AEE 361 – Fall 2009 Section: ___ Name: _____
Homework 5
Due: Wednesday December 23, 2009

COVER SHEET

- HW is to be turned in with the cover sheet filled out and signed.
- HW is due before class one week after it is handed out.
- Use the systematic solution technique presented in class.

I have completed this assignment on my own. I did not *copy* the solutions from anyone or any other source.

☐ I collaborated on this assignment with:

_____ _____

_____ _____

_____ _____

☐ I looked at the solutions from other sources after I worked on the problem and made the necessary corrections.

Signature: _____

No member of this class shall take unfair advantage of any other member in this class.

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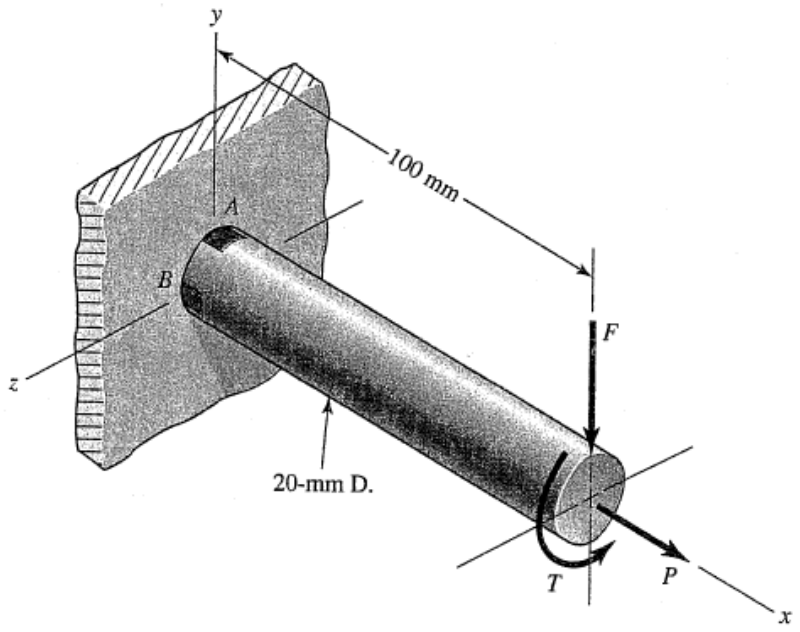
1. (Problem 6-14, Shigley)

This problem illustrates that the factor of safety for a machine element depends on the particular point selected for analysis. Here you are to compute factors of safety, based upon the distortion-energy theory, for stress elements at A and B of the member shown in the figure. This bar is made of AISI 1006 cold-drawn steel and is loaded by the forces $F = 0.55$ kN, $P = 8.0$ kN, and $T = 30$ N · m.



2. (Problem 6-39, Shigley)

A plate 4 in wide, 8 in long, and 0.5 in thick is loaded in tension in the direction of the length. The plate contains a crack as shown in Fig. 6–36 with the crack length of 0.625 in. The material is steel with $K_{Ic} = 70$ kpsi · $\sqrt{\text{in}}$, and $S_y = 160$ kpsi. Determine the maximum possible load that can be applied before the plate (*a*) yields, and (*b*) has uncontrollable crack growth.

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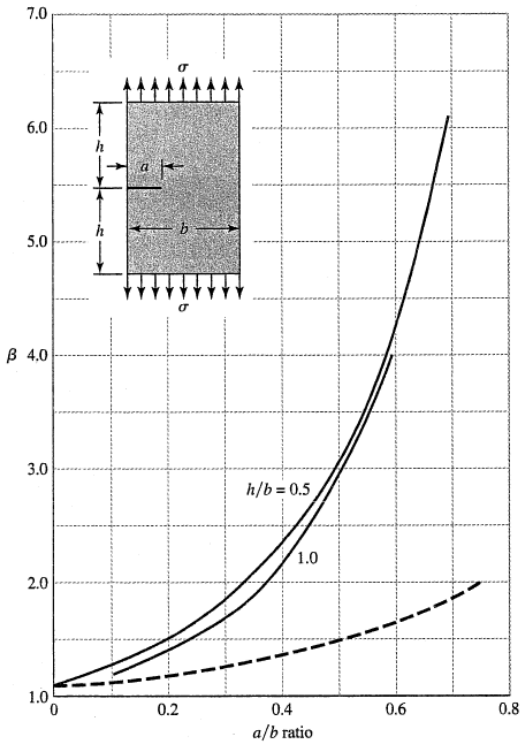
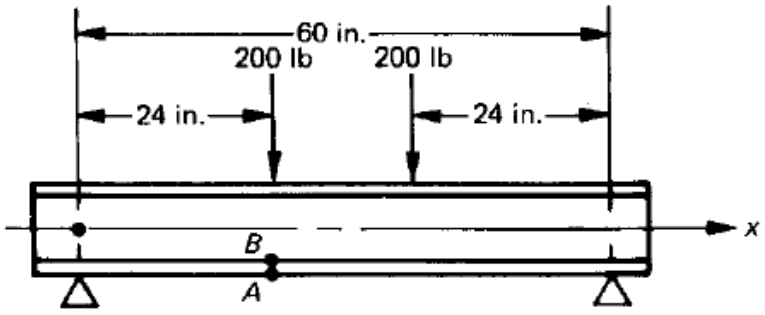
Figure 6–36

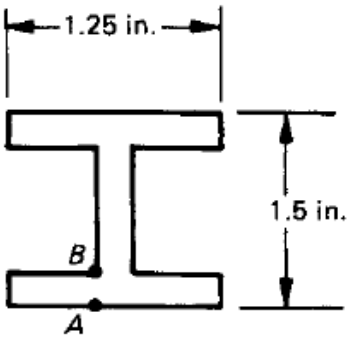
Plate loaded in longitudinal tension with a crack at the edge; for the solid curve there are no constraints to bending; the dashed curve was obtained with bending constraints added.



3. (extra)

(a) Find the bending and transverse shear stress at points A and B in the figure. (b) Find the maximum normal stress and maximum shear stress at both points. (c) For a yield point of 50,000 psi, find the factor of safety based on the maximum normal stress theory and the maximum shear stress theory.





Web and flange thickness = 0.125 in