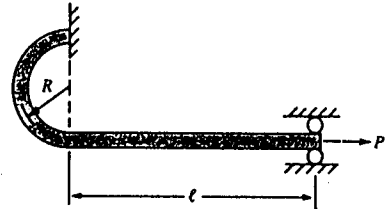


Problem 1. (25%)

Determine a formula for the roller reaction at the end of the slender rod (as shown). Consider bending energy only.



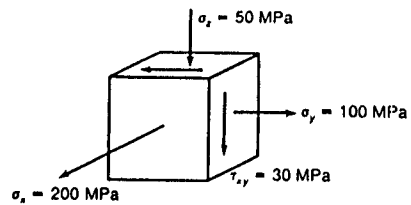
Problem 1

Problem 2 (25%)

The state of stress at a point in a structural member at which yielding was initiated is given as shown. Determine the value of the uniaxial tensile yield strength of the material that each of the following failure theories predict:

- (a) Maximum normal stress criterion
- (b) Maximum shear stress criterion
- (c) Maximum normal strain criterion
- (d) Von-Mises' criterion

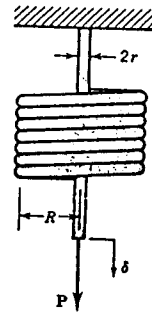
The poisson ratio and modulus of elasticity for the material are 0.3 and 210 GPA.



Problem 2

Problem 3. (25%)

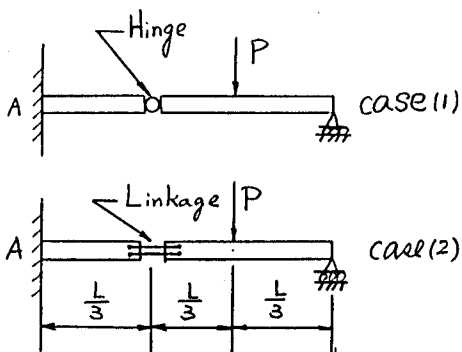
Consider a closely wound coil spring of radius R loaded by a force P (as shown). The spring consists of N turns of wire with radius r. Find the deflection of the spring and hence the spring constant, i.e. the load needed to produce unit deflection.



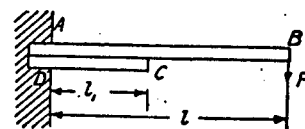
Problem 3

Problem 4.

- (a) (10%) Determine the reactions at built-end A for the two cases as shown.
- (b) (15%) A cantilever AB, loaded at the end B, is supported by a short canlever CD of the same cross section as cantilever AB. Determine the contact force between the two beams at C.



Problem 4(a)



Problem 4(b)