

Laboratory #4 Sensitivity Analysis and Design Optimization

Feb 21 – March 6

Objectives

- Enhancing the Lecture on *An Introduction to Pro/MECHANICA Structure*
- Familiarizing Pro/MECHANICA Menus
- Learning the Sensitivity Analysis and Design Parameter Optimization Using the FEA Function of Pro/MECHANICA
 - ◇ Pro/MECHANICA User Interface, Windows, and Menus
 - ◇ Defining a Design Optimization Problem:
 - 1) Introducing Design Objective
 - 2) Specifying Design Variables and Their Bounds
 - 3) Specifying Design Constraints
 - 4) (Determining Search Parameters)
 - ◇ Sensitivity Analysis and Its Role in Formulating the Optimization Problem
 - ◇ Result Interpretation.

Instructions

1. Go through the Pro/MECHANICA Structure Tutorial
2. Following the Procedure Given in the Tutorial to Carry out Finite Element Analysis on the Bracket Part (in Laboratory 3).
3. For the Aluminum Bracket Analyzed in Laboratory 3, carry out Sensitivity Analysis and Design Optimization to Yield a Minimum Total Mass.

The design variables are the thickness of the base plate (minimum 0.25”) and upright (minimum 0.5”), and the radius of the fillet (minimum 0.25”, maximum 1.0”). The Von Mises stress should be limited to 1500 psi.

The dimensions of the part (no fillet) and its loading force are same as in Laboratory 3, (Figures 1 and 2), and the 1000 pounds force is loaded onto the bracket through a bearing.

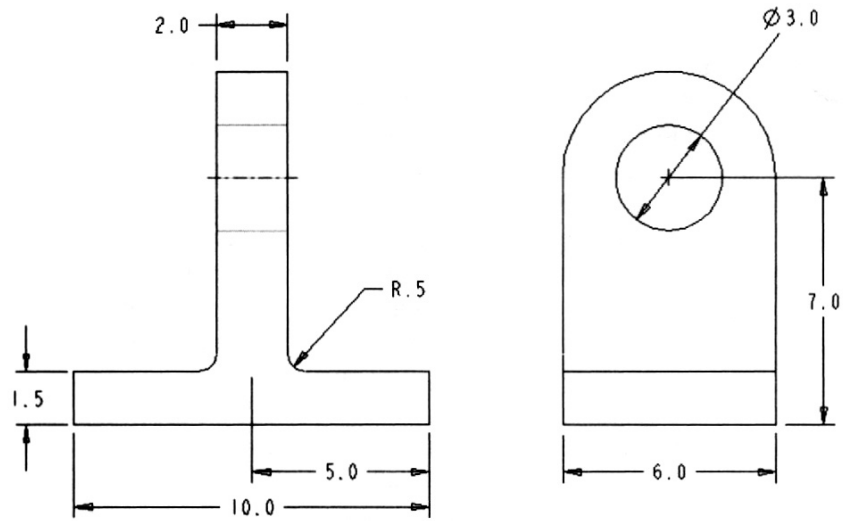


Figure 1 Part Dimensions

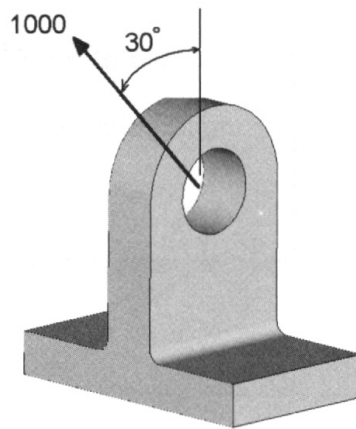


Figure 2 Loading Force

4. Write a Laboratory Report (with images of results) in the usual format.