Take Home Exam03D1: Crack Tip Fracture Mechanics

Assigned: 03/15/2022 (Tuesday)

Due (as pdf by email) 03/18/2022 (Friday)

You may submit your answers in one of two ways:

(i) •For typed answers: as a .docx file (as is) or converted into a pdf file. (DO NOT SEND GOOGLE DOC)

•For handwritten answers: Please scan as images, and group together into one pdf file. Or you may hand them manually to my office (ECME-212)

(ii) Please send your submission via email starting with HWExam03D1 in the subject line.

03D1.1

In today's lecture the equation for the shear stress near the crack tip is given by

$$\sigma_{xy} = \frac{K_I}{\sqrt{2\pi r}} \sin\frac{\theta}{2}\cos\frac{\theta}{2}\cos\frac{3\theta}{2}$$

Make a plot of the above equation to find the angle where the shear stress is at a maximum (I find it to occur at 40º - please confirm).

You do not have to send me the plot: just the angle where you find the maximum to be.

03D1.2

Recall that plastic deformation is a shear phenomenon. Draw a schematic of the plastic zone shape in front of a crack tip under local yielding. Add one or two sentences to explain.