(醫工所)

國立成功大學七十八學年度碩士班招考試(材料力學試題)共貳頁 第壹頁

共三大題:(1. 20%, 2. 40% 及 3. 40%)

1. 何謂平面應力(PLANE STRESS)和平面應變(PLANE STRAIN)? 試就應力、應變情形及各舉一實例說明。[佔20分]

2. 試解下列兩題:[佔40分,每題各佔20分]

(1) Consider a symmetric three-bar truss, as shown in Fig. A, and assume that the temperature is increased uniformly by ΔT. Modulus of Elasticity (E), cross section area (A) and coefficient of thermal expansion (α) for all three bars are the same. What is the downward displacement of joint D?

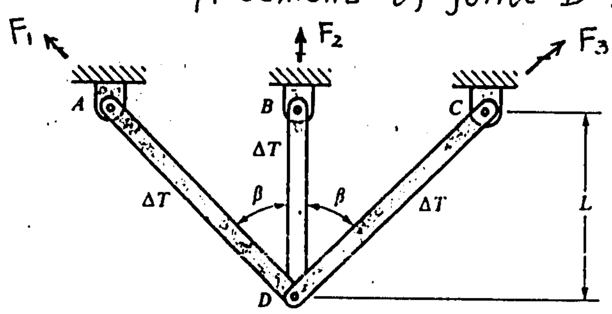

Fig. A

(2) A 60° strain rosette, Fig. B, gauge A measures the normal strain ϵ_a in the direction of x axis and gauges B and C measure the strains ϵ_b and ϵ_c in the inclined directions shown. Obtain equations for the strains ϵ_x, ϵ_y and γ_{xy} associated with the xy axes.

The transformation equation for plane strain

$$\epsilon = \frac{\epsilon_x + \epsilon_y}{2} + \frac{\epsilon_x - \epsilon_y}{2}\cos 2\theta + \frac{\gamma_{xy}}{2}\sin 2\theta$$

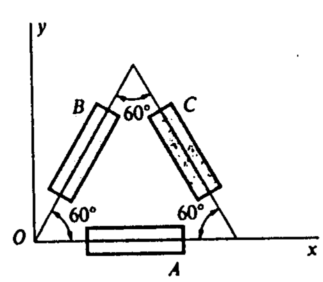

Fig. B

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3. 試證明下列之公式：[任選兩題 各佔 20分]

(1) Torsion Formula

$$\tau_{max} = \frac{Tr}{I_p}$$

τ_{max} : Maximum shear stress

I_p : Polar moment of Inertia of the circular cross section

r : radius of a circle

T : Torque in pure torsion

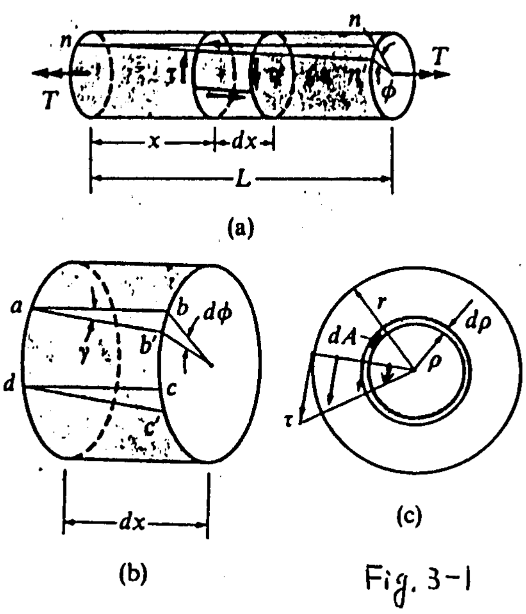

Fig. 3-1

(2) Flexure Formula

$$\sigma_x = \frac{My}{I}$$

σ_x : Normal stresses in beam..

M : Bending moment in beam

I : Moment of inertia of cross-sectional area respect to the z axis

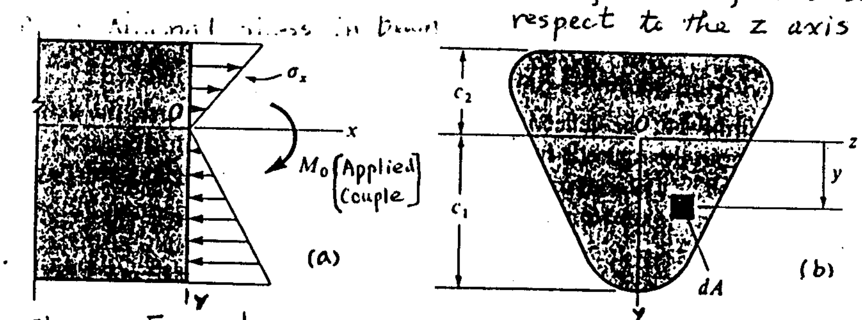

Fig. 3-2

(3) Shear Formula

$$\tau = \frac{VQ}{Ib}$$

τ : shear stress ,　b : width of rectangular cross section of beam

V : shear force ,

Q : The first moment for the shaded area of Fig 3-3 b respect to neutral axis z .

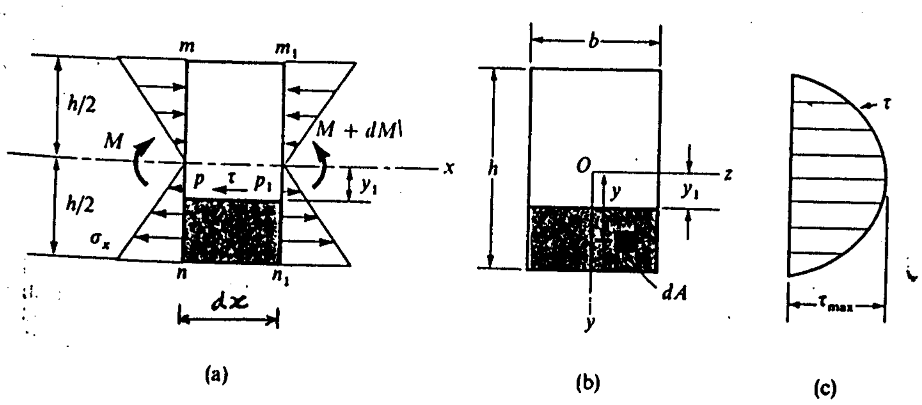

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Fig. 3-3