MASTER OF SCIENCE IN COMPUTATIONAL MECHANICS
UNIVERSIDAD POLITÉCNICA DE CATALUÑA

Subject: Computational Structural Mechanics and dynamics
Student: ANTONIO SOLITO

Practice 3
Exercise 1: Clamped plate with a uniform load
Solution

Geometry

Define the geometry of the structure in the preprocessor of Gid:

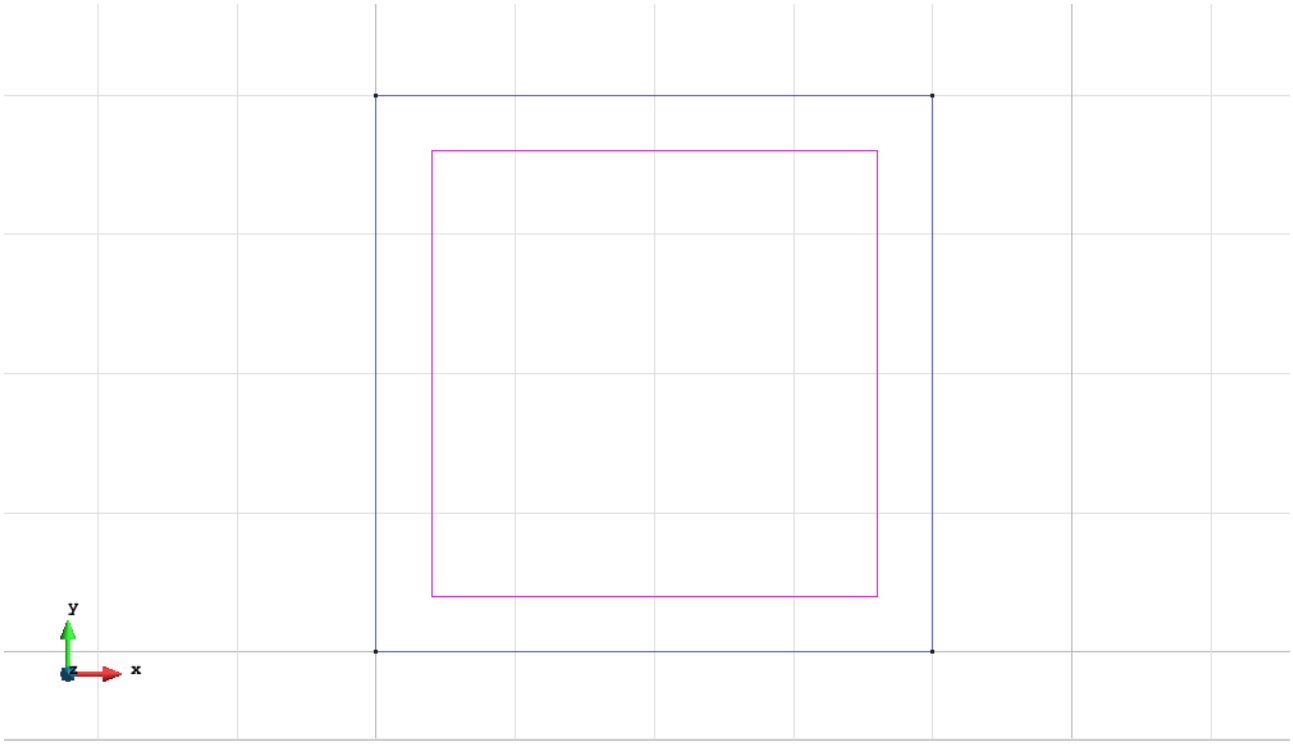

Figure 1 - Geometry of the structure

Data

Problem Type:

Once the geometry is defined, we can see which type of problem must be solved.
In this case we face a plates problem; therefore we choose the module RamSeries_Educational_2D/Plates using the following sequence of commands:

Data / Problem Type / RamSeries_Eductional_2D / Plates

Boundary conditions:

The types of boundary conditions that are enforced in this example are the following:

- Displacements Constraints / Linear Constraints.

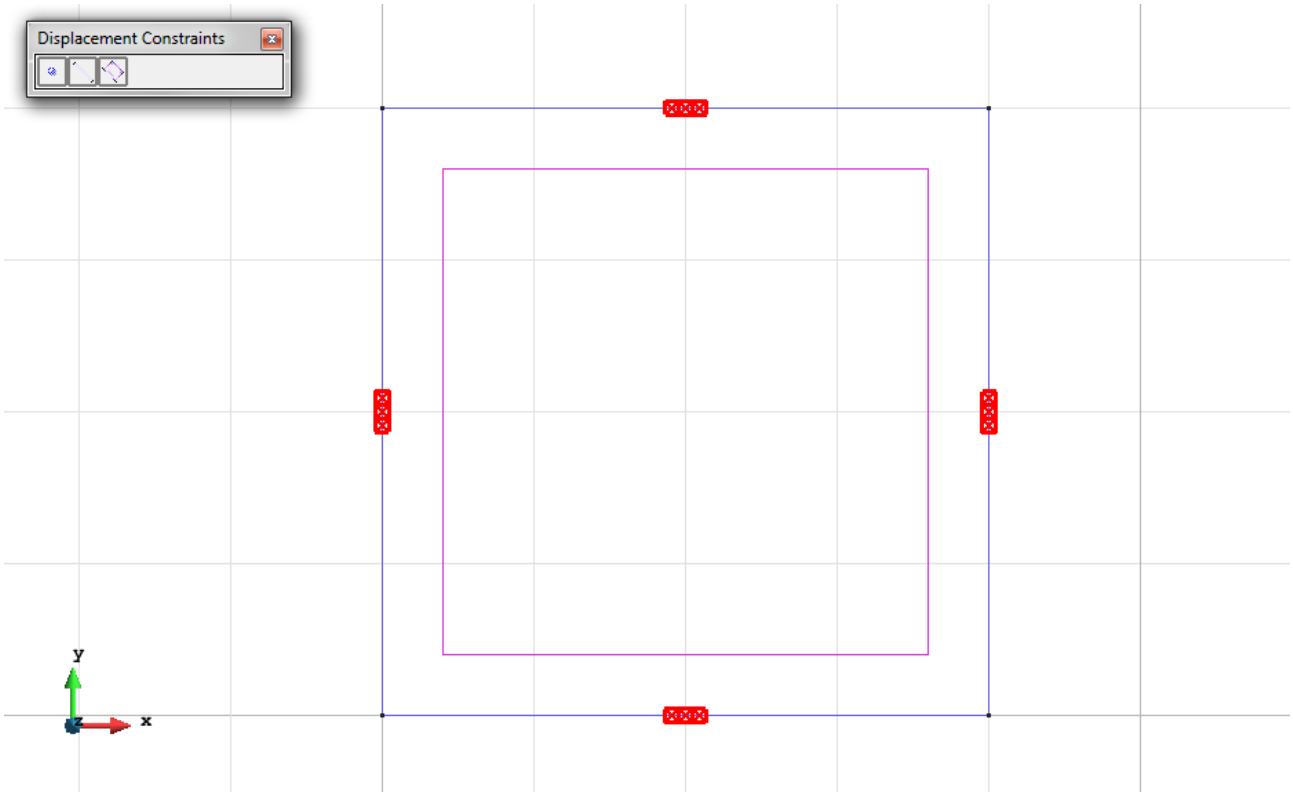

Figure 2 – Linear Constraints

- Loads / Uniform loads.

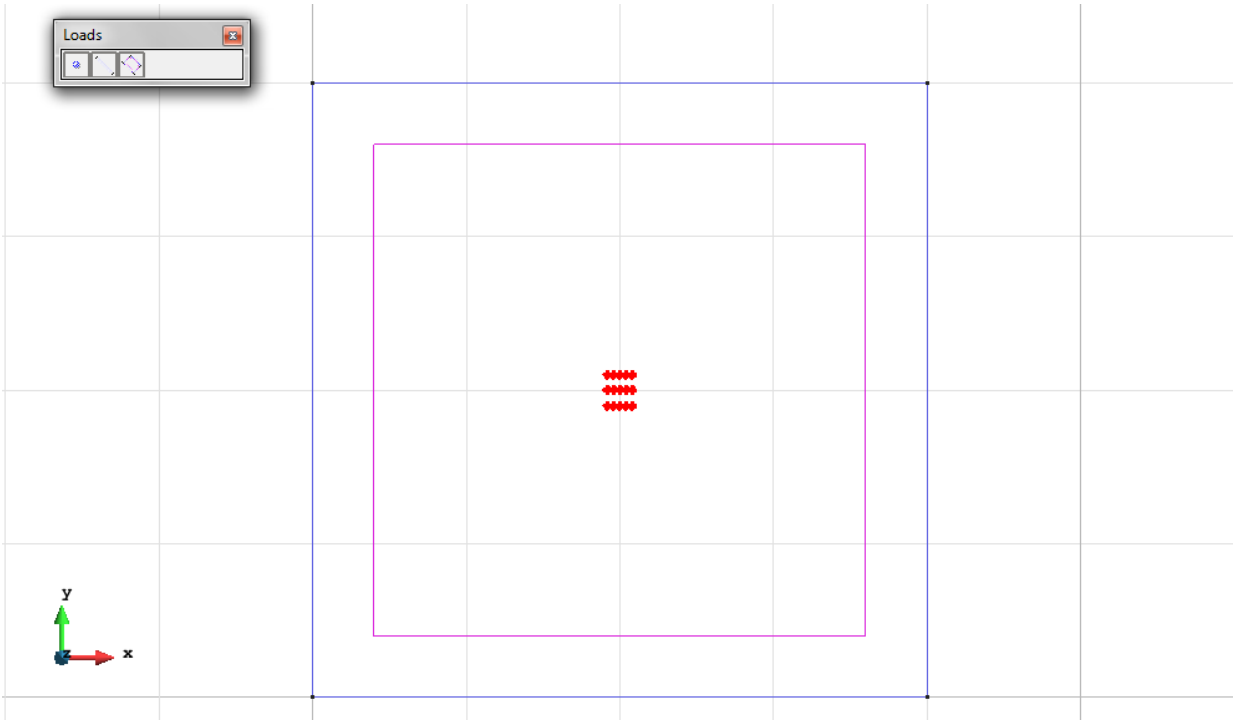

Figure 3 – Uniform load

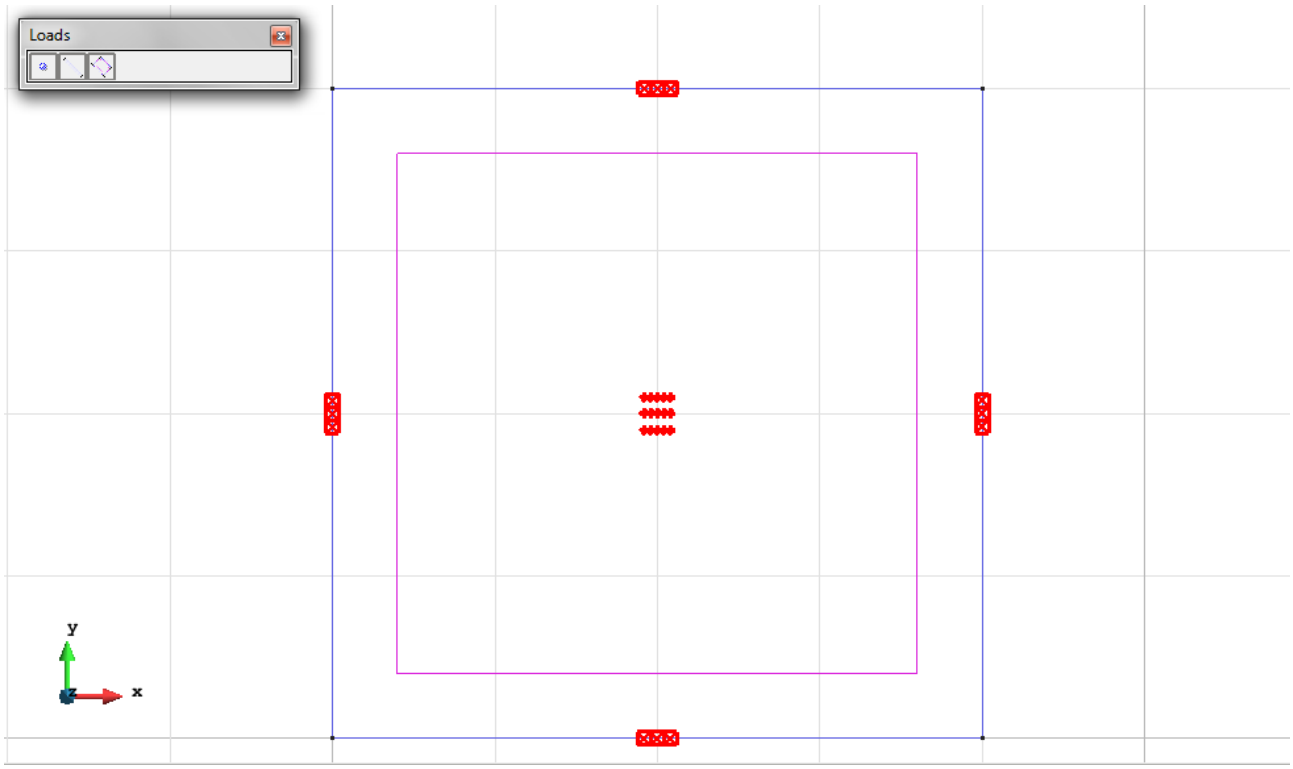

Figure 4 – All conditions on the plate

Material: We use material with the following mechanical characteristics.

