淡江大學九十學年度碩士班招生考試試題

系別：機械工程學系　　科目：材　料　力　學

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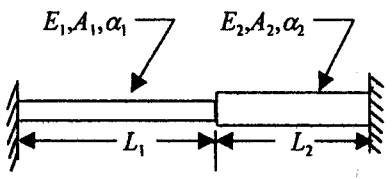
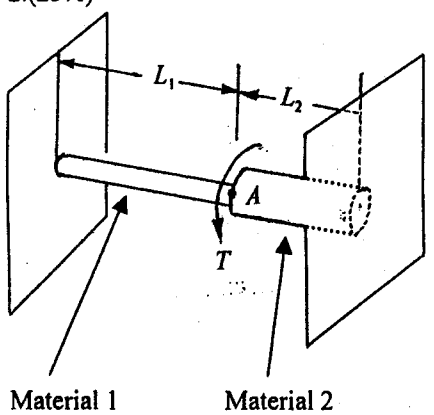
1.(25%)



Both ends of the axial force member shown in the figure are fixed. Moduli of elasticity for material 1 and 2 are E_1=75Gpa, and E_2=200Gpa. Cross-sectional areas A_1=1200mm^2, and A_2=1600mm^2. Coefficients of thermal expansion $\alpha_1=33\times10^{-6}$/°C, $\alpha_2=12\times10^{-6}$/°C. Also, L_1=200mm and L_2=120mm. Determine reaction forces at both ends as this member is subjected to a temperature increase ΔT=100°C.

2.(25%)

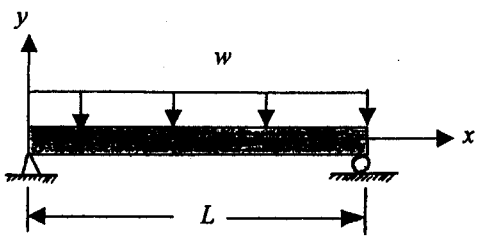


A solid circular shaft has two segments, which are made of two different materials. Diameters of segment 1 and 2 are d_1=40mm and d_2=80mm, and lengths of these segments are L_1=500mm and L_2=250mm respectively. Shear moduli for materials 1 and 2 are G_1=72Gpa, and G_2= 4.5Gpa.

a) Determine the magnitude of the torque T to produce a rotation θ=2° at the point A.

b) Determine the maximum shear stress in each segment as this torque T is applied.

3.(25%)

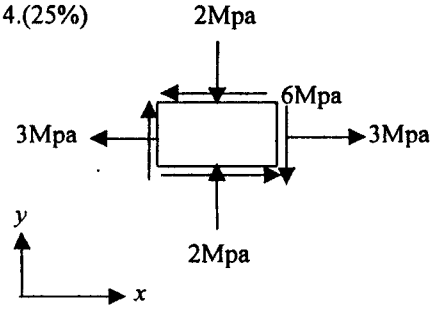


A simply supported beam of length L is subjected to a uniform distributed load w. This beam has a section modulus S and assuming shear stress can be neglected. Yield stress of the material is σ_o.

a) Plot bending moment M(x) as a function of x.

b) Determine the load w_y to cause yielding, express w_y as a function of S, L and σ_o.

4.(25%)



At a point in an element under plane stress, stresses are represented as in the figure.

a) Determine principal stresses and principal planes.

b) Draw principal planes and stresses on these planes.

c) Determine the maximum shear stresses τ_{max}, and planes on which τ_{max} act.

d) Draw planes of maximum shear stresses and show stresses on these planes.