UNIVERSITY OF CALIFORNIA BERKELEY Structural Engineering,
Department of Civil Engineering Mechanics and Materials
Summer 2015 Professor: S. Govindjee

CE W30 / ME W85
Midterm Exam 2
July 28, 2015
1.5 hours (download to upload)
No late exams will be accepted

Open Resource Exam

No Collaboration Permitted

Problem	Score
#1	/50
#2	/30
#3	/20
Total	/100

Name

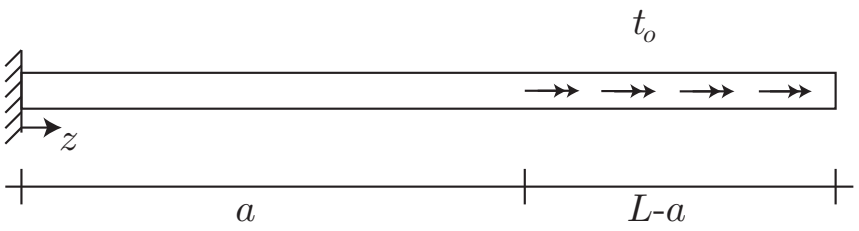
SID

1. The round elastic bar shown below is subjected to a constant distributed torque t_o over a portion of its span.

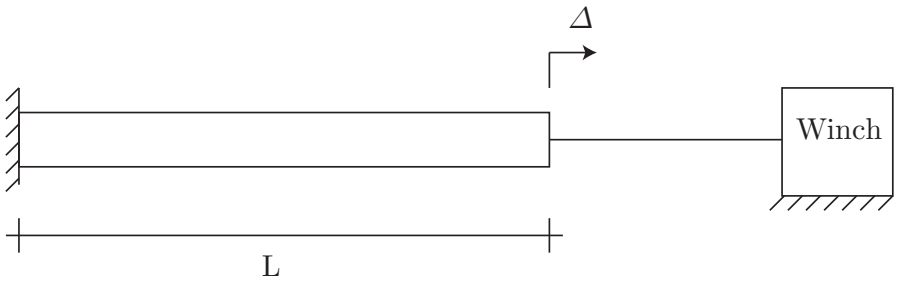
   (a) Find the rotation of the bar as a function of z.

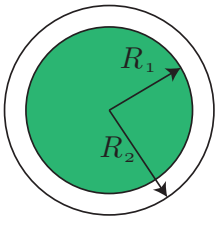
   (b) What is the rotation of the bar at $z = a/2$?

   Assume GJ is constant.



2. Shown is a thin composite rod with dimensions as shown. The inner core is made of a *nonlinear* elastic material whose constitutive response is given by $\sigma = E_1\varepsilon^3$. The outer material is made of a linear elastic material whose constitutive response is given by $\sigma = E_2\varepsilon$. The end of the rod is to be attached to a winch and displaced an amount Δ. How much force will be required?





Cross-section

3. A thin metal ring with square cross-section is heated so that it expands and can be slid over a greased *rigid* rod with diameter D_1; note $D_1 > D_2$. The ring is then allowed to cool down to room temperature. Assuming that the ring is linear elastic, find the pressure between the ring and the rod.