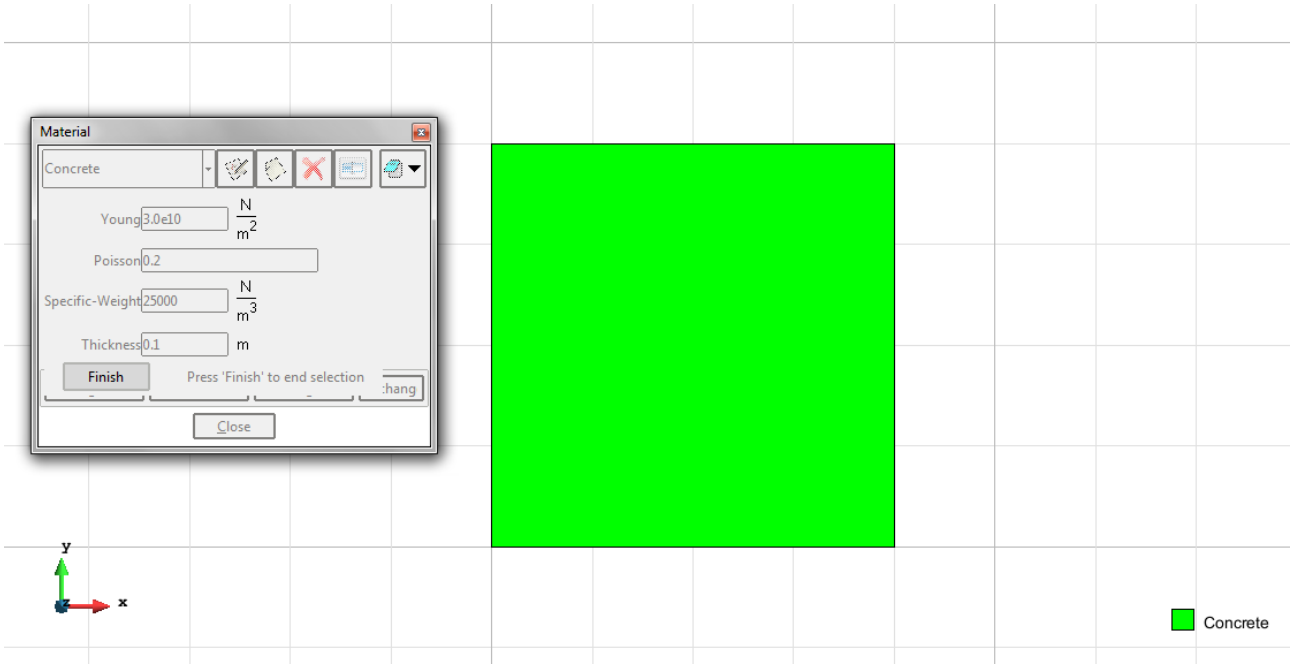

Figure 5 – Material

Meshing / Generate: To generate the mesh we have used the following options:

- For DKT elements: Quadratic type= Normal; Element type= Triangle.
- For CLLL elements: Quadratic type= Normal; Element type= Quadrilateral.
- For RM elements: Quadratic type= Quadratic; Element type= Triangle.

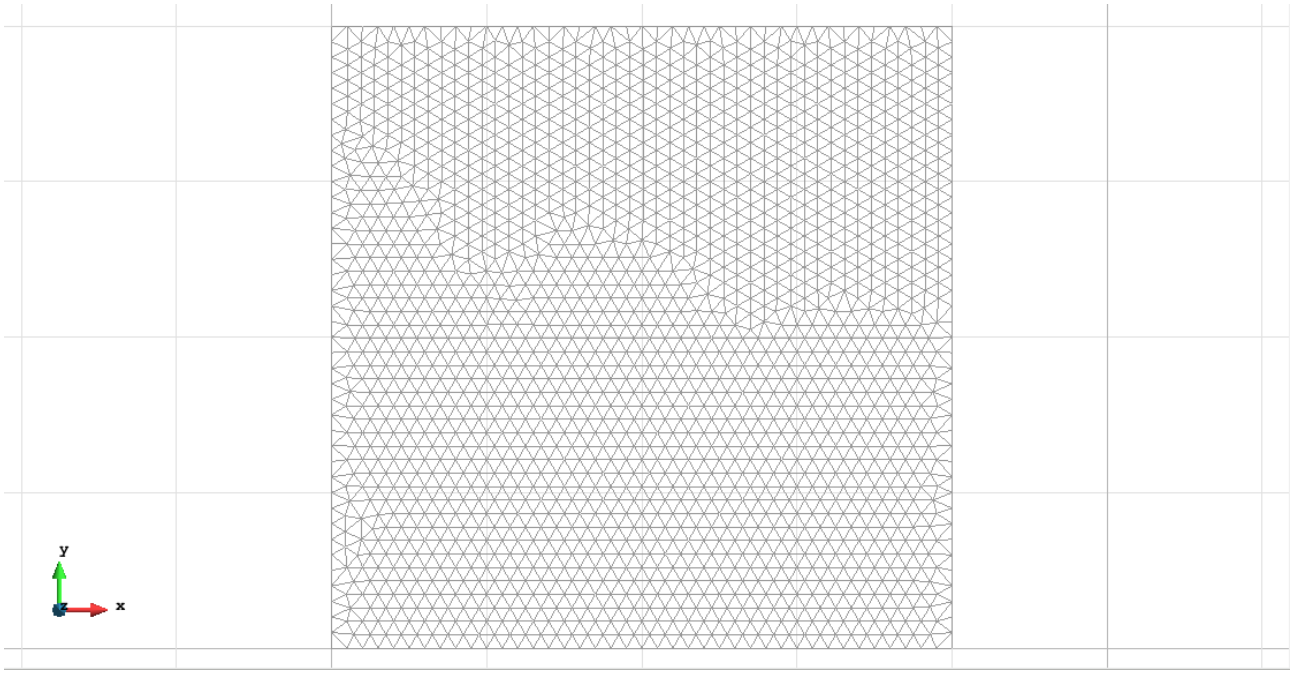

Figure 6 - Meshe of DKT elements

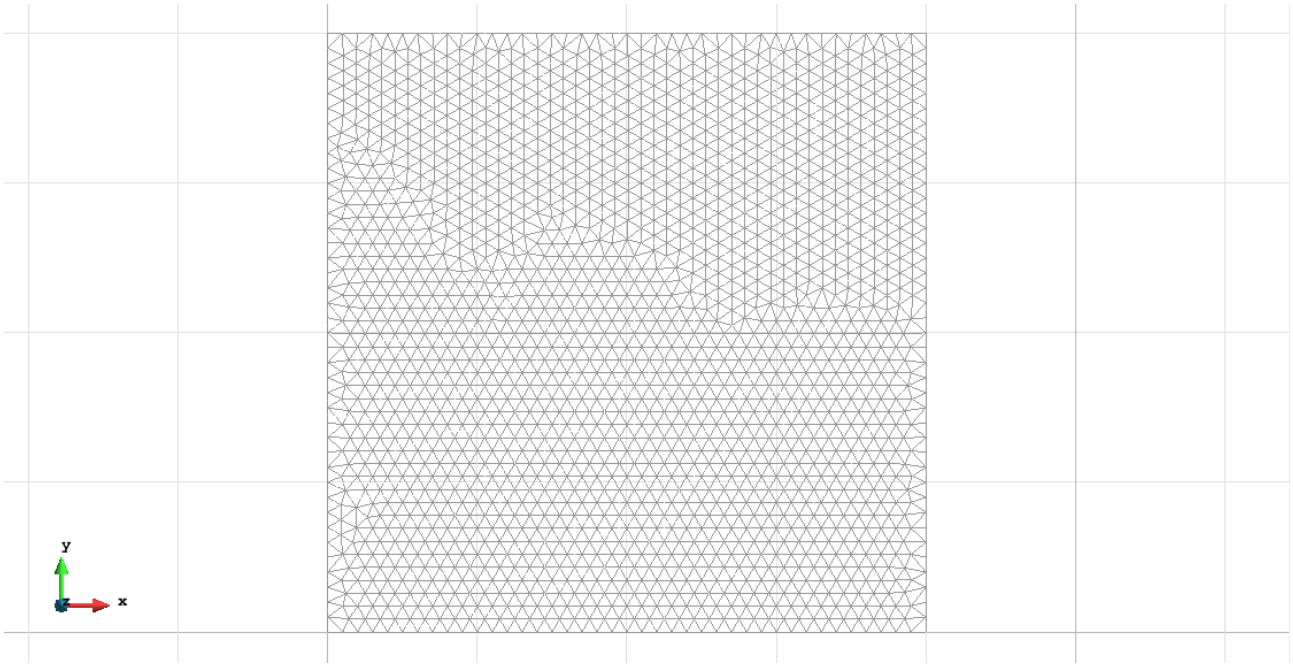

Figure 7 – Meshe of RM elements

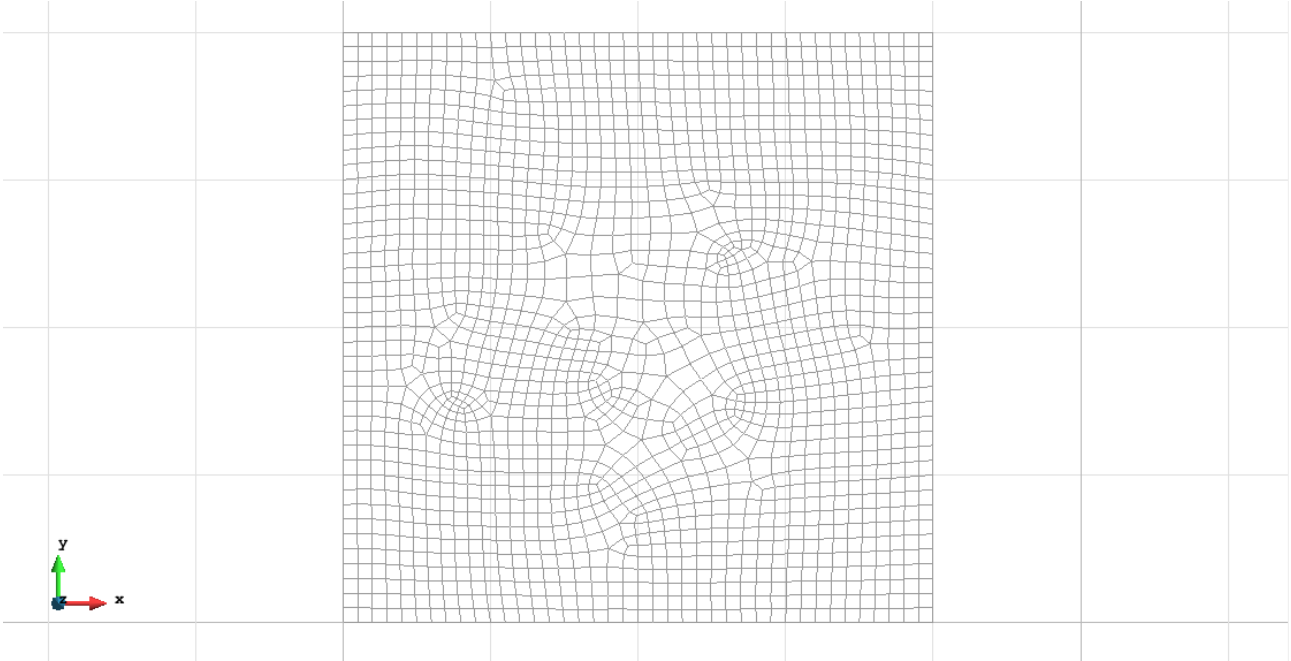

Figure 8 – Meshe of CLLL elements

Calculate / Calculate

Once the mesh is generated, we proceed to calculate the problem for the different meshes proposed.

File / Post Process

The following figures show the results of the analysis sought after in this exercise.

TRIANGULAR ELEMENTS WITH 3 NODES (DKT)

