Homework 3

By

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Q1 Clamped plate with a uniform load

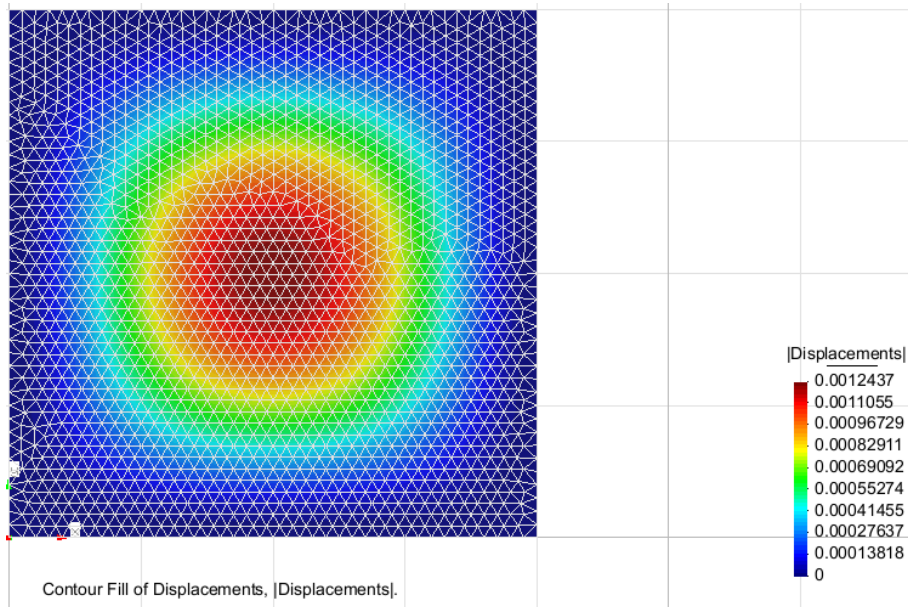Contour Fill of Displacements, |Displacements|.

|Displacements|
0.0012437
0.0011055
0.00096729
0.00082911
0.00069092
0.00055274
0.00041455
0.00027637
0.00013818
0

Fig.1 Deflection at Triangular Plate elements DKT

Contour Fill of Displacements, |Displacements|.

|Displacements|
0.0012567
0.0011171
0.00097747
0.00083783
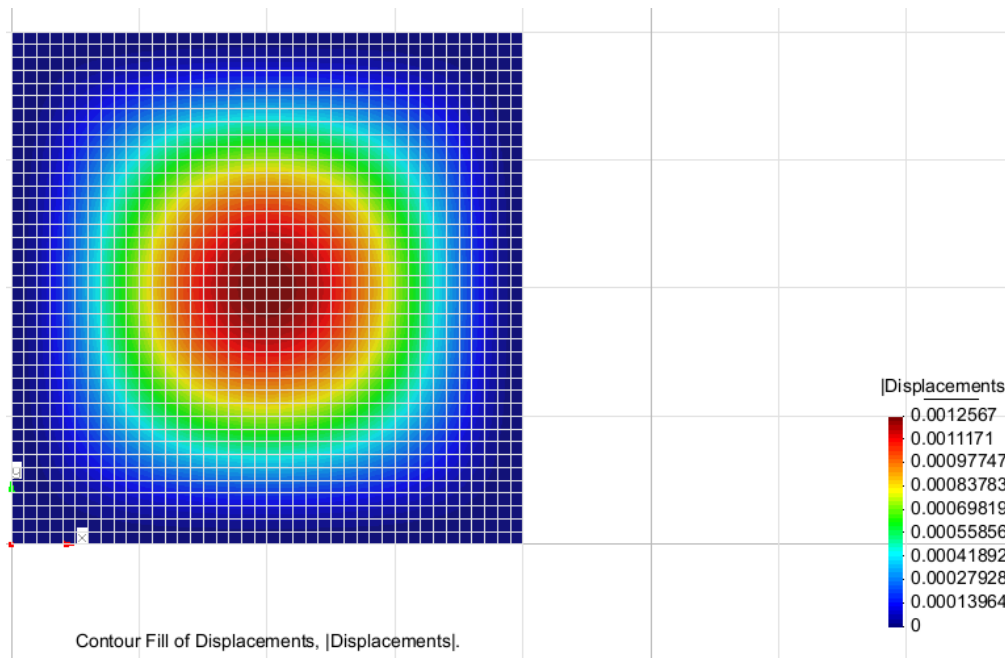0.00069819
0.00055856
0.00041892
0.00027928
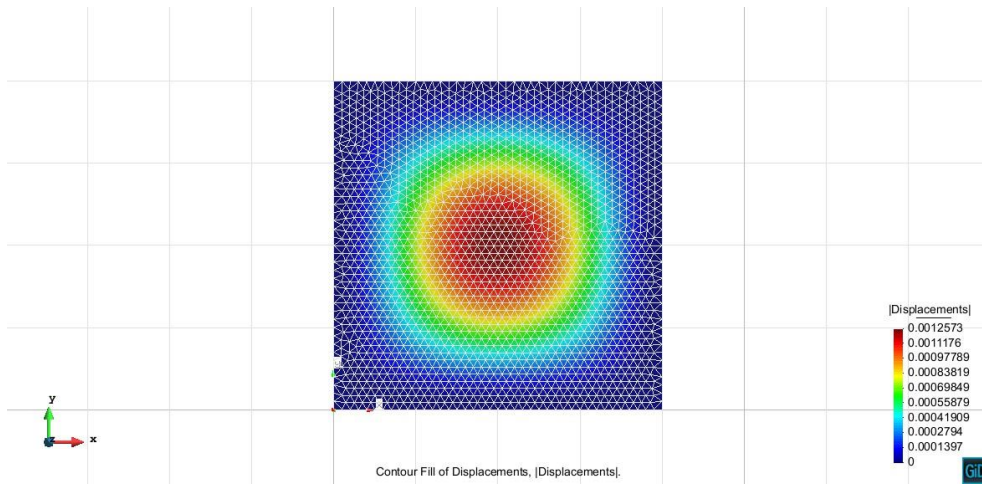0.00013964
0

