

3.35 Problem Set #2

Assigned: 9/30/03

Due: 10/7/03 in class

From S. Suresh, **Fatigue of Materials**

- 1: Problem 1.1
- 2: Problem 3.3
- 3: Problem 10.7
- 4: Problem 12.3

Problem 5:

This problem is intended to encourage you to think about some material issues related to fracture:

- (a) List at least four factors which lead to an increase in the ductile-brittle transition temperature of a low strength plain carbon steel
- (b) Explain briefly and in general terms why a piece of chalk breaks in torsion with a helical fracture surface whereas a similar piece of Plasticene (otherwise known as “silly putty”) shears normal to the axis of the specimen.
- (c) Why is tempered glass more resistant to tensile fracture than ordinary glass?

Problem 6:

As we did in class for the Mises yield criterion, determine the expressions for the radius of the plastic zone, $r_p(\theta)$, for both plane stress and plane strain using the Tresca yield criterion. As we did in class, evaluate the ratio of the plane strain radius to the plane stress radius for $\theta = 0^\circ$ and for $\theta = 45^\circ$. Recall that the Tresca yield criterion states that yielding occurs when the maximum shear stress reaches a critical value, i.e. when $\tau_{\max} = \sigma_y/2$.