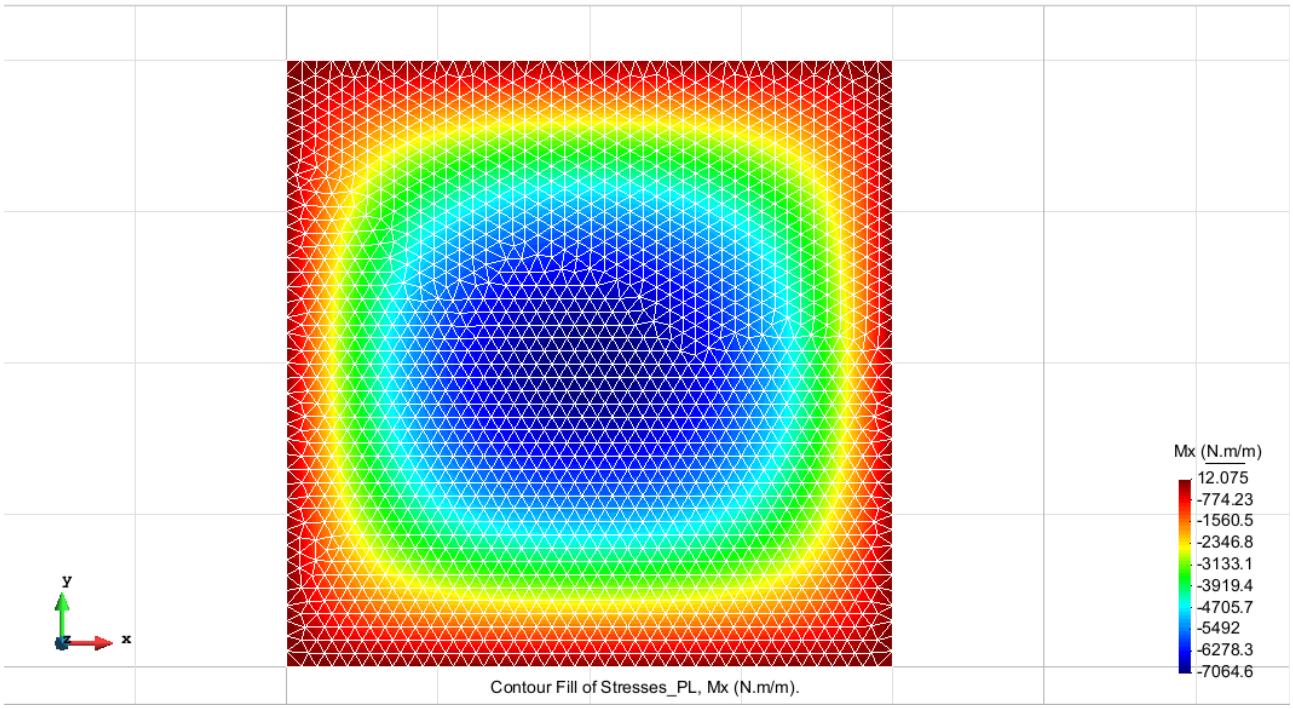

Figure 9 – Stresses Mx

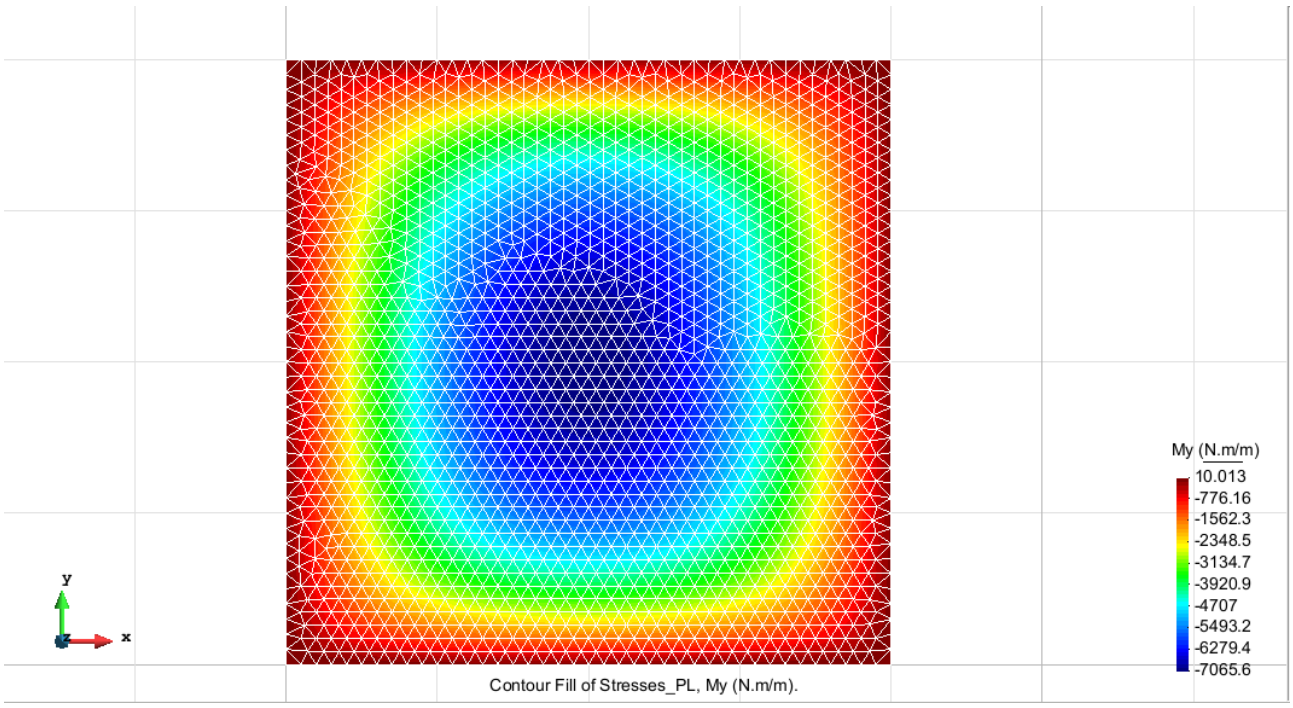

Figure 10 – Stresses My

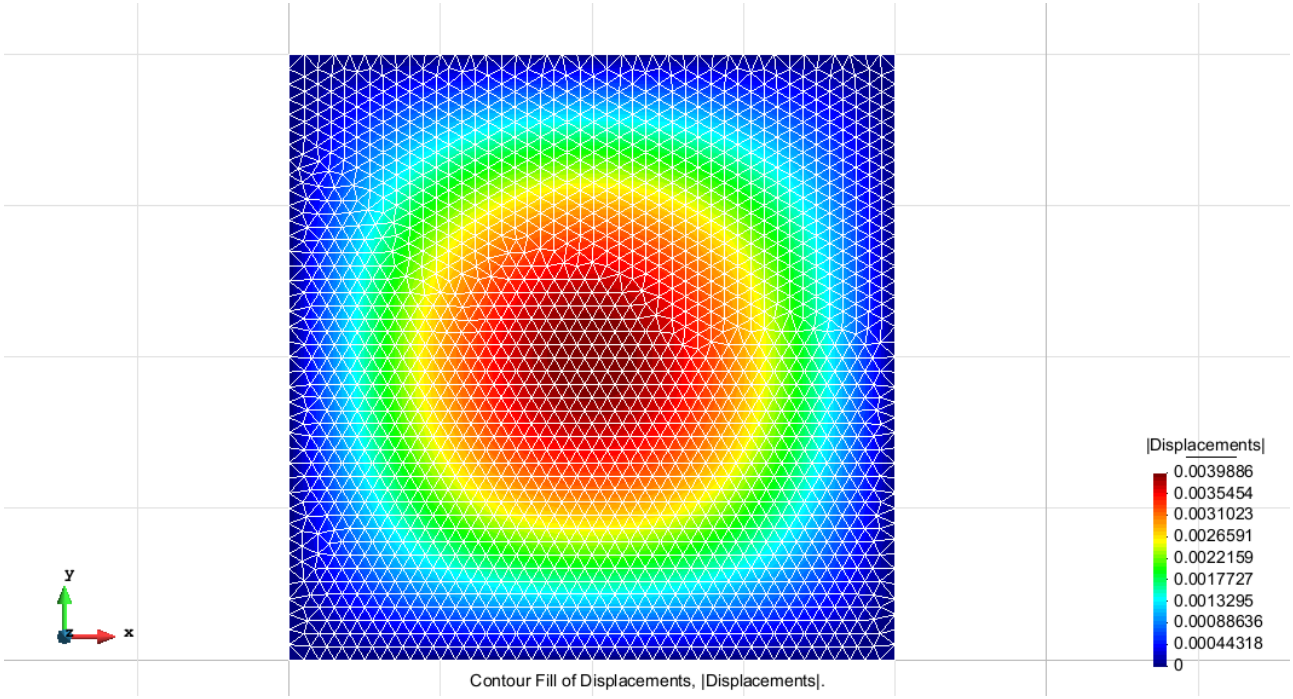

Figure 11 – Displacements

TRIANGULAR ELEMENTS WITH 6 NODES (RM)

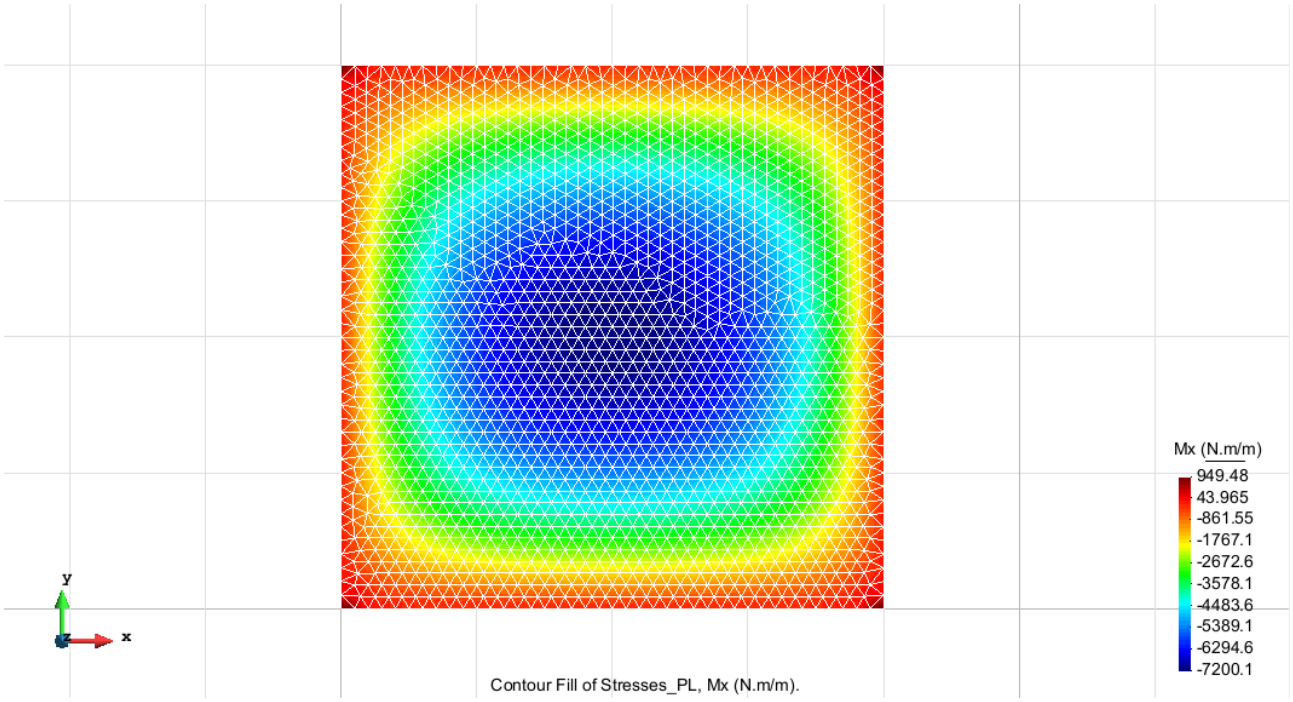

Figure 12 – Stresses Mx

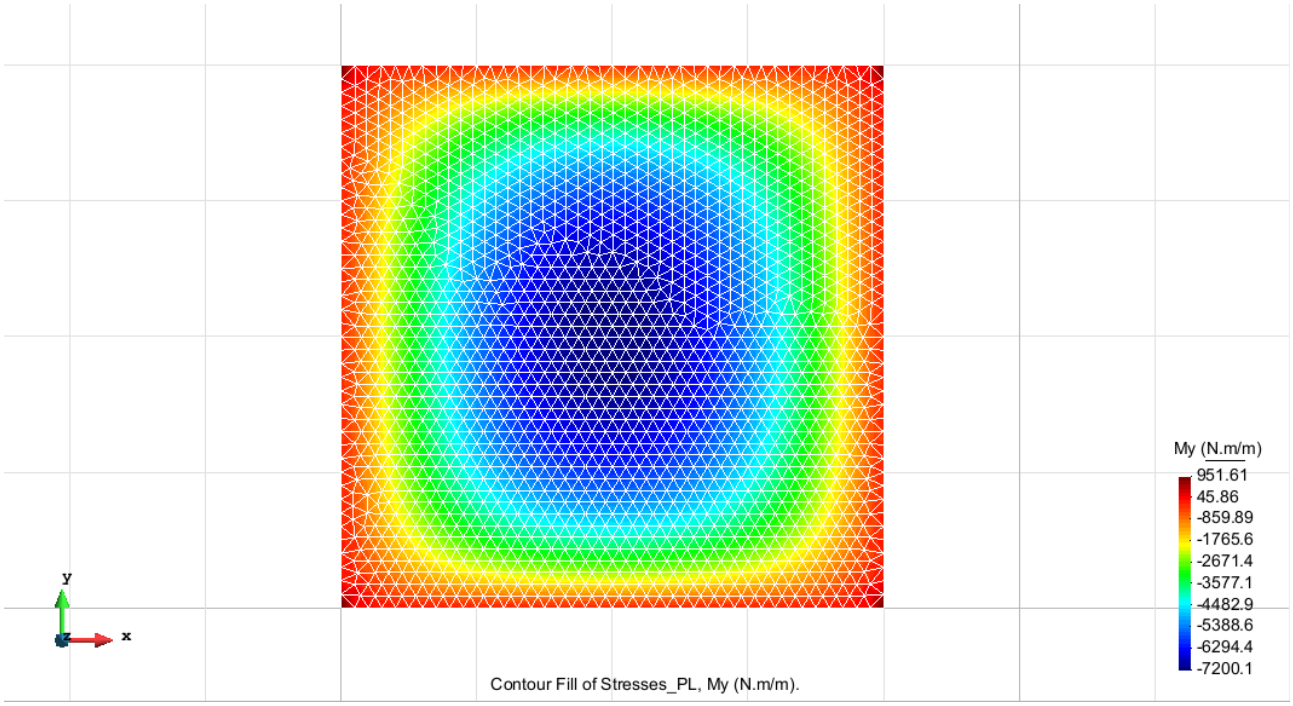

Figure 13 – Stresses My

Figure 14 - Displacements

QUADRILATELAR ELEMENTS WITH 4 NODES (CLLL)

