THE UNIVERSITY OF IOWA
Department of Mechanical Engineering

Fracture Mechanics	**Computer Project #1**	**Assigned: February 03, 2020**
ME:5159	**Total Points: 10**	**Due: February 17, 2020**

Consider a plate with a circular hole as shown below. The load and geometric dimensions are given. For the material properties, use E = 30,000 ksi and $\nu = 0.3$. Assume *unit* thickness of the plate and *plane stress* condition. Using the computer facilities at CSS (ICAEN):

1. Run CASCA to develop a finite element mesh for this geometry using either T6 (6-noded triangle) or Q8 (8-noded quadrilateral) elements or their combinations. Limit your mesh size with total DOF ≤ 2,000. Using WRITE MESH option, generate an input file for FRANC2D/L.

2. Run FRANC2D/L and then import the input file created by CASCA. Apply appropriate displacement boundary conditions and loads for this problem. Attach snapshot(s) of your mesh with boundary conditions and work-equivalent nodal loads clearly shown.

3. Using FRANC2D/L, perform a linear-elastic stress analysis by FEM. Post-process your FEM results and attach a snapshot of your deformed geometry. Using the LINE PLOT feature, compute the variation of normal stresses σ_y along line AB and σ_x along line CD. Attach relevant snapshots showing these results.

4. Compare the results of σ_y at point A (i.e., at $x = a$, $y = 0$) and σ_x at point C (i.e., at $x = 0$, $y = a$) predicted by FEM with the theoretical (analytical) results that we examined in Problem 1 of Homework No. 1. What are the errors in your FEM predictions of these stresses? Assume that the given geometric dimensions are large enough so that the analytical solutions for an infinite plate with a circular hole apply. Comments.