CEE526/MAE527 Finite Elements for Engineers
Modeling Project 1-3
Due date: See class website

Write a report (use the style *from FE Modeling Case Studies* document). A sample MS Word document is available on the class web site and can be used as a style guide.

The report should have a cover page, table of contents, list of figures and tables, page numbers, and several sections. As a minimum the following sections are recommended - (a) *Problem Statement* including statements on the response parameters that you are monitoring, (b) *FE Model* where you show via tables and text the material properties, element types used, boundary conditions and loads, (c) *Analysis Results* including details of the FE models used and the response quantities obtained, (d) *Convergence Analysis*, (e) *Concluding Remarks* and (f) *References*. The figures and tables should be labeled and called out in the text. Equations should be properly typed and should have equation numbers. Check your document carefully for spelling and grammatical errors. Write in third person using passive voice.

The report (as a Microsoft Word file) should be turned in electronically (e-mail to s.rajan@asu.edu) by the due date.

Problem 1: A syringe-plunger is shown in Figure 1. Model the glass syringe assuming that the 4 mm hole end is closed under test conditions. Obtain the deformation and stresses and compare the maximum principal stress with the ultimate tensile strength of glass.

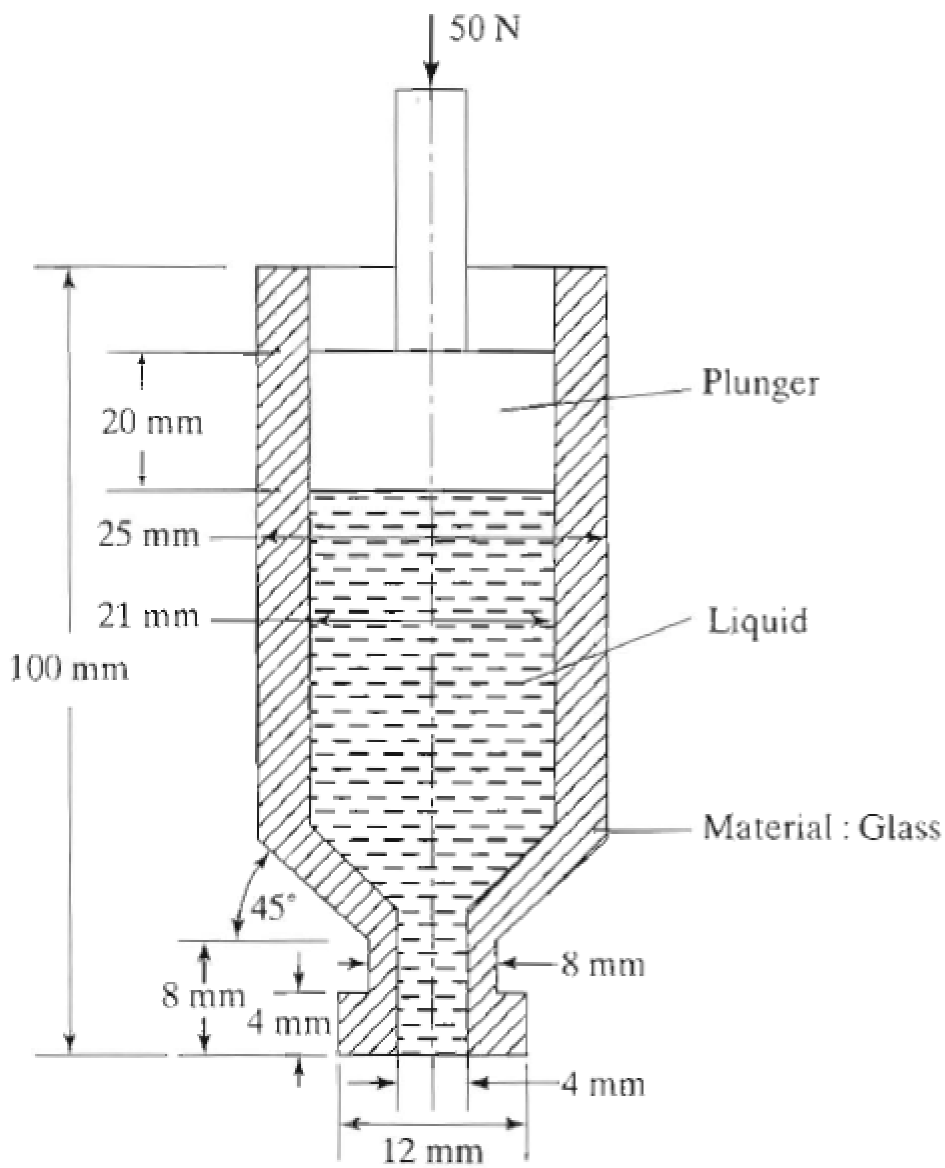

Figure 1

Solve either Problem 2 or Problem 3.

Problem 2: A Belleville spring is a conical disk spring. For the spring shown in Figure 2, determine the axial load required to flatter the spring. Solve the problem using the incremental approach and plot the load-deflection curve as the spring flattens.