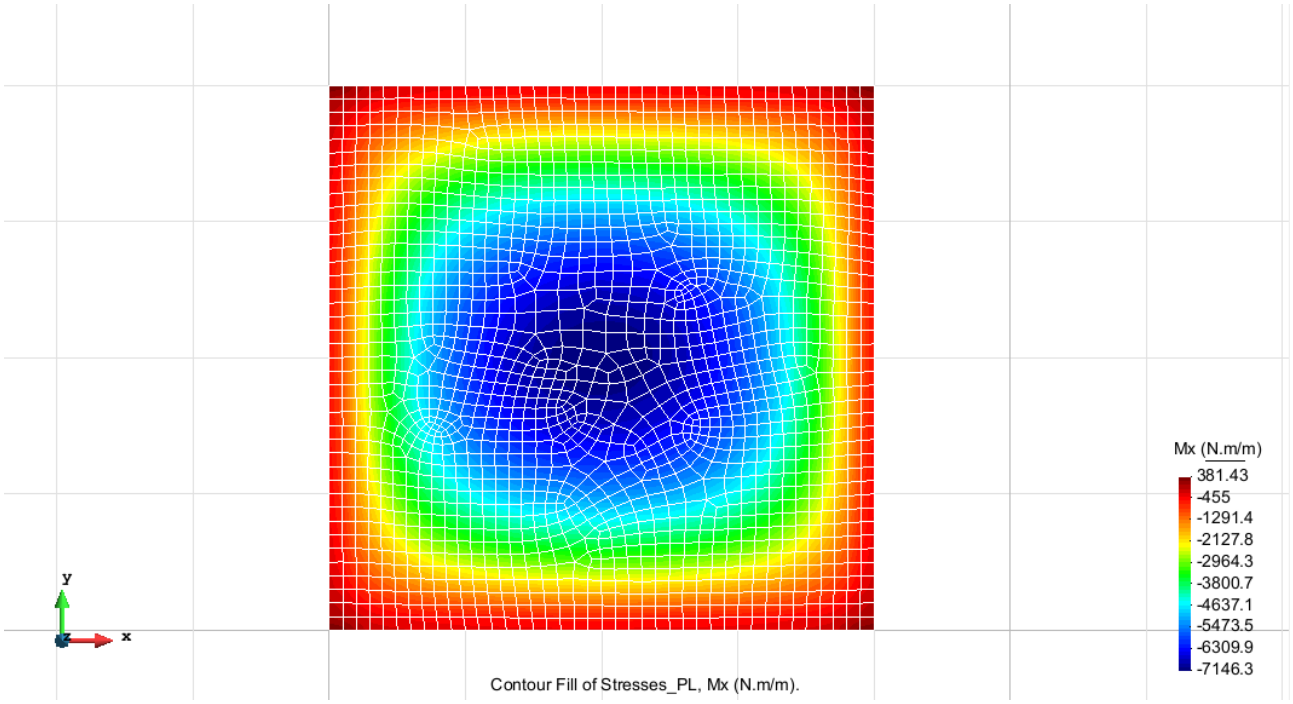

Figure 15 – Stresses Mx

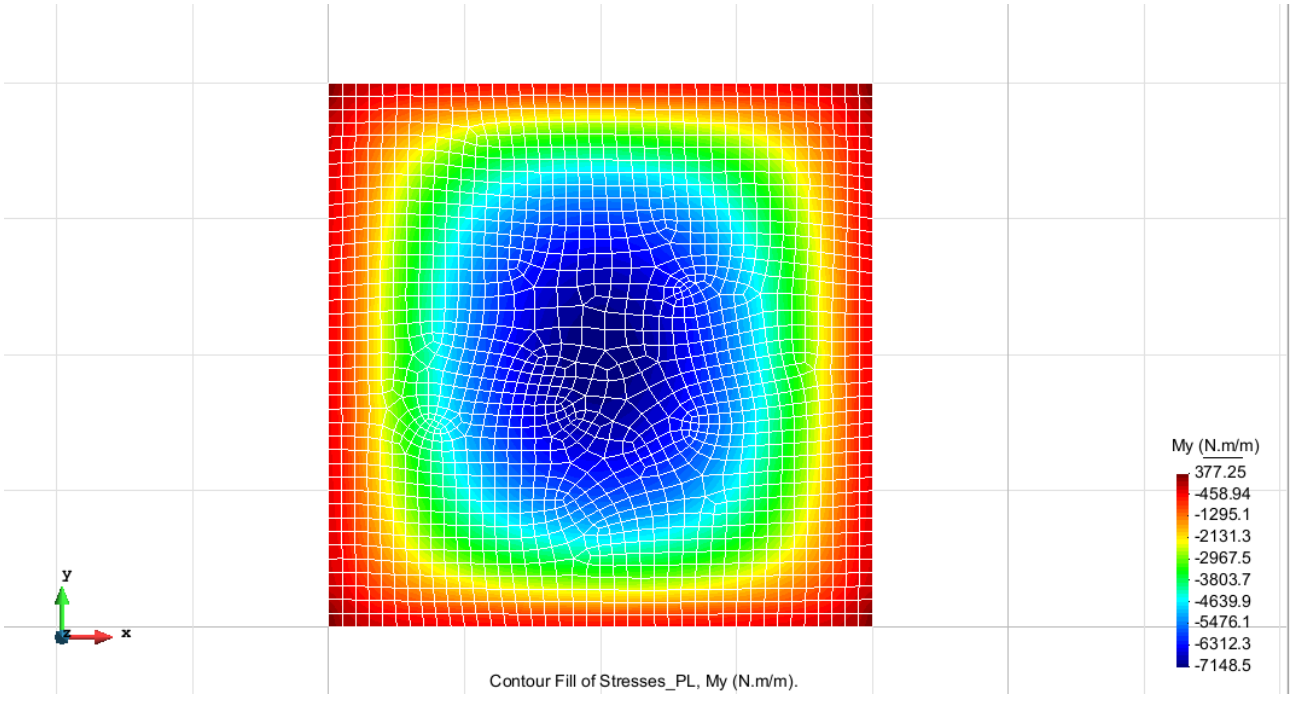

Figure 16 – Stresses My

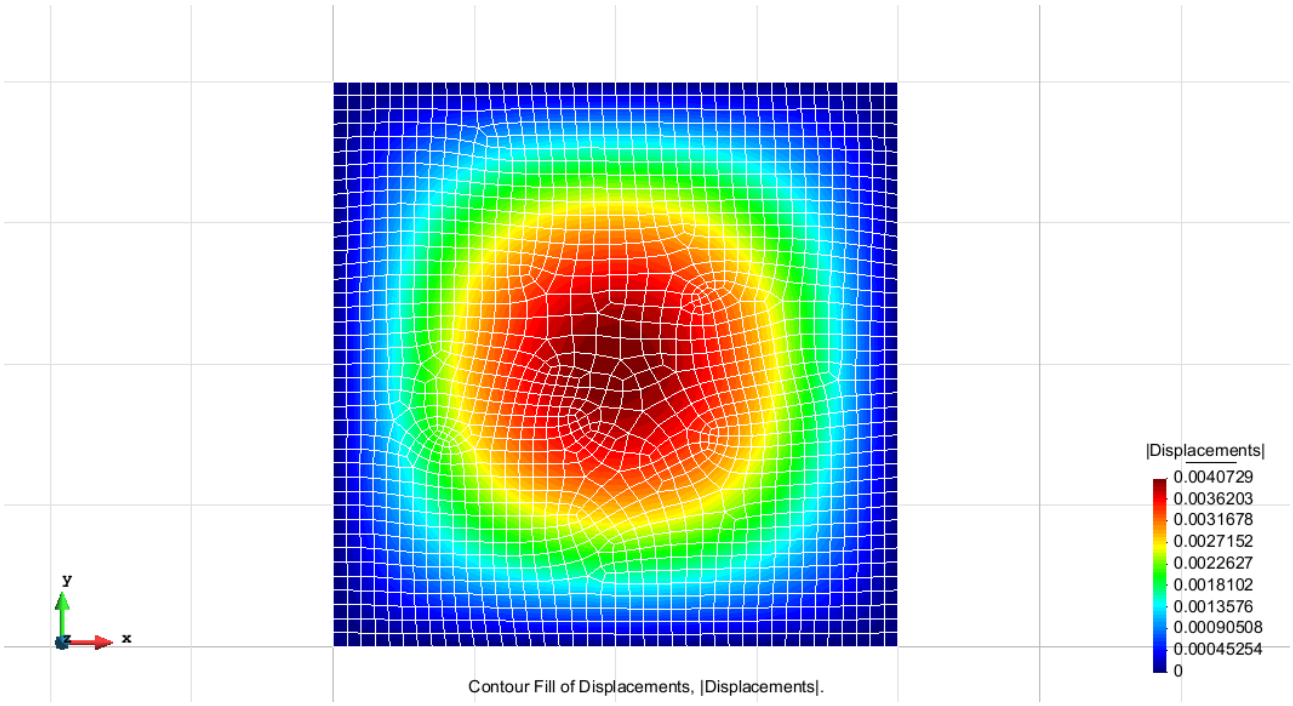

Figure 17 – Displacements

Exercise 2: Thin plate with internal hole

Solution

Geometry

Define the geometry of the structure in the preprocessor of Gid:

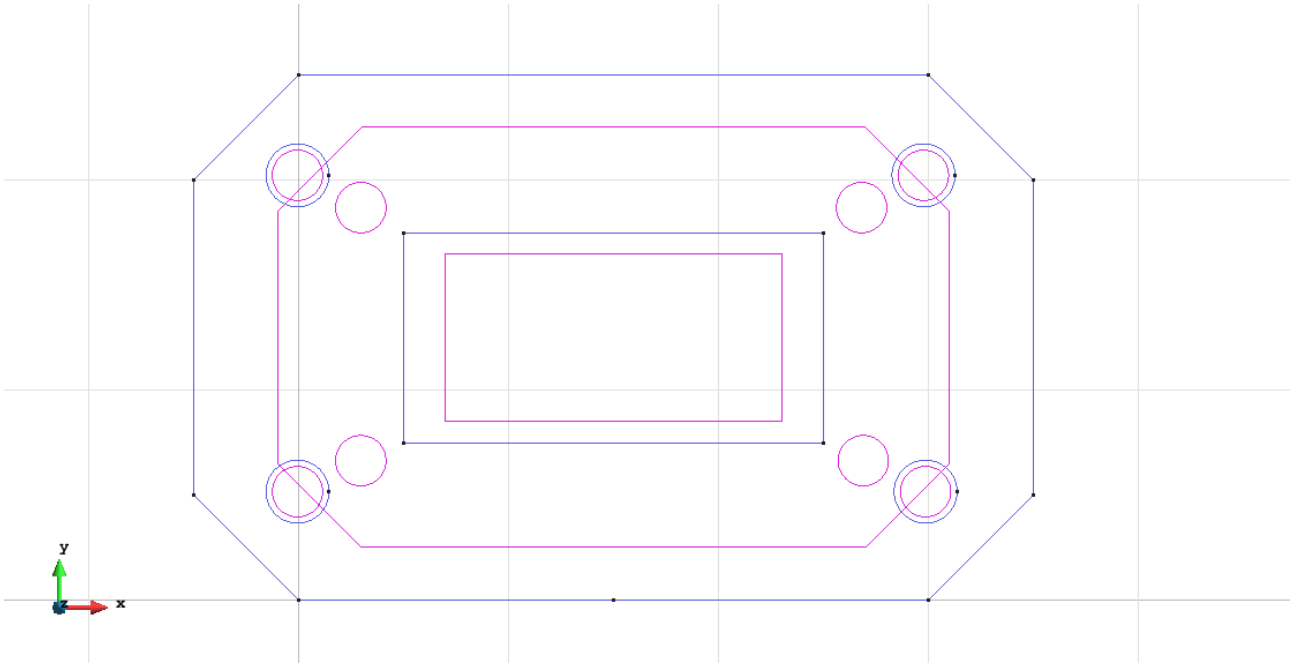

Figure 18 - Geometry of the structure

Data

Problem Type:

Once the geometry is defined, we can see which type of problem must be solved. In this case we face a plates problem; therefore we choose the module RamSeries_Educational_2D/Plates using the following sequence of commands:

Data / Problem Type / RamSeries_Eductional_2D / Plates

Boundary conditions:

The types of boundary conditions that are enforced in this example are the following:

- Displacements Constraints / Surface Constraints.

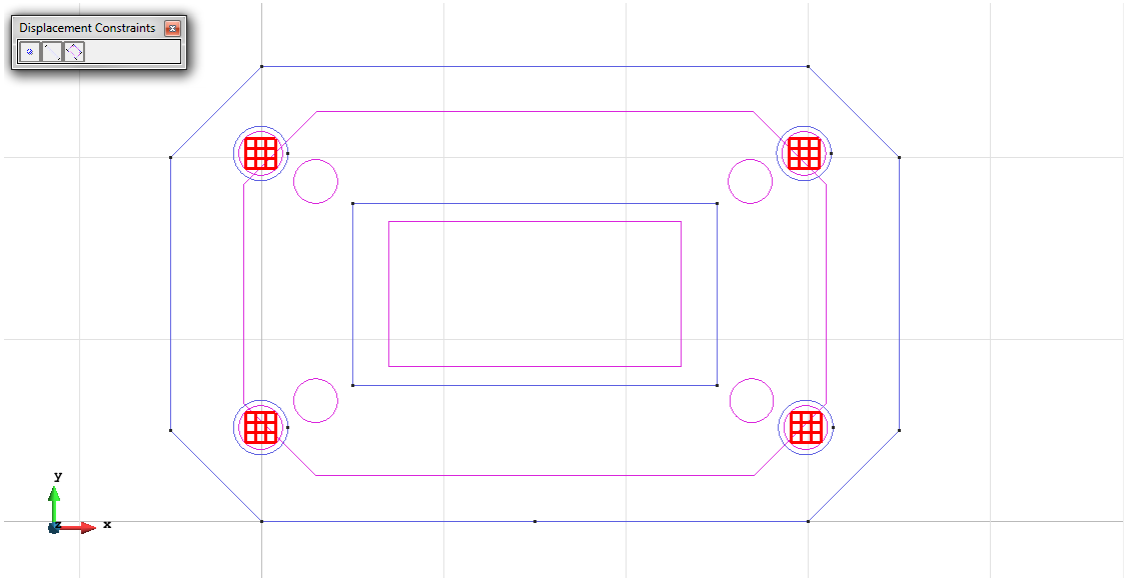

Figure 19 – Surface Constraints

- Loads / Uniform loads.

