UNIVERSITY OF CALIFORNIA, BERKELEY College of Engineering

Introduction to Solid Mechanics (ME85/C30)

Homework 12 (Due on Friday (April 19st))

Problem 1.

This is a MATLAB homework problem. Consider an elastic beam with Young's modulus, $E = 30 \times 10^6 Psi$, the cross section moment inertia $I_z = 256in^4$, and the length of the beam $L = 120in$. The beam has a built-in boundary conditions at $x = 0$, i.e. $y(0) = 0$ and $\theta(0) = 0$; and at $x = L$, $y(L) = 0$ and $\theta(L) = 0$ as shown in Fig. 1.

The differential equation that governs the equilibrium of the bar has been derived as follows,

$$\frac{d^2}{dx^2}\left(EI\frac{d^2y}{dx^2}\right) + w(x) = 0, \quad 0 < x < L \ ,$$

where $y(x)$ is the deflection field.

The beam is subjected a concentrated load at $x = L/2$, i.e.

$$w(x) = P\delta(x - L/2)$$

where $P = 100lb$.

Modify the template MATLAB code, *beam_model.m*, to find shear diagram, moment diagram, rotation diagram, and the deflection profile.

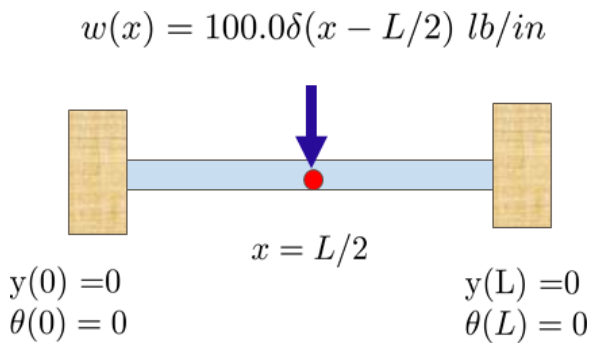

Figure 1: An elastic bar with the distributed load.

Hint:
Go to class Bcourses website and go to the lecture folder, and then download a Matlab template file: *beam_model.m*. You start your solution there. **For all details, please attend this coming Wednesday's lecture on April 10th.**

Problem 2. P 13.26

Problem 3. P 15.5

Problem 4. P 15.19

Problem 5. P 15.26

Problem 6. P 15.43

Problem 8. P 15.52