

Ae/AM/CE/ME 102c
Mechanics of Structures and Solids – Spring 2007-08
Assignment 1, Due Apr 10, 9:00AM, in class

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Grading TA: Ling Zheng

*****Please indicate the number of hours spent on this assignment*****

Problem 1 (10 points)

A one-dimensional longitudinal wave propagates in a bar with discontinuous cross section, shown below in Figure 1. Both parts of the bar are made of the same material with Young's modulus E and density ρ . Assume one-dimensional wave propagation applies across the section change. An incident wave, σ_I , propagates along the small-diameter bar to the right. Find the resulting transmitted and reflected stress waves, denoted by σ_T and σ_R .

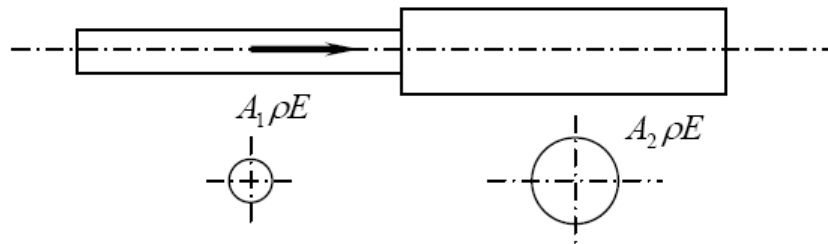


Figure 1

Problem 2 (10 points)

A compression wave traveling in a bar with velocity C_0 reflects from the free end as shown in Figure 2. If the bar material fractures in a tension at a stress $2\sigma_0$, determine where the fracture occurs.

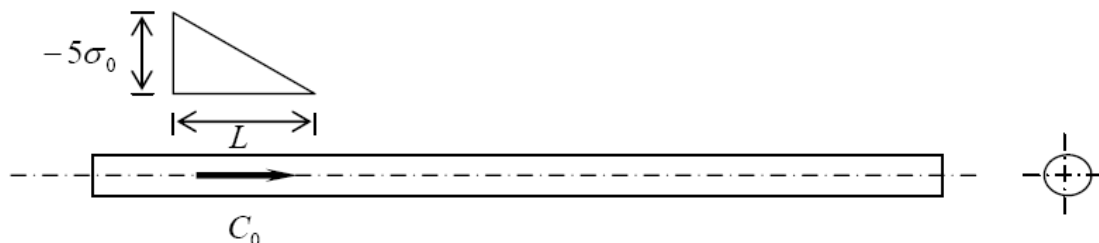


Figure 2

Problem 3 (10 points)

Consider a 2-D planar SH wave incident to a traction free boundary as shown in Figure 3. Derive the expressions for the displacement and the stress components for the reflected waves. Determine the displacement ratio of the amplitude of the reflected wave to the amplitude of the incident wave. Consider all possible cases.

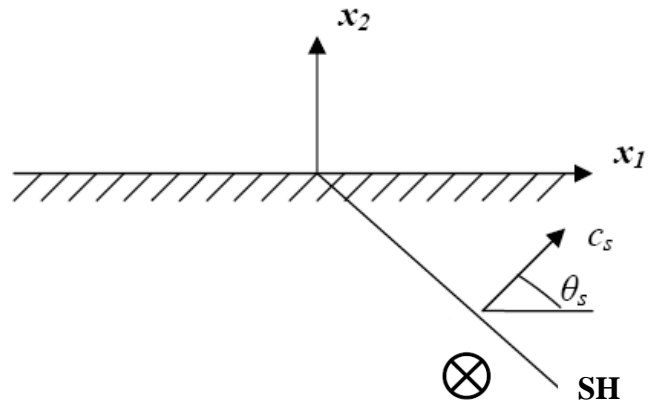


Figure 3