Fig.2 Deflection at quadrilateral elements CLLL

Fig.3 Deflection at triangular Reissner-Midlin elements with 6 nodes

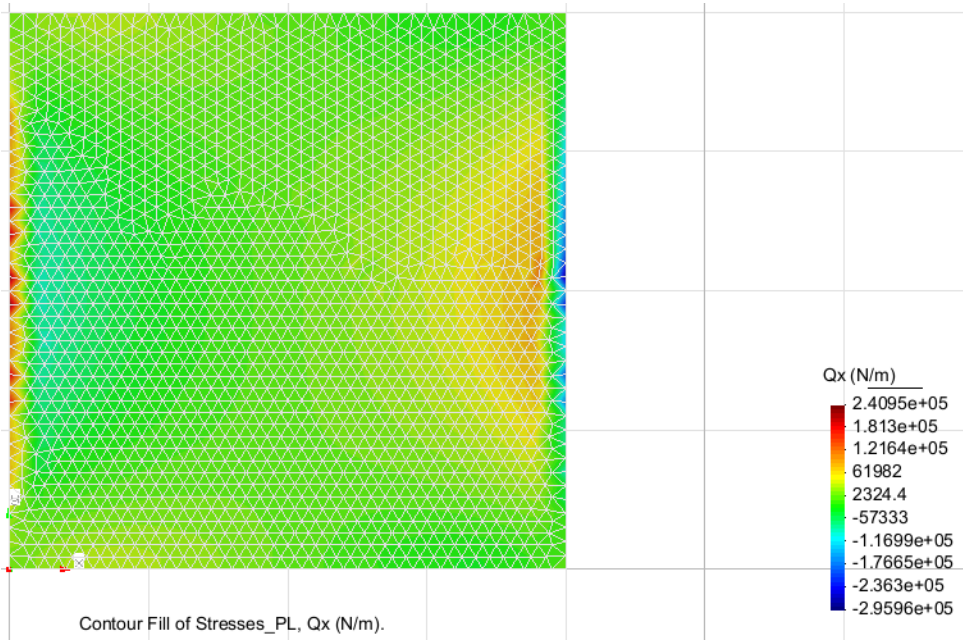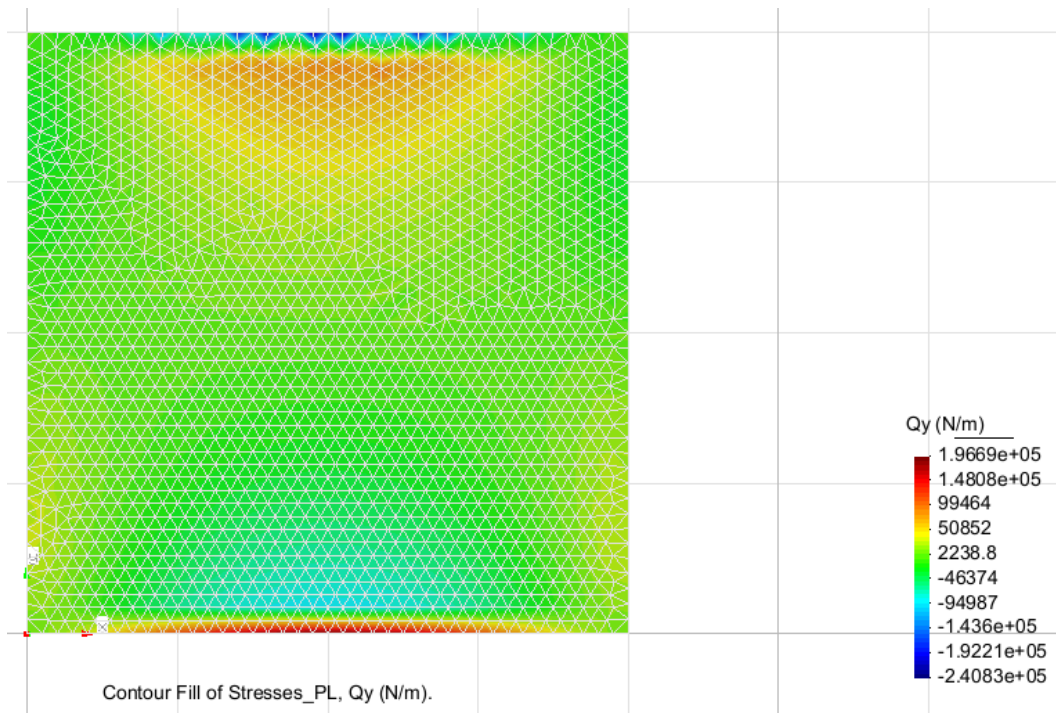**Fig.4 Stress Qx at triangular plate elements DKT**

