Project

Finite Element Method

Laruelle Cédric
Assistant
cedric.laruelle@uliege.be
Bât. B52/3 +2/541

Volvert Martin
Assistant
m.volvert@uliege.be
Bât. B52/3 +2/418

Author: Gaëtan Wautelet

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Problem 2 : Claw

Let us consider the following claw:

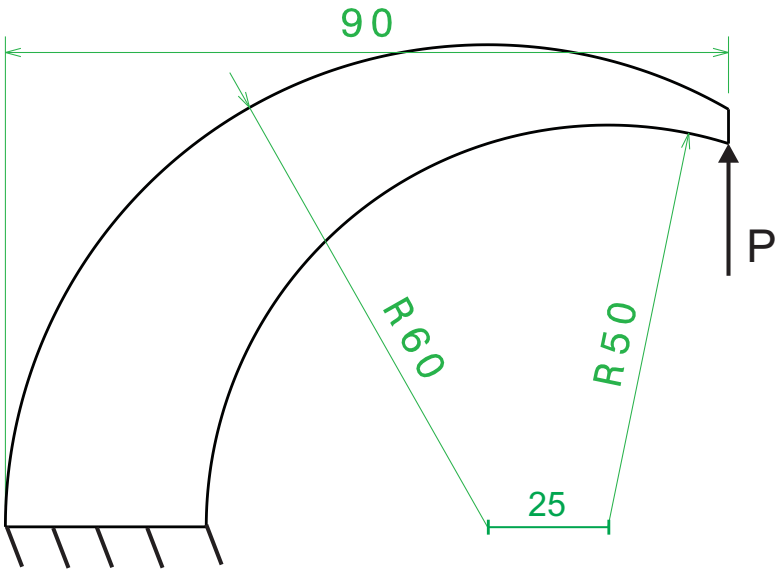

Figure 1: Claw (Dimensions: mm)

It is submitted to a concentrated load P applied as indicated in Figure (2). The weight of the claw is taken into account ($g = 9.81\, m/s^2$). The claw is clamped at its base as indicated in Figure (2).

- Analysis hypotheses: Plane stress state (thickness of $5\, mm$)
- Material properties:

$$E = 400\, MPa, \qquad \nu = 0.38, \qquad \sigma_y^0 = 50\, MPa, \qquad \rho = 1200\, kg/m^3$$

- Project objectives:
  - Determine the maximum load P_{max} to apply on the claw represented in Figure (2), above which it goes out of the elastic domain.
  - Optimize the shape and dimensions of the claw represented in Figure (2) in order to increase the maximum load P_{max} determined before, while remaining in the elastic domain.
  - The stress field should be made as uniform as possible and the volume should not be increased by more than 5%.