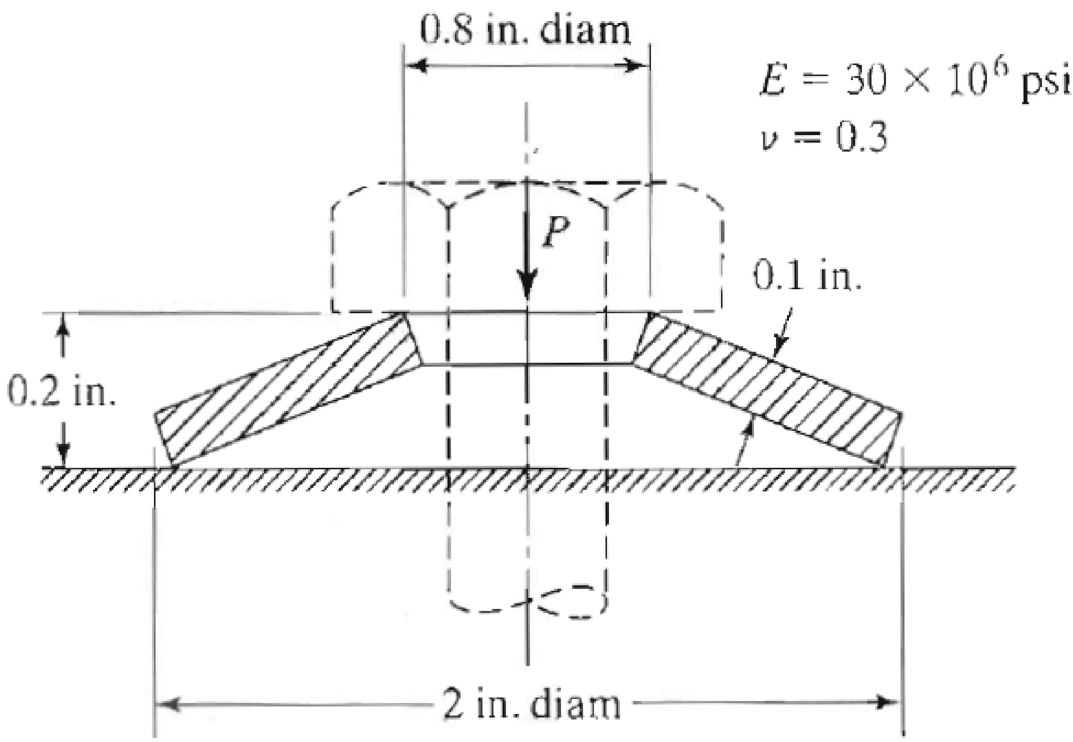

Figure 2

Problem 3: A half-symmetric model of a plain concrete culvert (E=32 GPa, v=0.15) is shown in Figure 3. The pavement load is a uniformly distributed load of 5000 N/m^2. Determine the location and magnitude of the largest and the smallest principal stress.

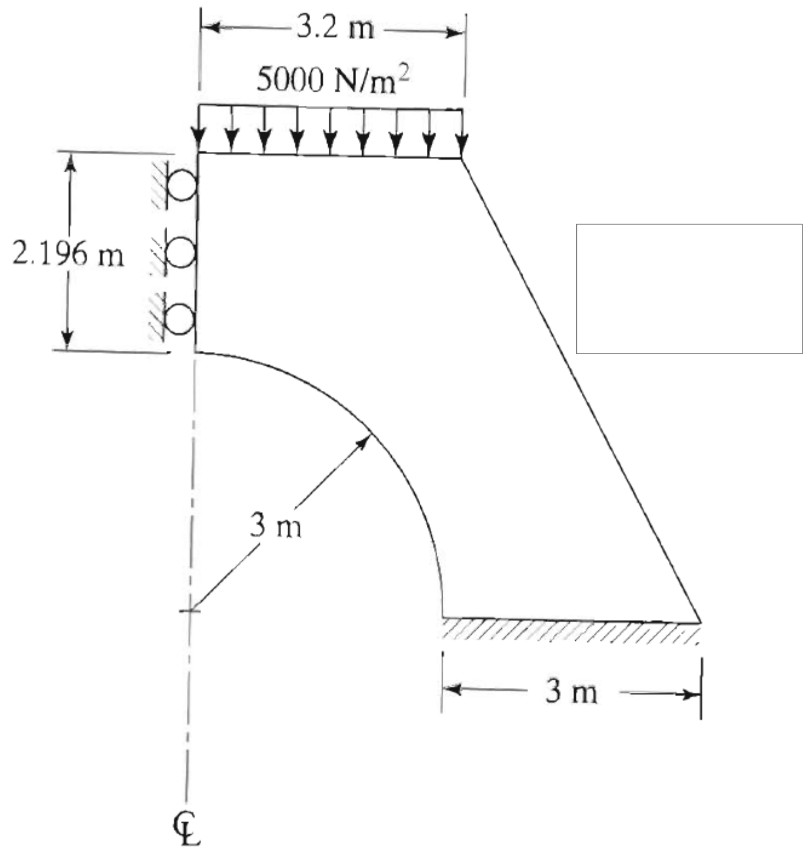

Figure 3