Contour Fill of Stresses_PL, Qy (N/m).

Qy (N/m)
1.9669e+05
1.4808e+05
99464
50852
2238.8
-46374
-94987
-1.436e+05
-1.9221e+05
-2.4083e+05

Fig.5 Stress Qy at triangular plate elements DKT

Contour Fill of Stresses_PL, Qx (N/m).

Qx (N/m)
16783
13054
9324.1
5594.4
1864.8
-1864.8
-5594.4
-9324.1
-13054
-16783
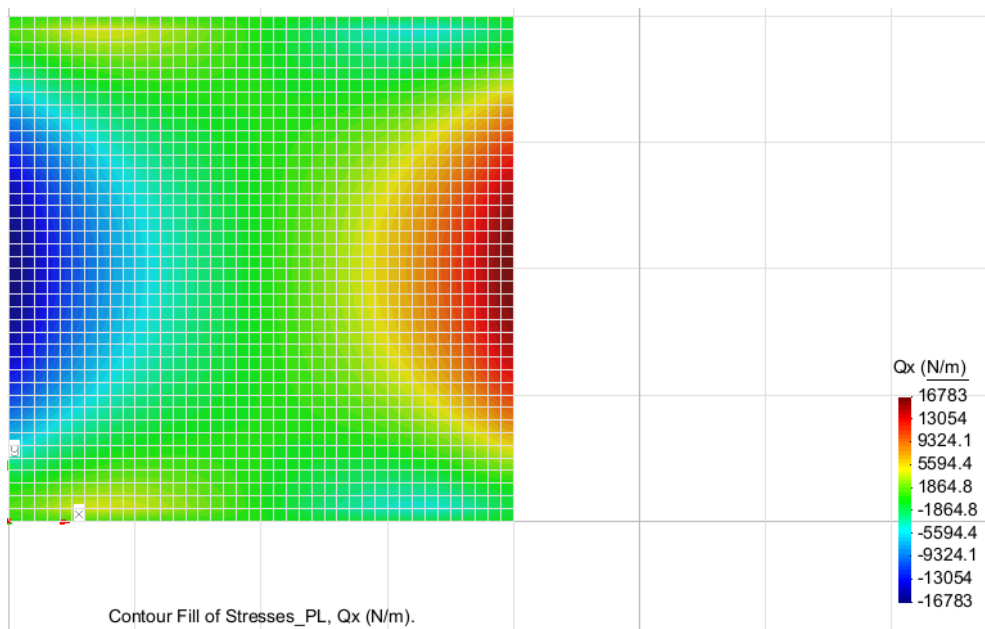
Fig.6 Stress Qx at quadrilateral elements CLLL

Contour Fill of Stresses_PL, Qy (N/m).

