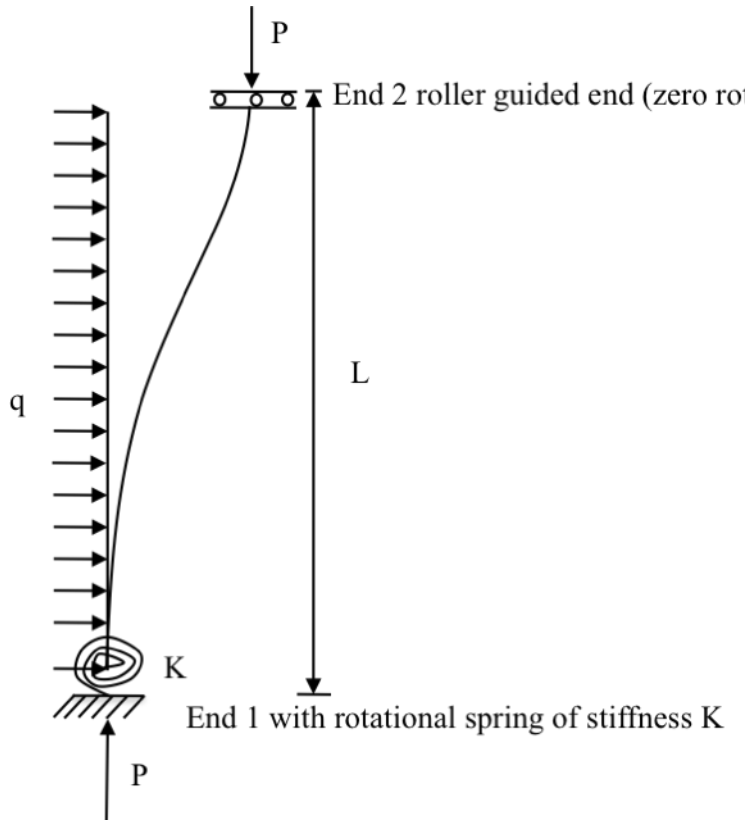
CE 595 – Finite Elements in Elasticity Due: Wednesday, Feb. 18th, 2009

Homework No. 3 and 4



The governing differential equation of the beam-column above is given as:

$EI \times u^{iv} + Pu'' - q = 0$

The forced boundary conditions are: $u(0) = 0$ and $u'(L)=0$

The natural boundary conditions are: $Ku' - EIu'' = 0$ at x=0; and $EIu''' = 0$ at x=L

Assume a family of coordinate functions that satisfy the forced boundary conditions. The terms in this family will be sin(πx/2L), sin(3πx/2L), sin(5πx/2L), and so on….

Assume a three parameter approximation for the solution, and solve it using: (a) Collocation method, (b) Galerkin's method, (c) Method of Least Squares, and (d) Rayleigh-Ritz method using principle of minimum potential energy.

Compare the solutions, and remark on the differences and advantages of each approach. In the Galerkin's method remember to continue integrating by parts till you capture all the natural boundary conditions before substitution.

Do the solutions satisfy the natural boundary conditions or not? Why?

Hint: Please use any mathematical software you would like. Present your final answers in clean readable format. Do not submit pages and pages of computer output. Just the relevant information.