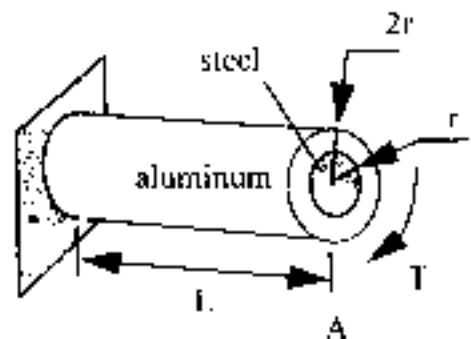


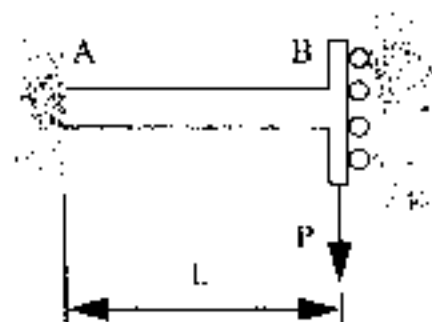
八十六學年度 動力機 系(所) 丙 組碩士班研究生入學考試

科目 材料力學 科號 280 共 3 頁第 1 頁 *請在試卷【答案卷】內作答

A torque T is applied at end A of the composite shaft shown. Knowing that the modulus of rigidity is G_s for steel and G_a for aluminum, determine (a) the maximum shearing stress in the steel core, and (b) the angle of twist at A. (20%)



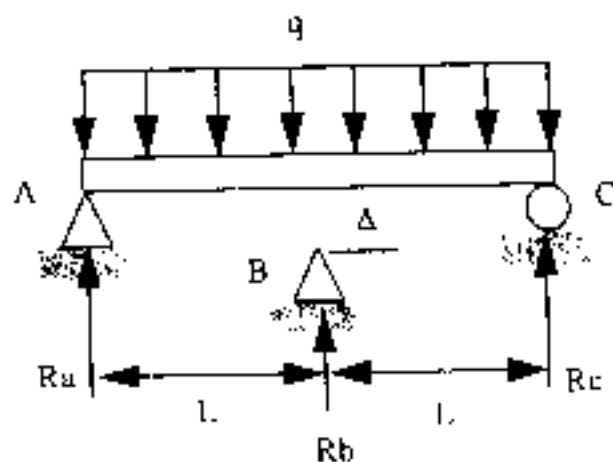
For the uniform beam AB the support at B prevents rotation but allows vertical motion. For the loading shown, determine the deflection at B. (15%)



八十六學年度 動力機 系(所) 丙 組碩士班研究生入學考試

科目 材料力學 科號 2801 共 3 頁第 2 頁 *請在試卷【答案卷】內作答

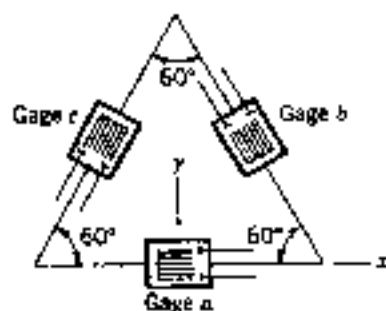
3. Determine Δ to let reaction force $R_a = R_b = R_c$ (15%)



4. The strain rosette shown was used to obtain the following strain data at a point on the free surface of an aluminum alloy ($E = 70$ GPa, and $\nu = 0.33$) machine part:

$$\epsilon_a = -2000 \mu, \epsilon_b = +1500 \mu, \epsilon_c = -1300 \mu$$

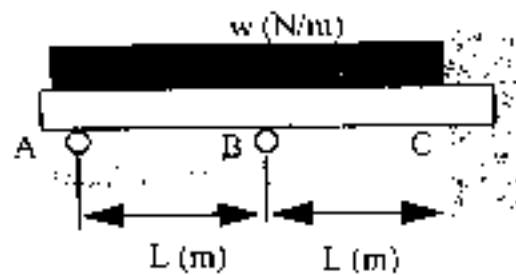
Determine the principal stresses and the maximum shearing stress at the point by first computing the principal strains and the maximum shearing strain at the point and using these strains to compute the stresses. (15%)



八十六學年度 動力 系(所) 丙 組碩士班研究生入學考試

科目 材料力學 科號 2801 共 3 頁第 3 頁 *請在試卷【答案卷】內作答

5. A beam is loaded and supported as shown in figure. Use the Castigliano's theorem to determine the reactions at supports A and B in terms of w and L . (15%)



6. A 7 m column is composed of two structural steel C254 x 45 channels. Determine the maximum allowable load (a) If the channels are not connected and each acts as an independent axially loaded member. (b) If the channels are latticed 150 mm back to back as shown in figure. (20%)

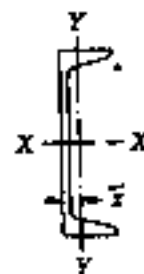
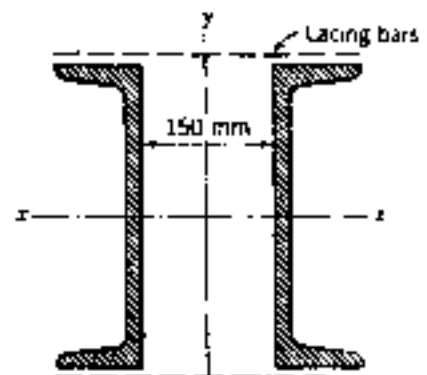
Use the code for structural steel ($E = 200 \text{ GPa}$) for this problem, i.e.

$$\frac{P_u}{A} = 110 - 0.00345 \left(\frac{L}{r}\right)^2 \text{ MPa}$$

$$k \text{ included, } 0 \leq \frac{L}{r} \leq 130$$

and in the slender range, $k = 2.24$

where P_u is the allowable load, k is the factor of safety, and L/r is the slenderness ratio.



Designation	Area (mm ²)	Depth (mm)	Flange		Web Thickness (mm)	Axis X-X			Axis Y-Y			
			Width (mm)	Thickness (mm)		I (10 ⁶ mm ⁴)	S (10 ³ mm ³)	r (mm)	I (10 ⁶ mm ⁴)	S (10 ³ mm ³)	r (mm)	r (mm)
C254x45	5690	254.0	77.0	11.1	17.1	42.9	339	86.9	1.64	27.0	17.0	16.5