

淡江大學九十學年度碩士班招生考試試題

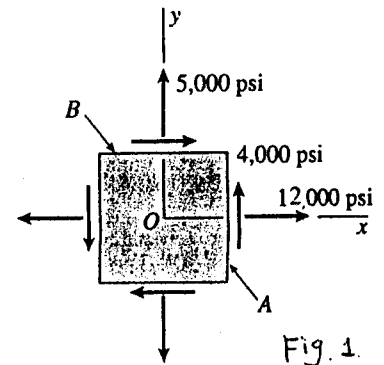
系別：土木工程學系

科目：材 料 力 學

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計算機	字典
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1. An element in plane stress at the surface of a machine is subjected to stresses $\sigma_x = 12000$ psi, $\sigma_y = 6000$ psi, and $\tau_{xy} = 4500$ psi, as shown in Fig. 1. The material is aluminum with modulus of elasticity $E = 10000$ ksi and Poisson's ratio $\nu = 0.33$. 25%

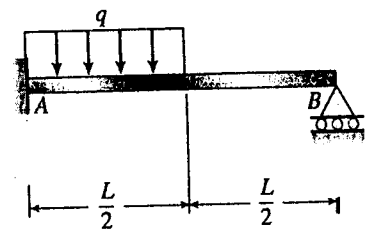


Using Mohr's circle, determine the following quantities:

- (a) the stresses acting on an element inclined at angle $\theta = 45^\circ$,
- (b) the principal stresses,
- (c) the maximum shear stresses
- (d) the principal strains, and
- (e) the maximum shear strains

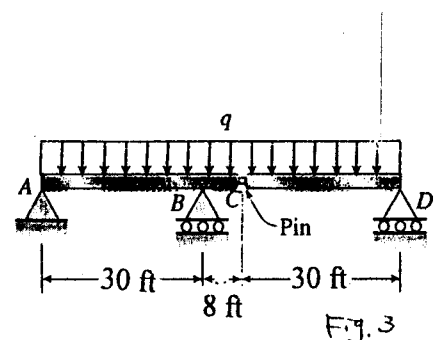
Consider only the in-plane stresses, and show all results on sketches of properly oriented elements.

2. A propped cantilever beam AB of length L supports a uniform load of intensity q on the left-hand half of the beam. 30%



Determine the reactions, shear forces, bending moments, slopes, and deflections of the beam.

3. A compound beam ABCD is supported at points A, B, and D and has a pin connection at point C. The beam is a W14×82 wide-flange shape with an allowable bending stress of 18000 psi. ($E = 30000$ ksi) 30%



- (a) Determine the allowable uniform load q that may be placed on top of the beam, taking into account the weight of the beam itself.
- (b) Find the deflection of the beam at point C.
- (c) Determine the maximum and minimum shear stresses in the web.

4. Explanations: 15%

- (a) Plane strain
- (b) Torsional rigidity
- (c) Creep

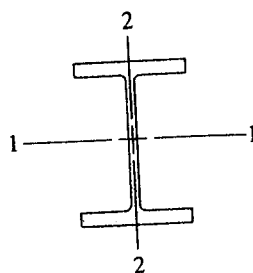


TABLE E-1 PROPERTIES OF WIDE-FLANGE SECTIONS (W SHAPES)
(ABRIDGED LIST)

Designation	Weight per foot	Area	Depth	Web thickness	Flange	
					Width	Thickness
	lb	in. ²	in.	in.	in.	in.
W 14 × 120	120	35.3	14.48	0.590	14.670	0.940
W 14 × 82	82	24.1	14.31	0.510	10.130	0.855
W 14 × 53	53	15.6	13.92	0.370	8.060	0.660
W 14 × 26	26	7.69	13.91	0.255	5.025	0.420