

Final Exam - Theory of Elasticity

2016. 6. 16.

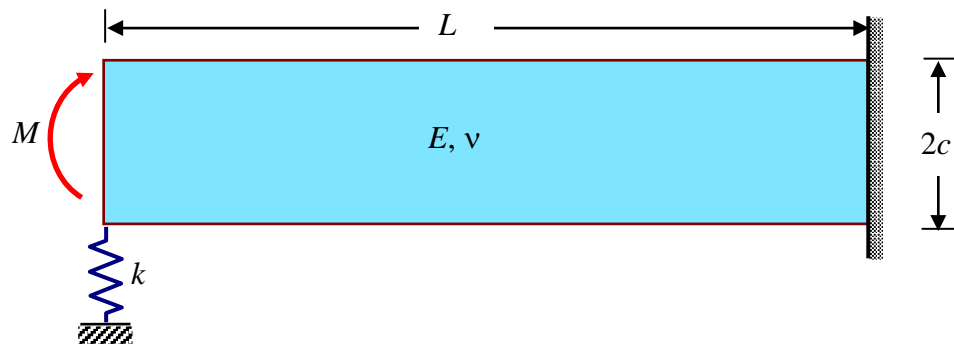
Prob. 1 Derive all the governing equations for 3-D elasticity problems under the small deformation condition from purely mathematical point of view. (30pts)

Prob. 2 Derive the equilibrium equations of the force resultants in a general 3-D prismatic beam. (30 pts.)

Prob. 3 Discuss why the shear stress in a Bernoulli beam does not vanish although the shear strain of a Bernoulli beam is zero. Present how to determine the shear stress in a Bernoulli beam. (20 pts.)

Prob. 4 Derive the equilibrium equation of a prismatic bar under the uniform torsion in terms of a stress function. Discuss how to define the torsional constant of a given section, J , which appears in the torsional rigidity, GJ . (30 pts)

Prob. 5 Calculate the displacement of the spring in the cantilever beam under the plane stress condition shown below. You may use idealized boundary conditions. If so, however, you have to justify your idealization. For the convenience of calculation, assume the Poisson ratio of the beam as zero. (40 pts.)



Prob. 6 Derive the stress distribution of a plate with a small hole, of which the radius is very small compared to the dimension of the plate, for one dimensional tension and pure shear load case. Based on your calculation, discuss the net distance between two adjacent bolt holes in the flange and web of an I beam in case an allowable stress design code is employed. (50pts)

