required to produce a compressive stress σ_S in the sleeve. Also, what is the increase δ in the length L of the sleeve and bolt? (Use the coefficient of thermal expansion α_S and Young's modulus E_S for the sleeve; Use the coefficient of thermal expansion α_B and Young's modulus E_B for the bolt. Assume α_S is greater than α_B) (25%)

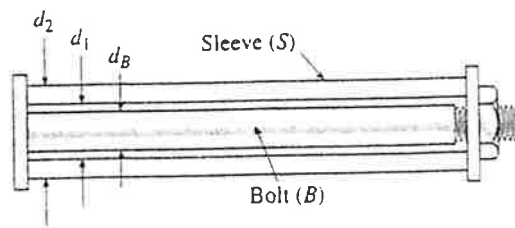


Fig.1

2. A block of rubber is confined between plane parallel walls of a steel block as shown in Fig.2. A uniformly distributed pressure is applied to the top of the rubber block by a force F . Derive a formula for the lateral pressure between the rubber and the steel. (Disregard friction between the rubber and the steel, and assume that the steel block is rigid when compared to the rubber. Use Young's modulus E and Poisson's ratio ν for the rubber.) Derive a formula for the dilatation of the rubber. Derive a formula for the strain-energy density of the rubber. (25%)

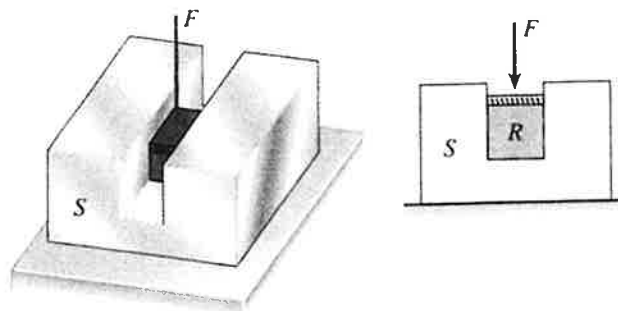


Fig.2

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3. A compound beam ABCDE of flexural rigidity EI consists of two parts (ABC and CDE) connected by a hinge at C, as shown in Fig. 3. The elastic support at B has stiffness $k = EI/b^3$. Determine the deflection at the free end E due to the load P acting at that point. (25%)

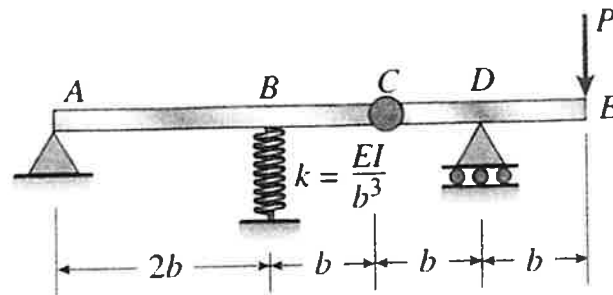


Fig.3

4. The column of flexural rigidity EI shown in Fig.4 is fixed at the base and free at the upper end. A compressive load P acts at the top of the column with an eccentricity e from the axis of the column. Beginning with the differential equation of the deflection curve, derive formulas for the maximum deflection of the column and the maximum bending moment M_{max} in the column. (25%)

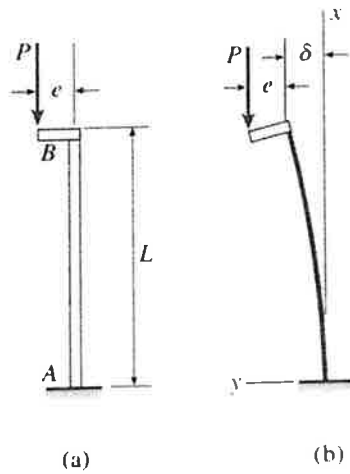


Fig. 4