## First computing lab - plane elements

STUDENT IDENTIFICATION NUMBER: _ _ _ _ _ _
                               a b c d e f

Consider the rectangular steel plate with a central rectangular hole schematized below, clamped along two sides and subjected to the uniform temperature increase ΔT=30°C.

Assume ℓ_1=(250+5·f) mm, ℓ_2=(400-5·e) mm, thickness h=5 mm for the dimensions of the plate, t_1=(45+10·d) mm and t_2=(140-10·d) mm for the hole sides, where d, e and f coincide with the last digits of your student id number.
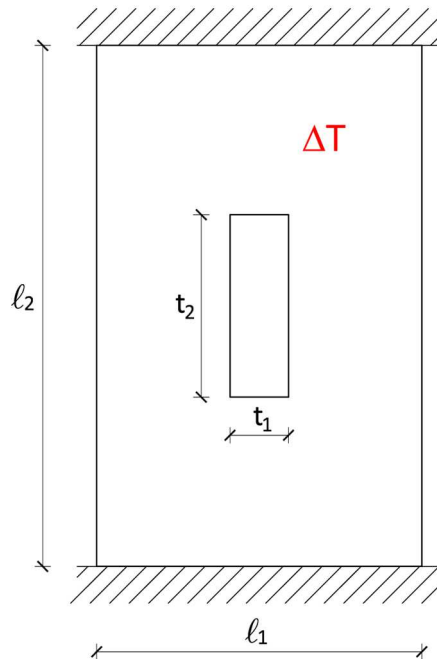
Consider for the material the typical properties of a structural steel: elastic modulus E=210000 N/mm^2, Poisson coefficient ν=0.30, thermal expansion coefficient α=1.2·10^{-5} °C^{-1}.

Compare the displacement and stress distributions resulting from two different meshes (one rough, one finer) made of plane stress elements.

Modify the Matlab code in order to introduce the variation of temperature.

MAIN RESULTS

Deliver only the main results listed on pages 2 and 3, filling in the indicated fields, and further provide

- for each discretization:
1) ONE FIGURE REPRESENTING THE STRUCTURAL SCHEME (with legible numbers of nodes and elements)
2) ONE FIGURE REPRESENTING THE DEFORMED SHAPE OF THE STRUCTURE (with legible amplification factor)
3) THE MAP OF THE HORIZONTAL NORMAL STRESS (with legible scale)
4) THE MAP OF THE VERTICAL NORMAL STRESS (with legible scale)
5) THE MAP OF SHEAR STRESS (with legible scale)
6) THE MAP OF VON MISES STRESS (with legible scale)
- for the comparison:
7) ONE FIGURE WITH THE GRAPHICAL COMPARISON OF THE DEFORMED SHAPE OF THE 2 MESHES (with only the external sides in view)
- for modifications referred to the variation of temperature:
8) THE MODIFIED PARTS OF MATLAB CODE

Specify the adopted sign conventions in your graphs and numerical results.

The delivery mode has to follow the instructions in the published document "Delivery Deadlines".
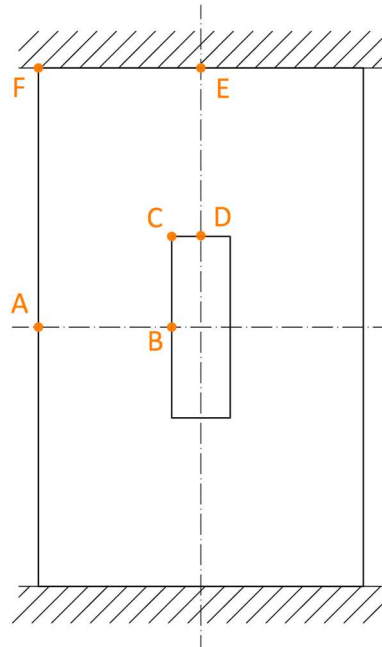
First computing lab - MODULE OF RESULTS

SURNAME   NAME:
STUDENT IDENTIFICATION NUMBER: _ _ _ _ _ _   PERSON CODE:
                                        a b c d e f

ROUGH MESH
9) REACTION FORCES (all + their sum)

10)   HORIZONTAL NORMAL STRESS, VERTICAL NORMAL STRESS, SHEAR STRESS, VON MISES STRES IN THE
        HIGHLIGHTED NODES

node	σ_{xx}	σ_{yy}	σ_{xy}	σ_{VM}
A				
B				
C				
D				
E				
F				

11)   NODAL DISPLACEMENTS

   node A:

   node B:

   node C:

   node D:

FINE MESH

12)   REACTION FORCES (all + their sum)

13)   HORIZONTAL NORMAL STRESS, VERTICAL NORMAL STRESS, SHEAR STRESS, VON MISES STRES IN THE
       HIGHLIGHTED NODES

node	σ_{xx}	σ_{yy}	σ_{xy}	σ_{VM}
A				
B				
C				
D				
E				
F				

14)   NODAL DISPLACEMENTS

node A:

node B:

node C:

node D: