淡江大學 99 學年度碩士班招生考試試題

50-1

系別：機械與機電工程學系　　科目：材 料 力 學

准帶項目請打「V」	
V	計 算 機

本試題共 2 頁，4 大題

本試題雙面印製

1. In Fig. 1, a semi-circular rod ACB with circular cross section has the radius of r and flexural rigidity of EI. Its two ends are supported by hinges as shown. A vertical force P is applied at point C. Please determine: (a) the horizontal reaction force R_h at two supports; (b) the vertical deflection at point C. (25%)

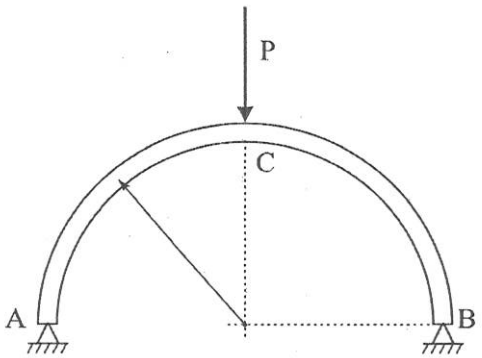

Fig. 1

2. In Fig. 2 a rectangular plate has the displacement $\vec{u}(x,y)=u(x,y)\hat{x}+v(x,y)\hat{y}$, where $\hat{x}$ and $\hat{y}$ are the unit vectors along x- and y-axes respectively. If the displacement components has the following forms:

(a) $u=\alpha_1+\beta_1 x$, $v=\alpha_2+\beta_2 y$

(b) $u=\alpha_3+\beta_3 y$, $v=\alpha_4+\beta_4 x$

(c) $u=\alpha_5 x+\beta_5 y$, $v=\alpha_6 x+\beta_6 y$

Determine strains ε_x, ε_y, ε_{xy}, and plot the strain figures at point A for each cases. (25%)

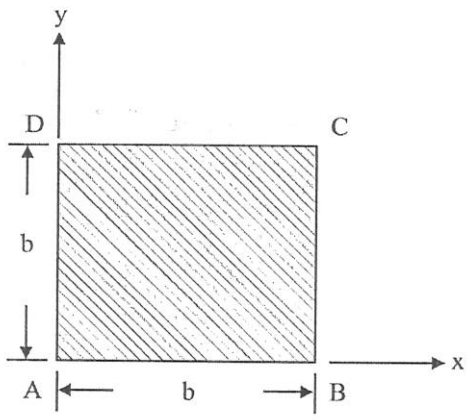

Fig. 2

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50-2

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3. A linearly elastic body, with the Young's modulus E and Poisson ratio ν, has the dimension L×h×t as shown in Fig. 3. There are two rigid walls at the top and bottom of the body respectively, which limit the deformation of the body along y direction. A force P is applied in x direction, and therefore the body length is shortened 0.004L. Please determine: (a) the force P; (b) the stress q on the wall surfaces at the top and bottom of the elastic body; (c) the thickness increment Δt. (25%)

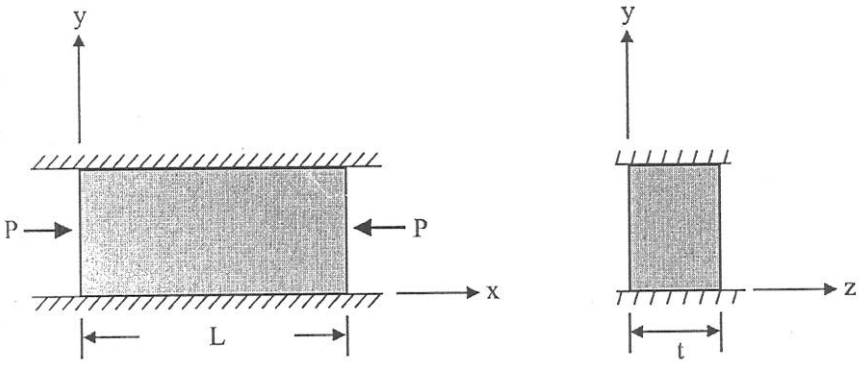

Fig. 3

4. A balloon has the diameter d of 10 cm and the thickness t of 0.1 mm as shown in Fig. 4. Assume its internal pressure p is 0.2 MPa. Please determine: (a) the membrane stress of the balloon; (b) the principal stress and the maximum shear stress of the outer surface of the balloon; (c) the principal stress and the maximum shear stress of the inner surface of the balloon. (25%)

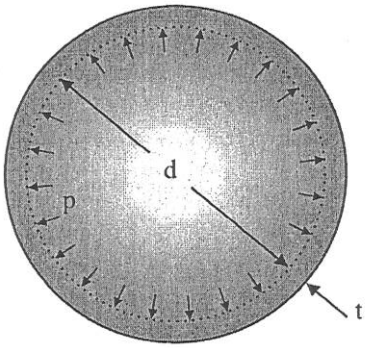

Fig. 4