Name:

Homework 7

Due 7 November 2019

1. Consider an edge-cracked and a center-cracked panel as shown in Figure 1. Use finite element analysis to plot the plastic zone size vs. applied load for both plane stress and plane strain and compare with Irwin and Dugdale's approximations. For material properties, assume an elastic-perfectly plastic material with $E = 70$ GPa, $\nu = 0.3$ and $\sigma_y = 500$ MPa.

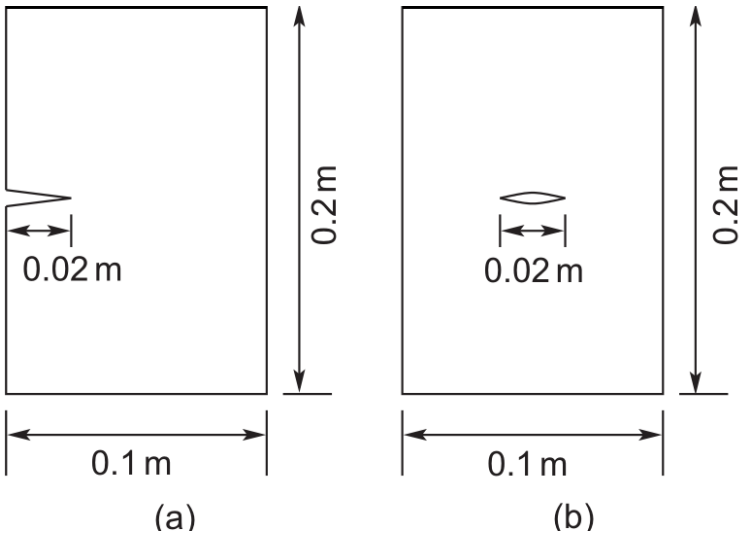

Figure 1: Panels for problem 1

2. A thin plate with a center crack is loaded with uniform tensile stress. The elastic-perfectly plastic material has $E = 70$ GPa, $\nu = 0.3$ and $\sigma_y = 500$ MPa. Fracture tests are conducted and failure is found to occur when the net section reaches the yield stress. Plot the applied stress at failure as a function of a/W. Assuming failure occurred due to fracture, find the fracture toughness, K_c using Irwin's plastic zone adjustment method ($K_c = K_I(a_{eff})$) and plot it as a function of a/W.