國立屏東科技大學　九十四　學年度　碩士班暨碩士在職專班招生考試

材料力學 試題

注意：請一律使用試務中心提供的計算機

1. A prismatic bar CD of length L and cross-sectional area A is held between immovable supports (Fig. 1). If the temperature of the bar is raised uniformly by an amount ΔT, what thermal stress σ_T is developed in the bar? (Assume that the bar is made of linearly elastic material. E and α are the modulus of elasticity and coefficient of thermal expansion of the bar, respectively.) (25%)

2. A steel strut S serving as a brace for a boat hoist transmits a compressive force P = 54 kN to the deck of a pier (Fig. 2a). The strut has a hollow square cross section with wall thickness t = 12 mm (Fig. 2b), and the angle θ between the strut and the horizontal is 45°. A pin through the strut transmits the compressive force from the strut to two gussets G that are welded to the base plate B. Four anchor bolts fasten the base plate to the deck. The diameter of the pin is d_{pin} = 18 mm, the thickness of the gussets is t_G = 15 mm, the thickness of the base plate is t_B = 8 mm, and the diameter of the anchor bolts is d_{bolt} = 12 mm.

   Determine the following stresses (units: MPa): (a) the bearing stress between the strut and the pin, (b) the shear stress in the pin, (c) the bearing stress between the pin and the gussets, (d) the bearing stress between the anchor bolts and the base plate, and (e) the shear stress in the anchor bolts. (Disregard any friction between the base plate and the deck.) (25%)

3. A cantilever beam AB of length L supporting a uniform load of constant intensity q is shown in Fig. 3. Draw the shear-force and bending-moment diagrams for this beam. (25%)

4. At a point on the surface of a pressurized cylinder, the material is subjected to biaxial stresses σ_x = 90 MPa andσ_y = 20 MPa, as shown on the stress element of Fig. 4. Using Mohr's circle, determine the stresses acting on an element inclined at an angle θ= 30°. (Consider only the in-plane stresses, and show the results on a sketch of a properly oriented element.) (25%)

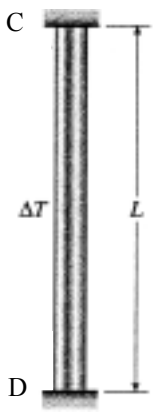

Fig.1

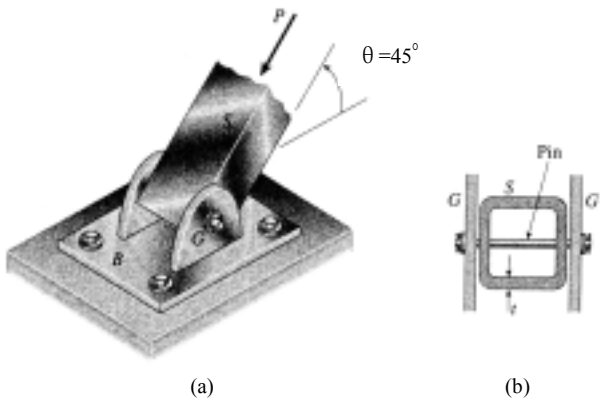

Fig. 2

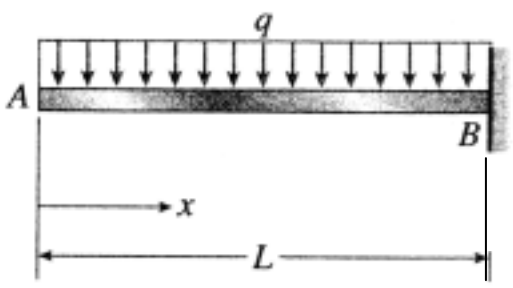

Fig. 3

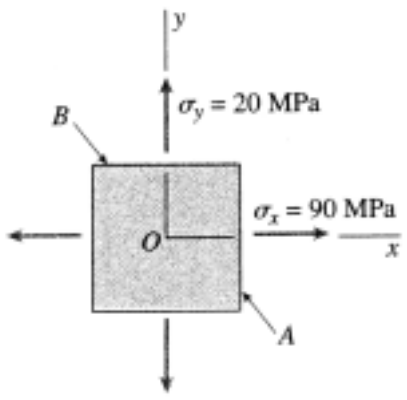

Fig. 4