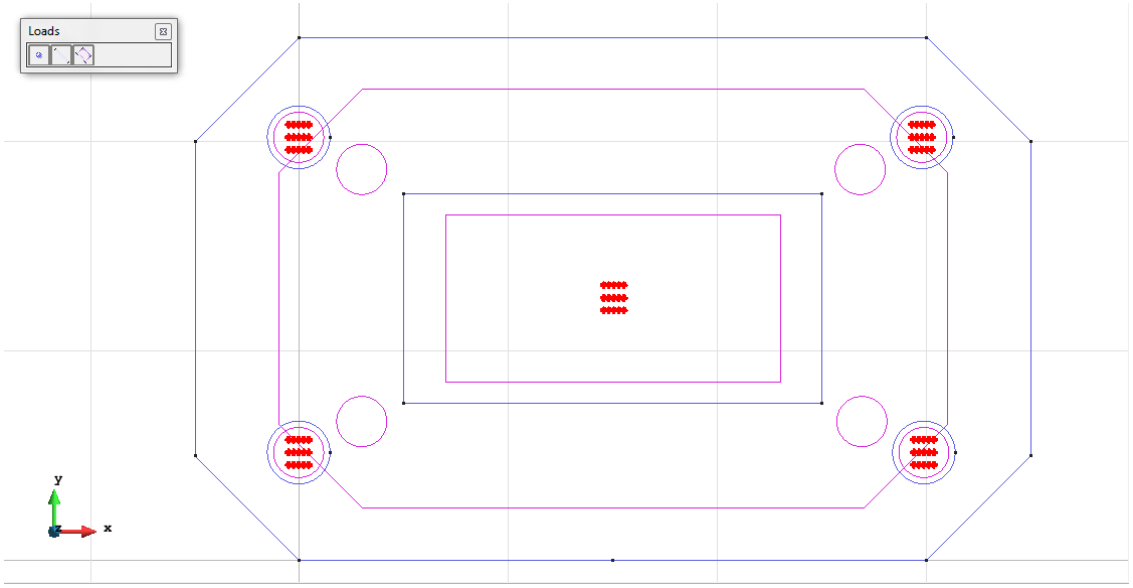

Figure 20 – Uniform load

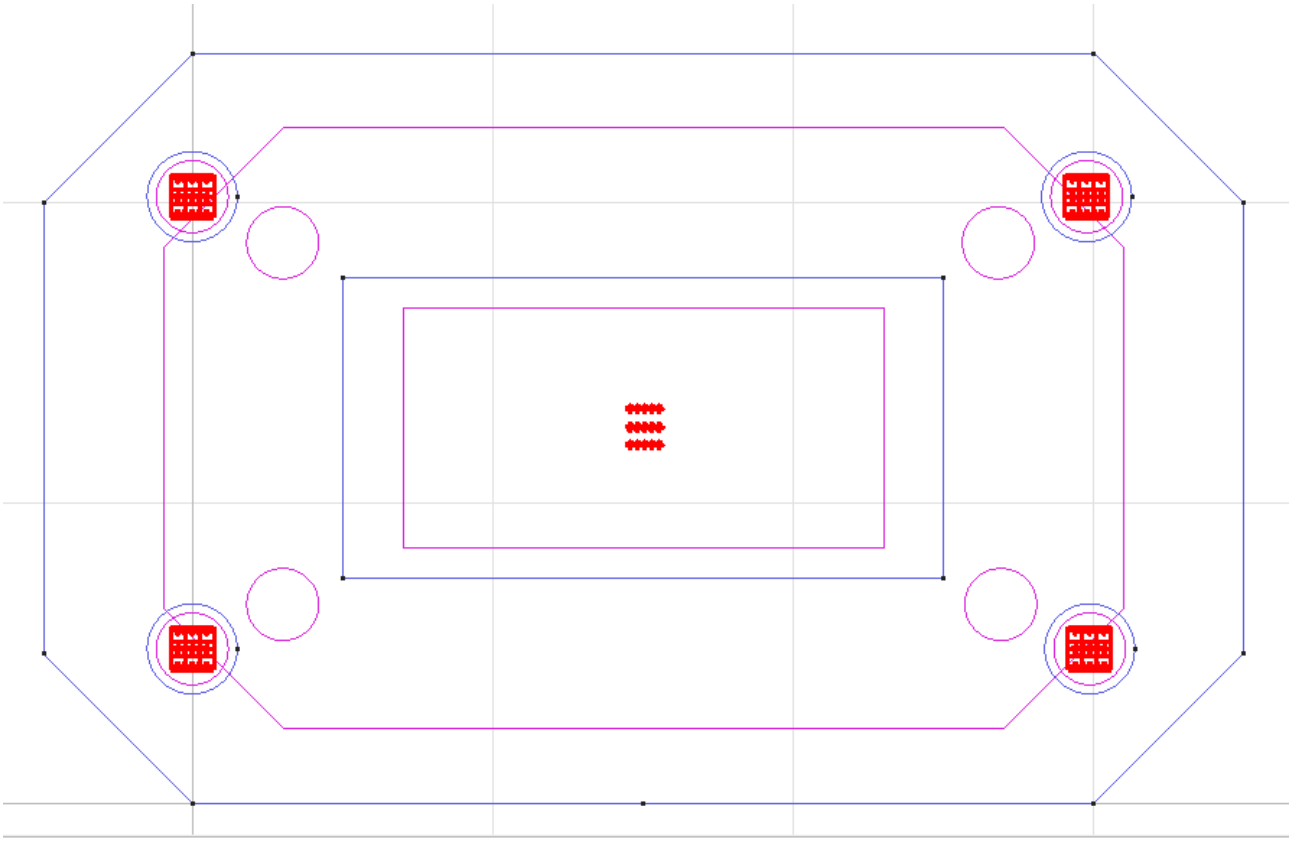

Figure 21 – All conditions on the plate

Material: We use material with the following mechanical characteristics.

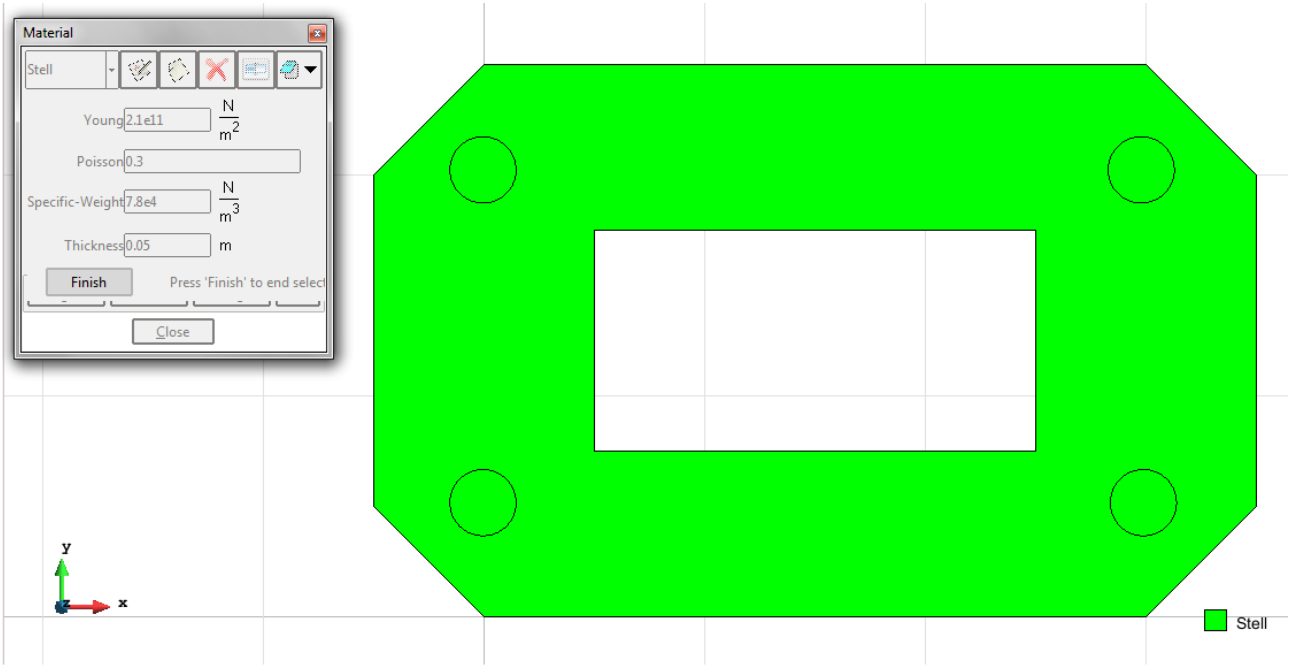

Figure 22 – Material

Meshing / Generate: To generate the mesh we have used the following option:

- For DKT elements: Quadratic type= Normal; Element type= Triangle.

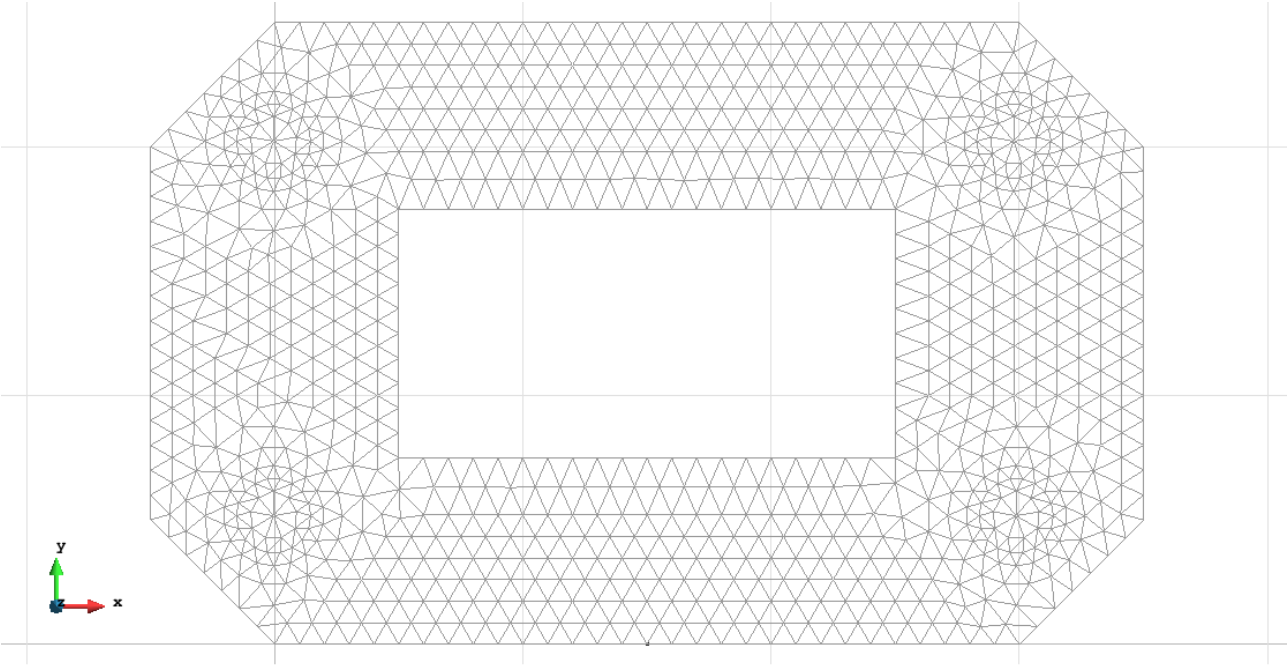

Figure 23 – Meshe of DKT elements

Calculate / Calculate

Once the mesh is generated, we proceed to calculate the problem for the meshe proposed.

File / Post Process

The following figures show the results of the analysis sought after in this exercise.

TRIANGULAR ELEMENTS WITH 3 NODES (DKT)

