

Project

Finite Element Method

Problem 29: Connecting rod

Let us consider the following mechanical element:

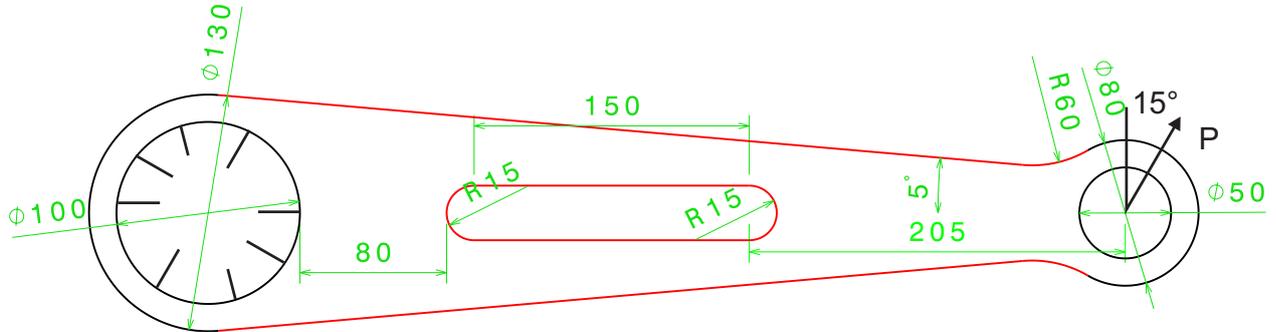


Figure 1: Connecting rod (Dimensions: mm)

It is submitted to a resultant load P (not a concentrated load) applied on the small circular hole as indicated in Figure (29). The weight of the structure must be taken into account ($g = 9.81 \text{ m/s}^2$). The connecting rod is fixed at the large hole as indicated in Figure (29).

- Analysis hypotheses: Plane stress state (thickness of 40 mm)
- Material properties:

$$E = 72000 \text{ MPa}, \quad \nu = 0.345, \quad \sigma_y^0 = 350 \text{ MPa}, \quad \rho = 2700 \text{ kg/m}^3$$

- Project objectives:
 - Determine the maximum load P_{max} to apply to this mechanical element above which it goes out of the elastic domain.
 - Optimize the shape of the region indicated in red in Figure (29)) in order to increase the maximum load P_{max} determined before, while remaining in the elastic domain.
 - The stress field should be as uniform as possible and the volume should be minimized.