INTRODUCTION TO THE FINITE ELEMENT METHOD

Department of Mechanical Engineering
National Taiwan University
Fall 2019

HOMEWORK #5

Due November 28, 2019

1. (Reddy) Problem 5.5

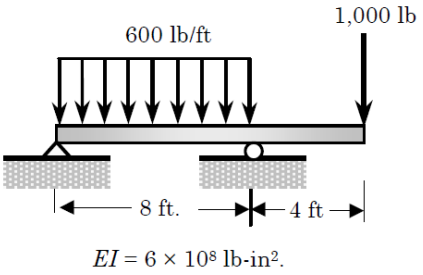
Problem 5.5: Consider the weak form (5.2.4) of the Euler–Bernoulli beam element. Use a three-node element with two degrees of freedom (w, θ), where $\theta \equiv -dw/dx$. Derive the Hermite interpolation functions for the element. Compute the element stiffness matrix and force vector.

2. (Reddy) Problem 5.7

Problems 5.6–5.20: Use the minimum number of Euler–Bernoulli beam finite elements to analyze the beam problems shown in Figs. P5.6–P5.20. In particular, give:

(a) the assembled stiffness matrix and force vector;
(b) the specified global displacements and forces, and the equilibrium conditions;
(c) the condensed matrix equations for the primary unknowns (i.e., generalized forces) separately.

Exploit symmetries, if any, in analyzing the problems. The instructor may also ask the students to compute the secondary variables at points other than the nodes.



3. (Reddy) Problem 5.18