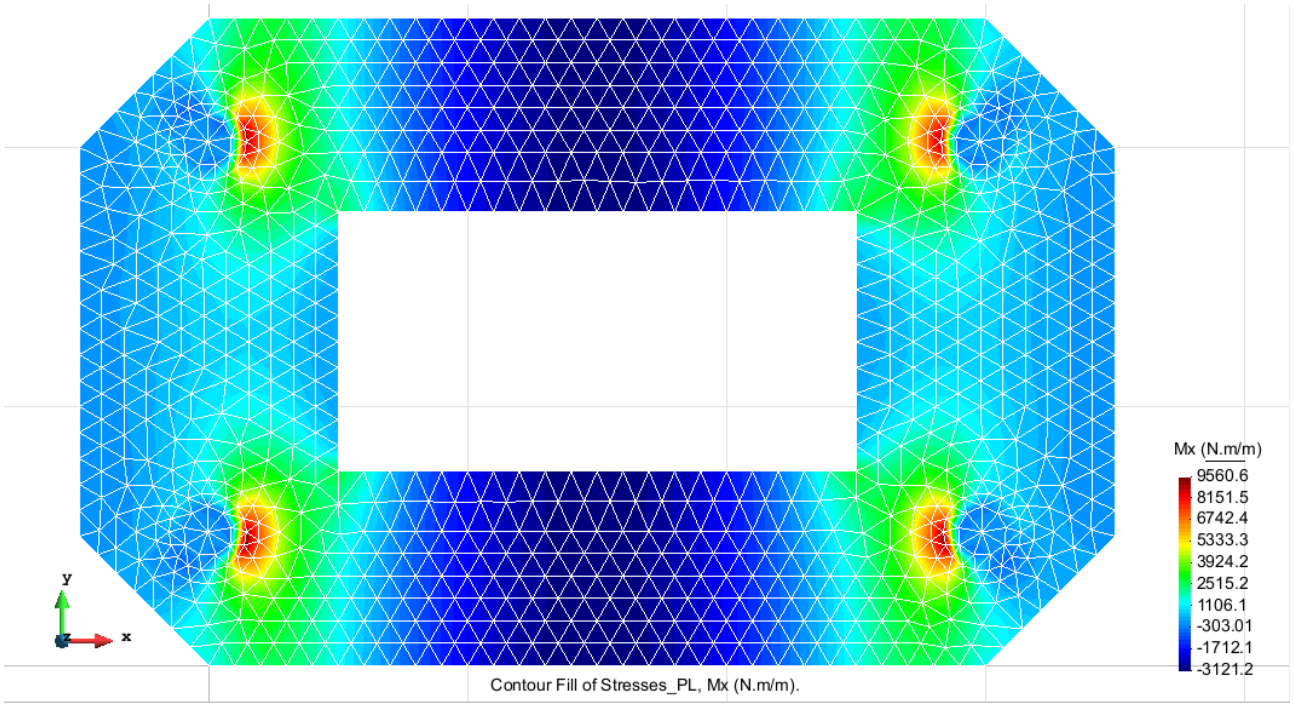

Figure 24 – Stresses Mx

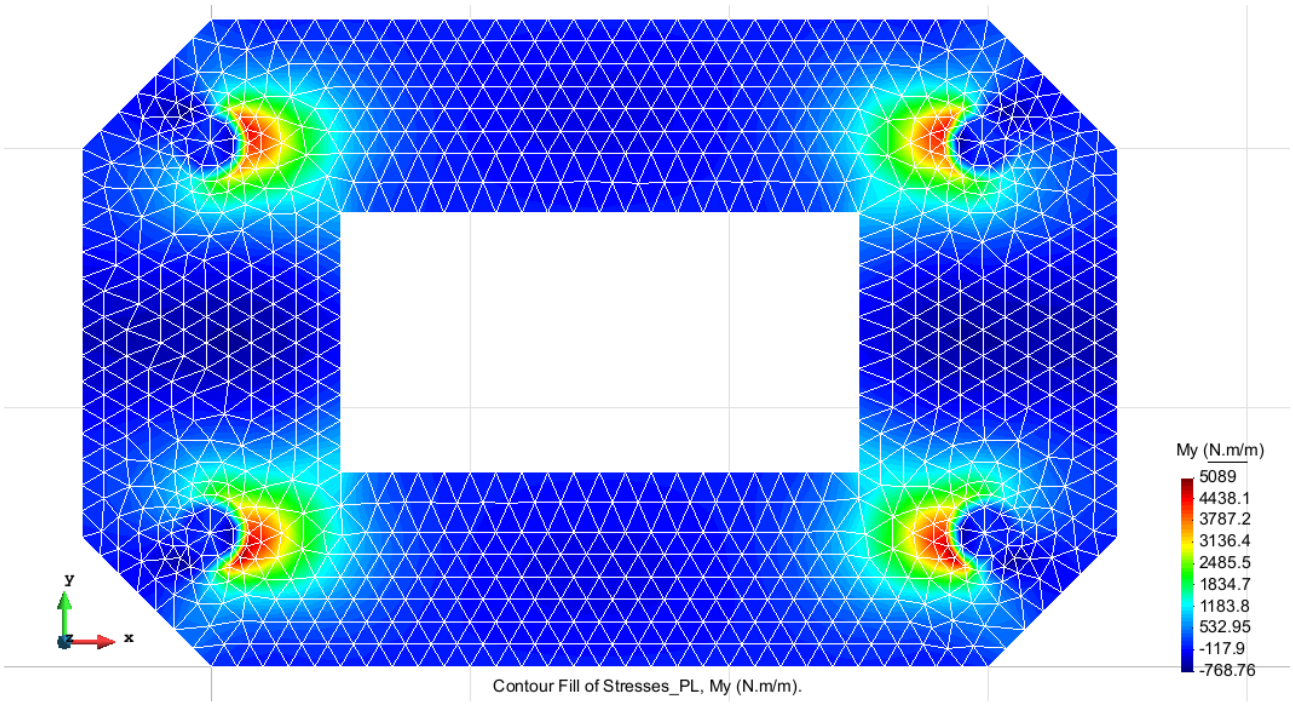

Figure 25 – Stresses My

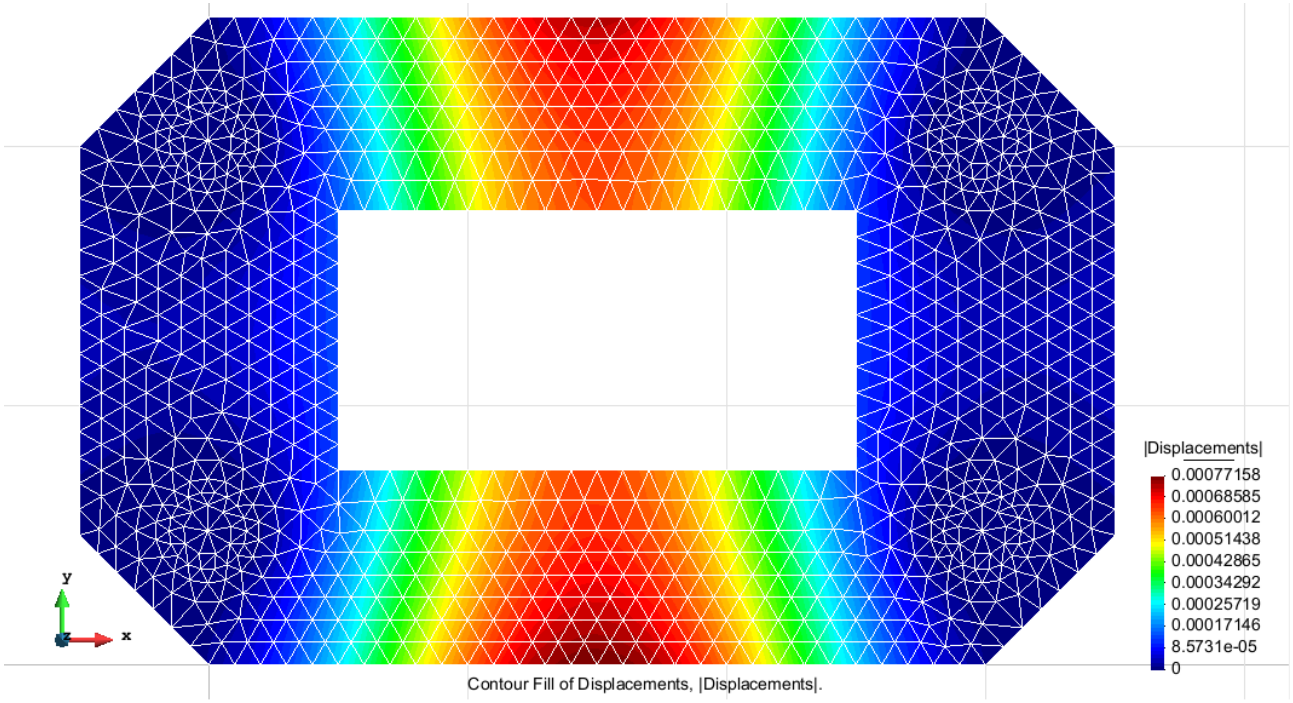

Figure 26 – Displacements

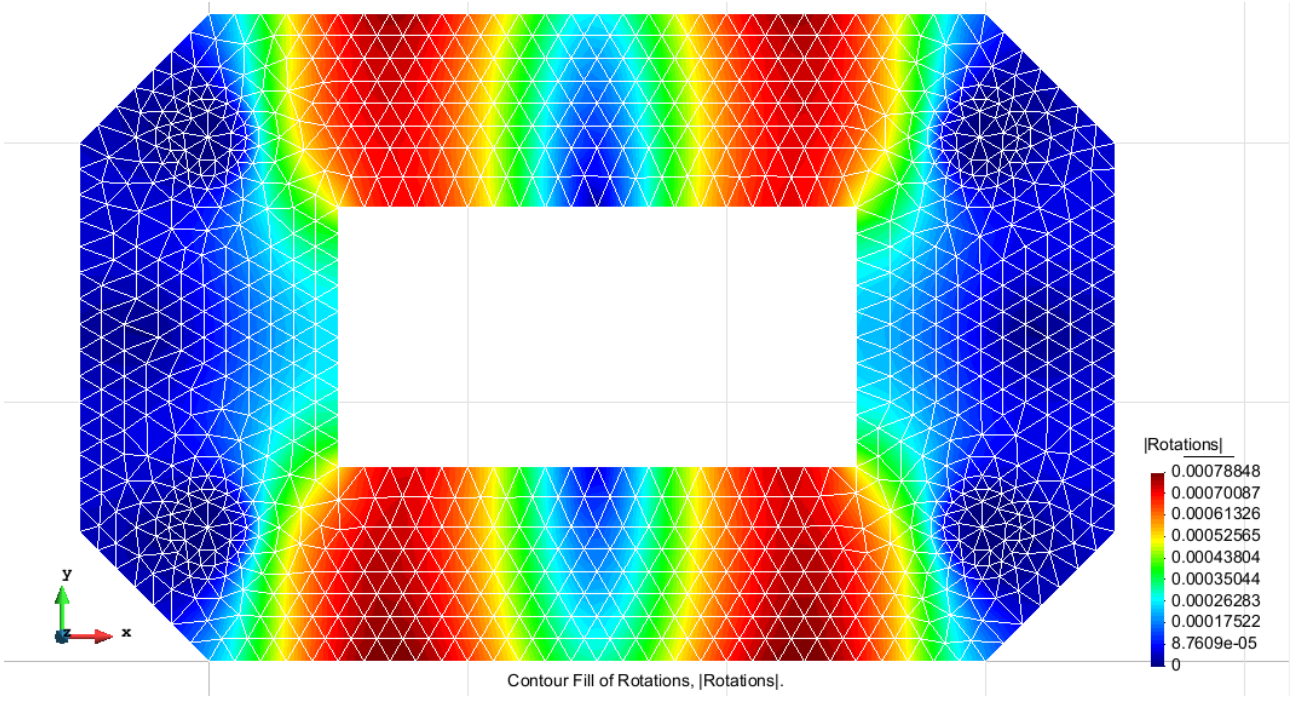

Figure 27 – Rotations

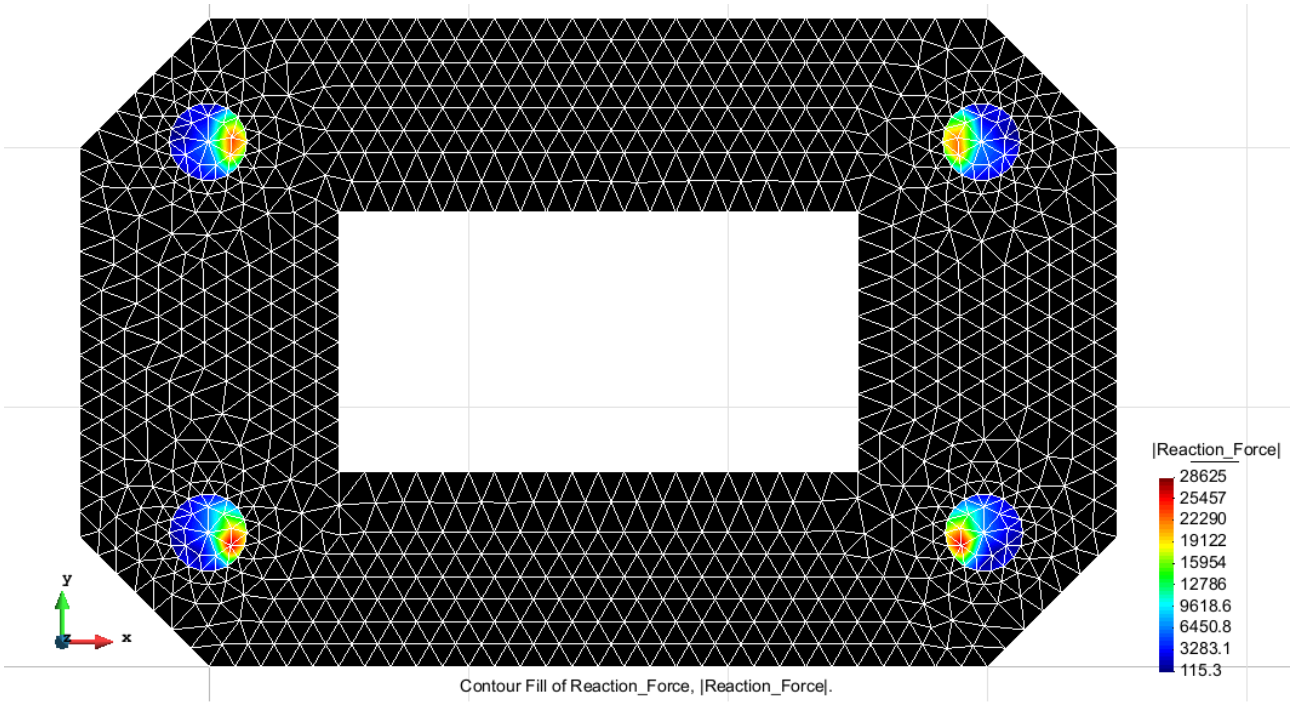

Figure 28 – Reaction Force

Exercise 3: Thick circular plate with internal hole

Solution

Geometry

Define the geometry of the structure in the preprocessor of Gid:

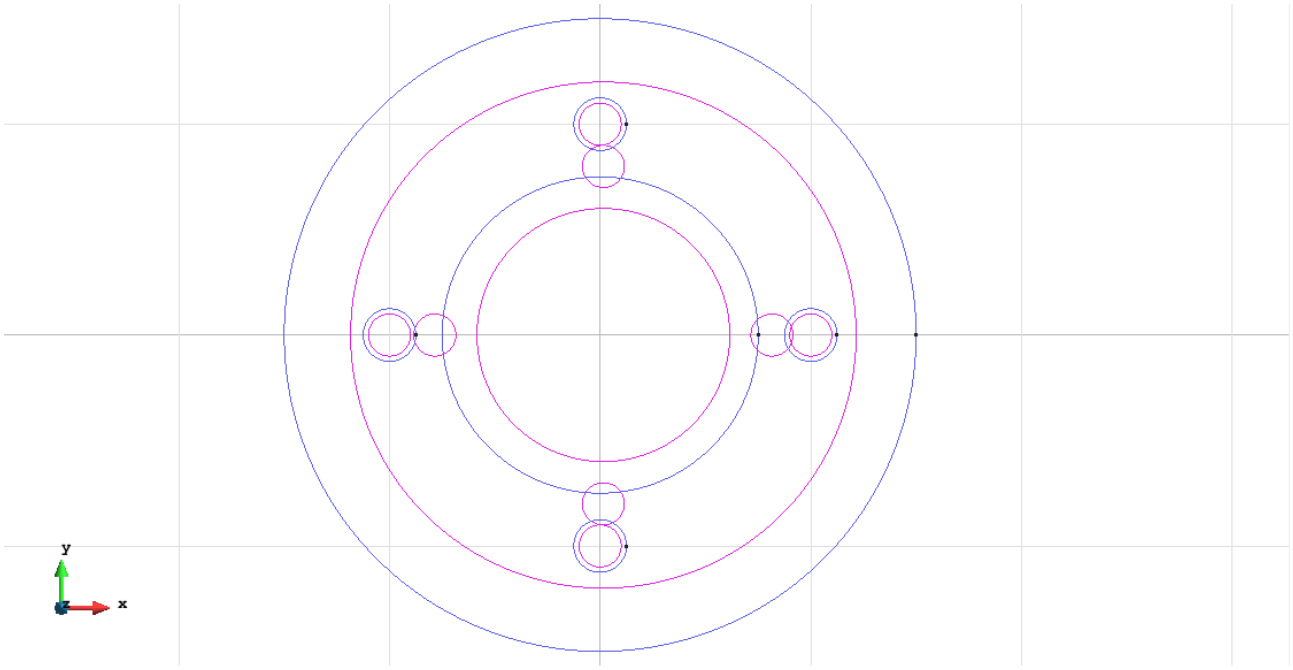

Figure 29 - Geometry of the structure

Data

Problem Type:

Once the geometry is defined, we can see which type of problem must be solved. In this case we face a plates problem; therefore we choose the module RamSeries_Educational_2D/Plates using the following sequence of commands:

Data / Problem Type / RamSeries_Eductional_2D / Plates

Boundary conditions:

The types of boundary conditions that are enforced in this example are the following:

- Displacements Constraints / Surface Constraints.

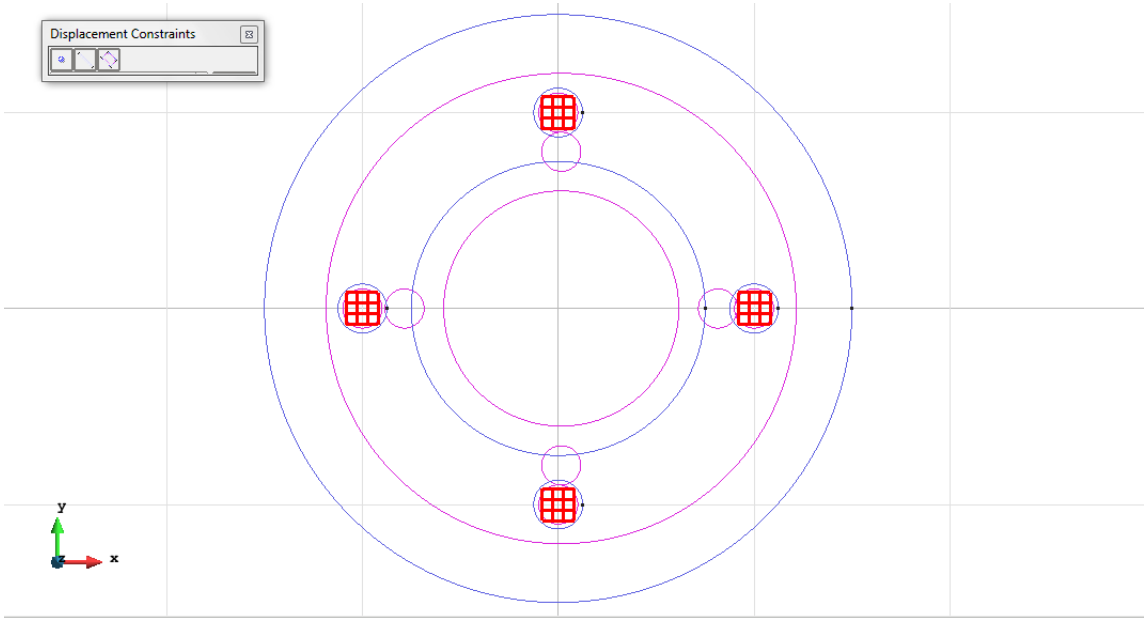

Figure 30 – Surface Constraints

- Loads / Uniform loads.

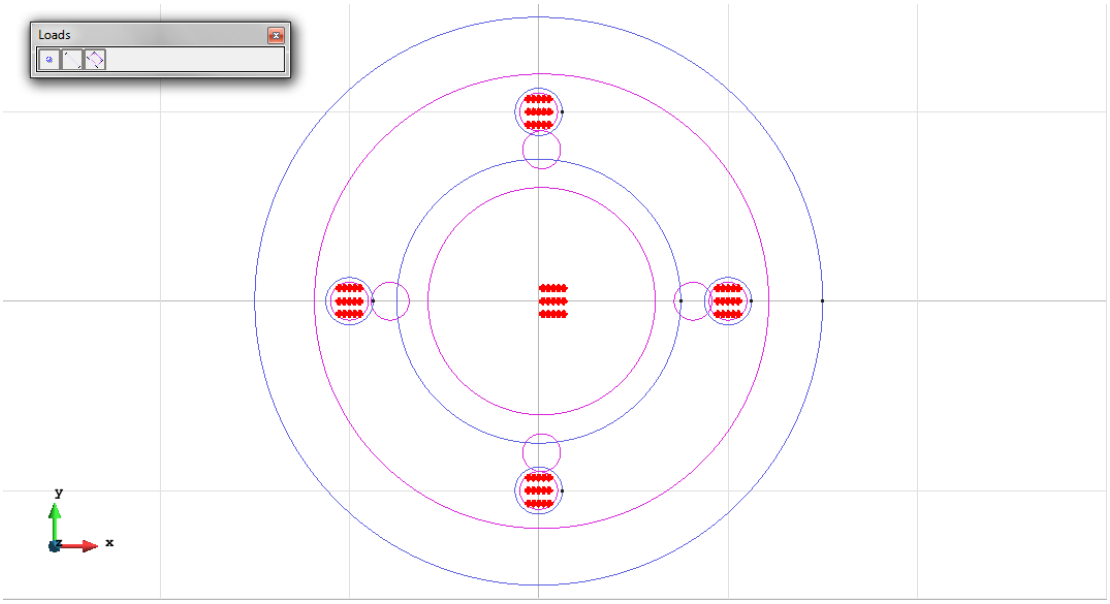

Figure 31 – Uniform load

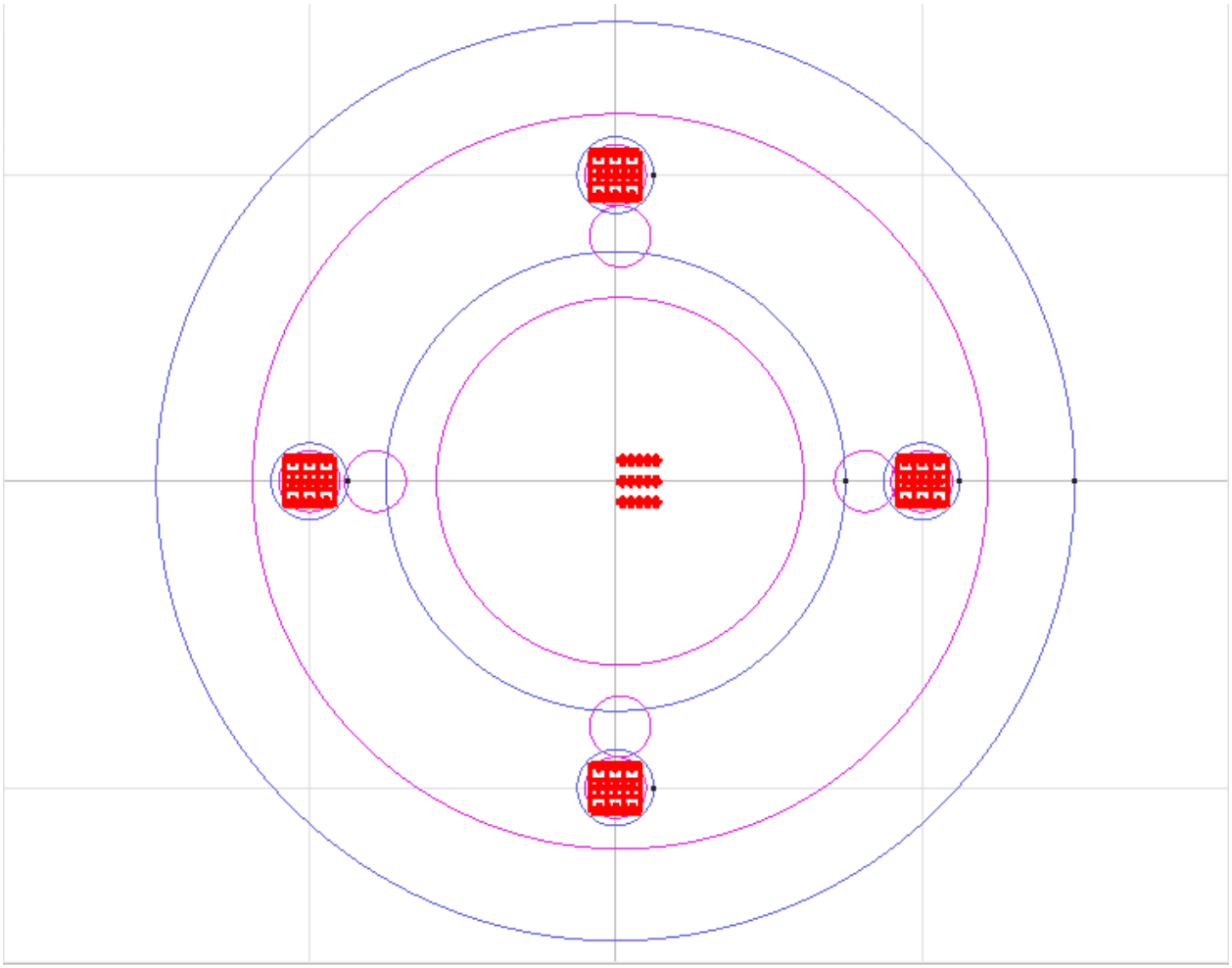

Figure 32 – All conditions on the plate

Material: We use material with the following mechanical characteristics.

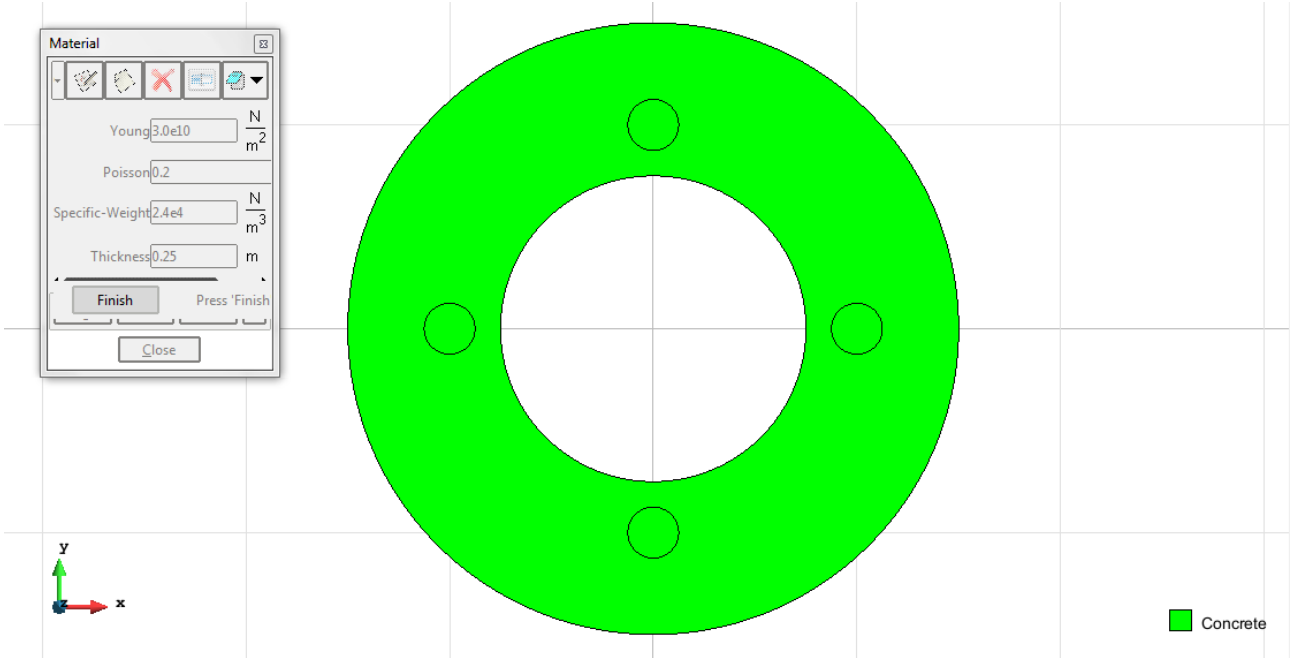

Figure 33 – Material

Meshing / Generate: To generate the mesh we have used the following option:

- For RM elements: Quadratic type= Quadratic; Element type= Triangle.

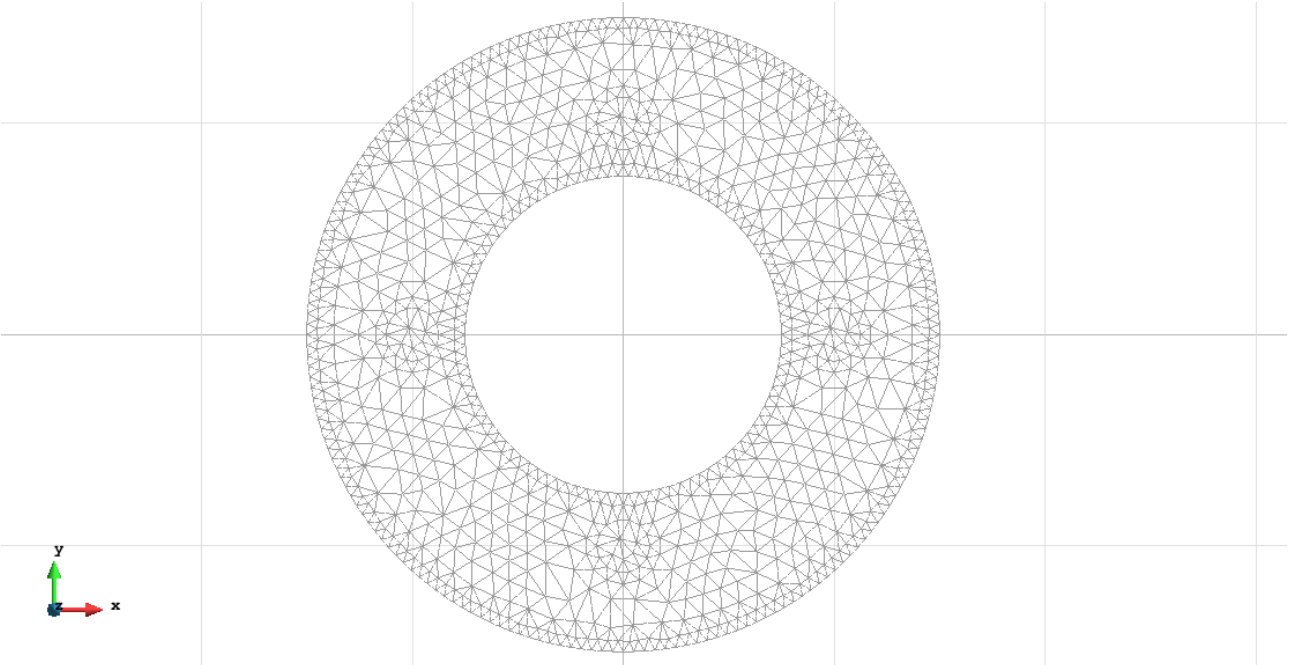

Figure 34 – Meshe of RM elements

Calculate / Calculate

Once the mesh is generated, we proceed to calculate the problem for the meshe proposed.

File / Post Process

The following figures show the results of the analysis sought after in this exercise.

TRIANGULAR ELEMENTS WITH 6 NODES (RM)

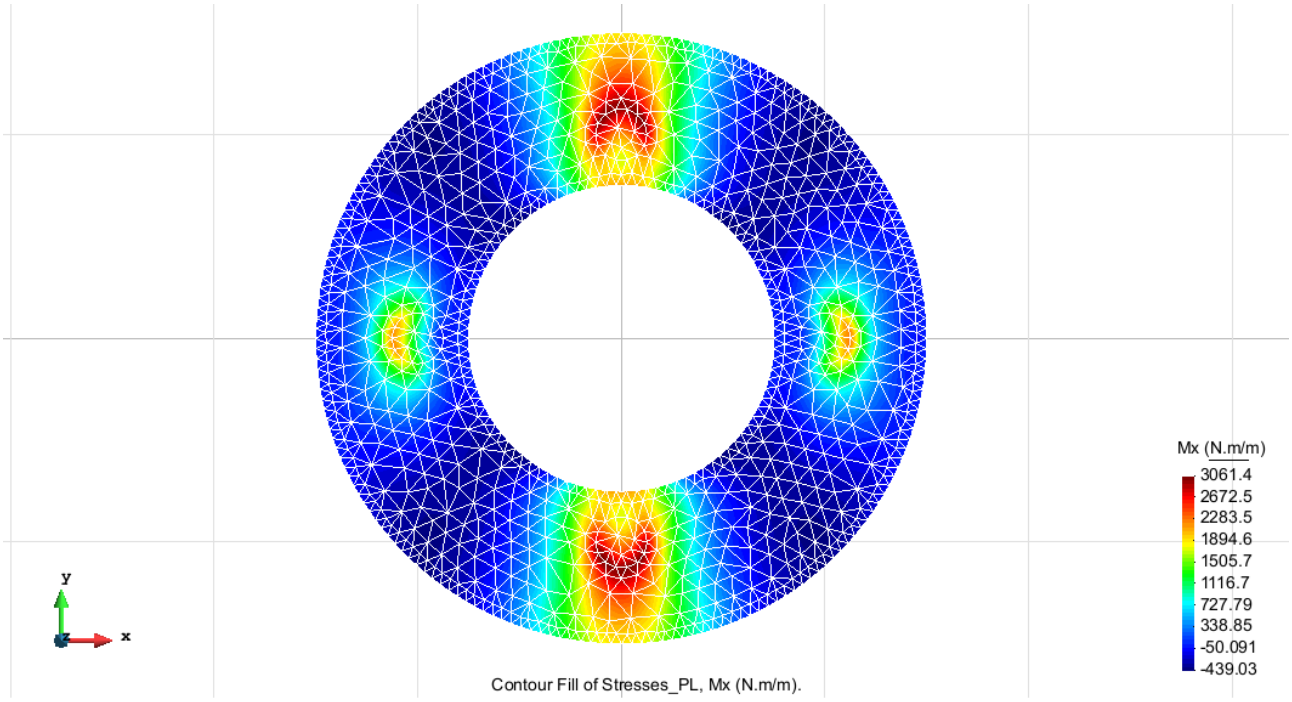

Figure 35 – Stresses Mx

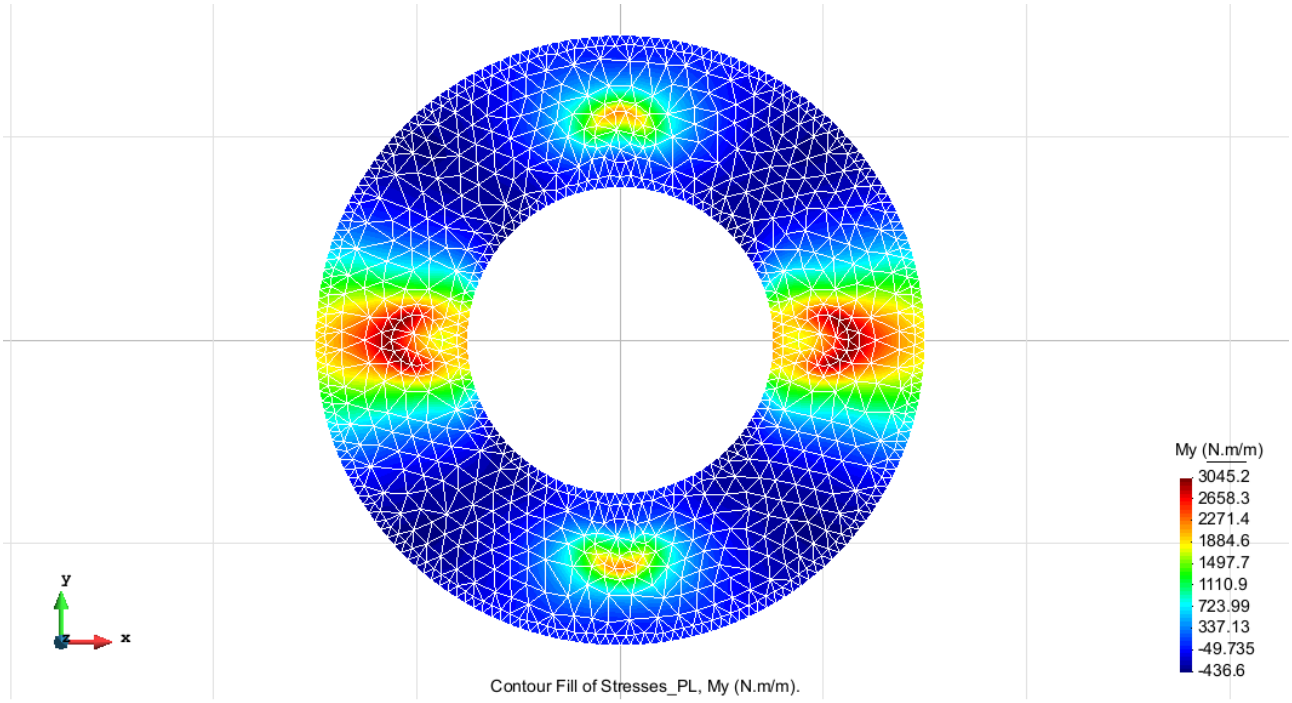

Figure 36 – Stresses My

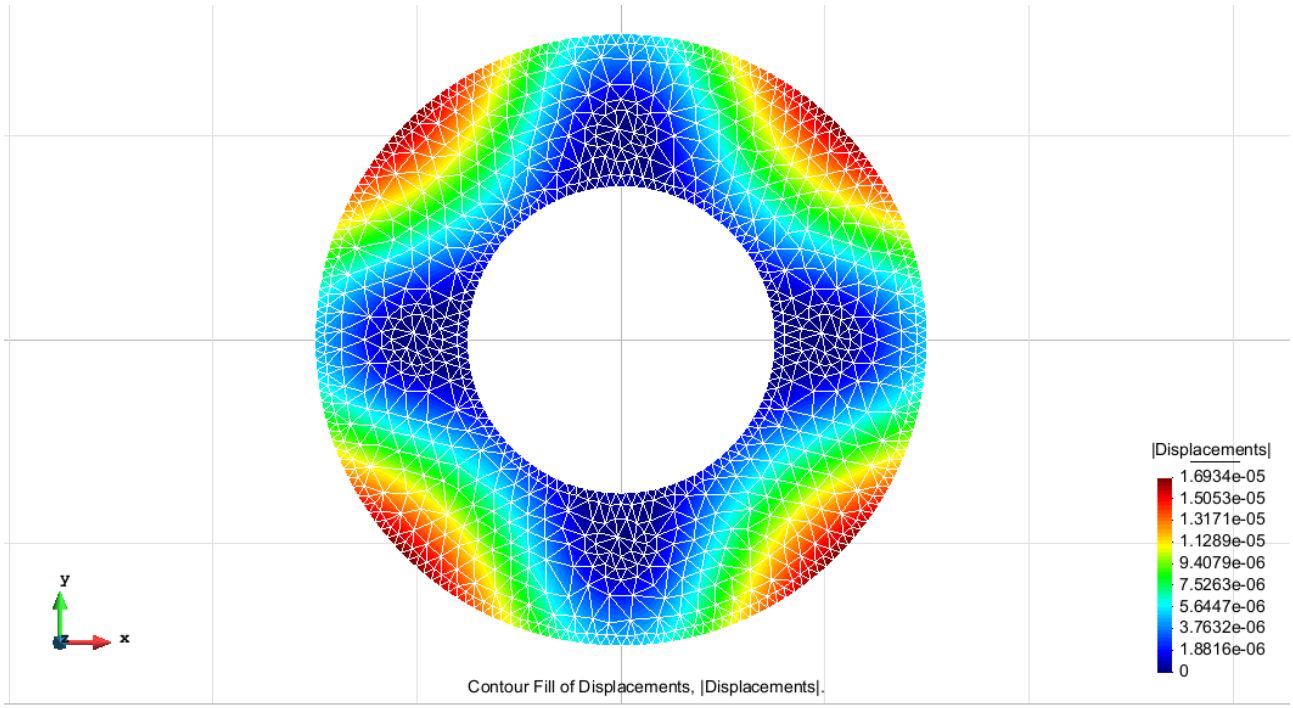

Figure 37 – Displacements

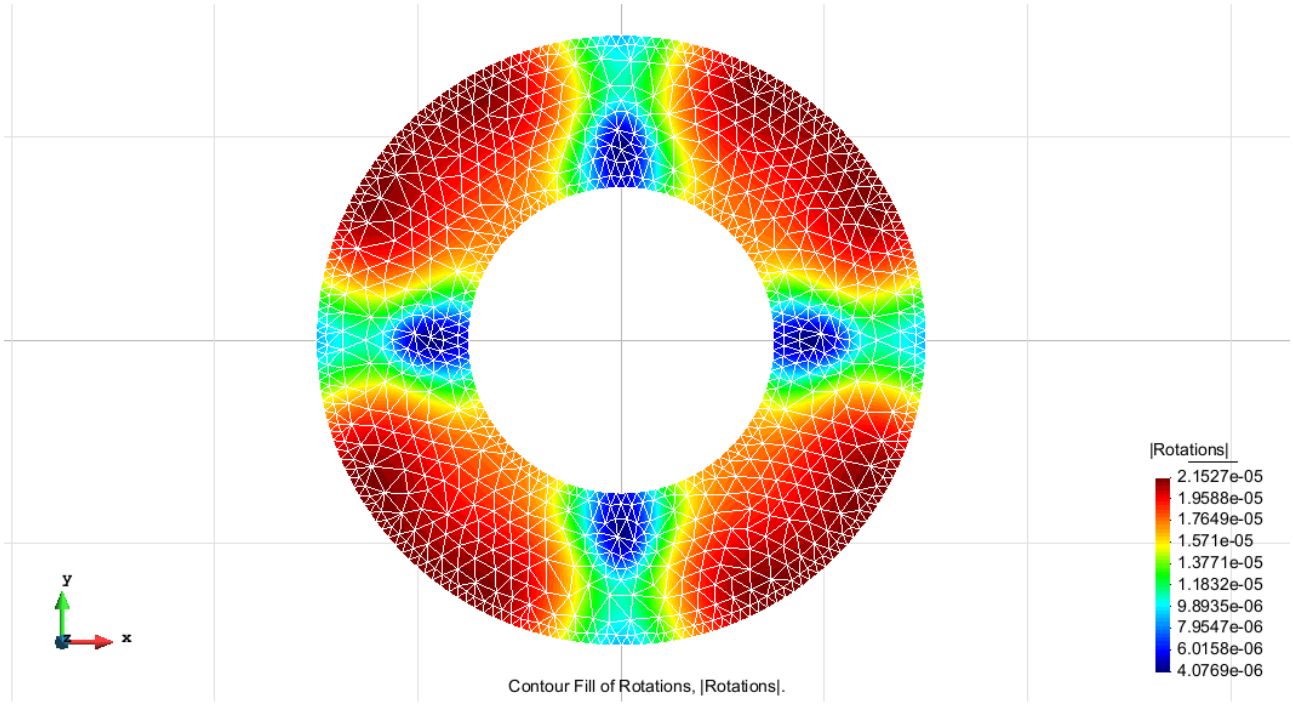

Figure 38 – Rotations

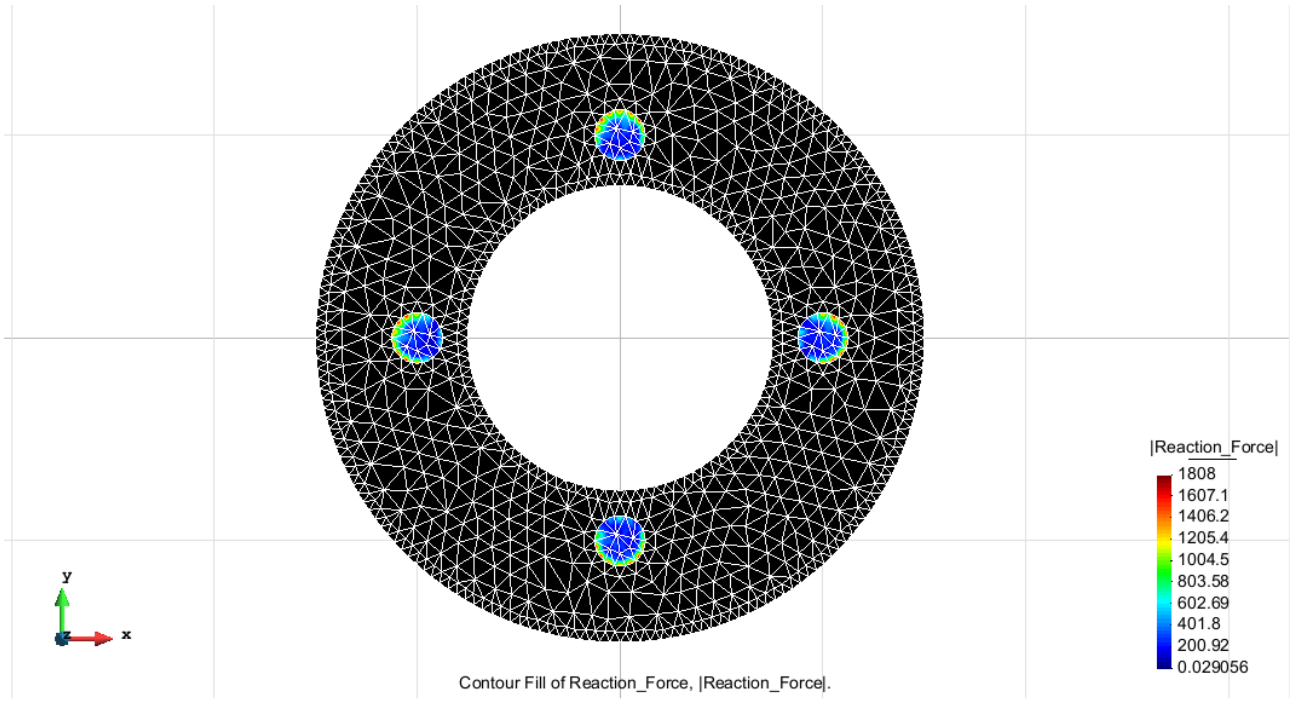

Figure 39 – Reaction Force