Qy (N/m)
16783
13054
9324.1
5594.4
1864.8
-1864.8
-5594.4
-9324.1
-13054
-16783
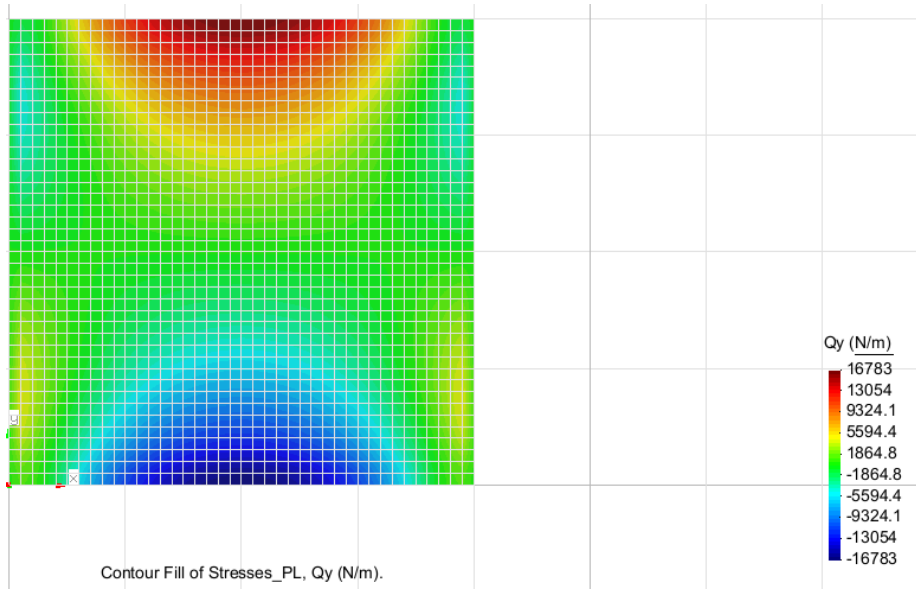
Fig.7 Stress at quadrilateral elements CLLL

Contour Fill of Stresses_PL, Qx (N/m).

Qx (N/m)
18585
14401
10217
6033.2
1849.2
-2334.7
-6518.6
-10702
-14886
-19070
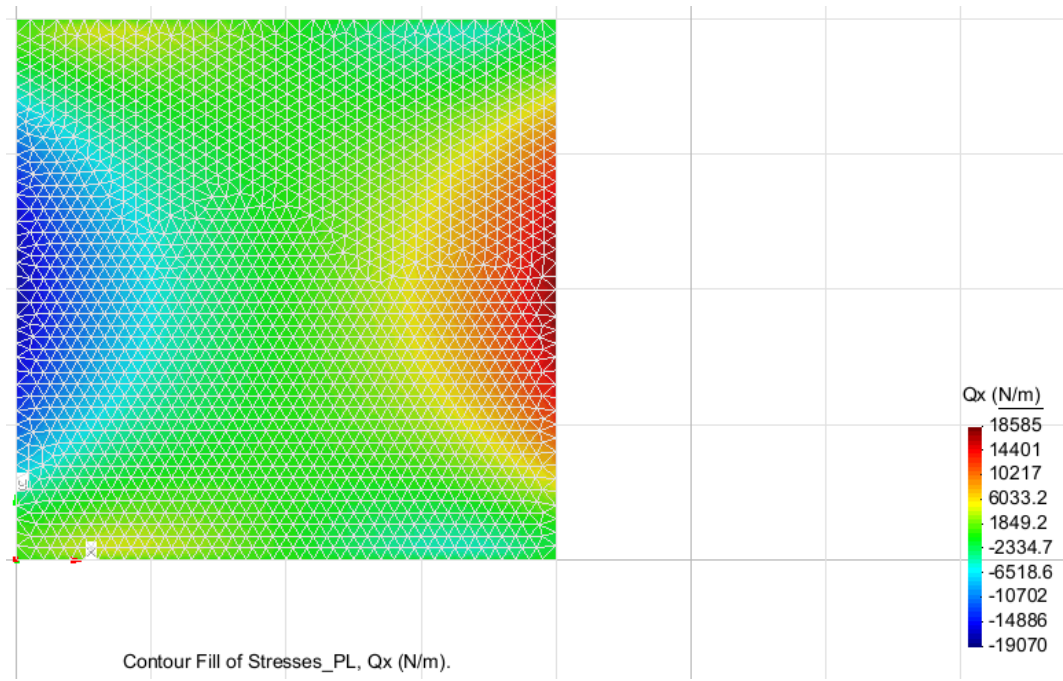
Fig.8 Stress Qx at triangular Reissner-Midlin elements with 6 nodes

Contour Fill of Stresses_PL, Qy (N/m).

Qy (N/m)
- 19059
- 14948
- 10838
- 6727.2
- 2616.7
- -1493.7
- -5604.2
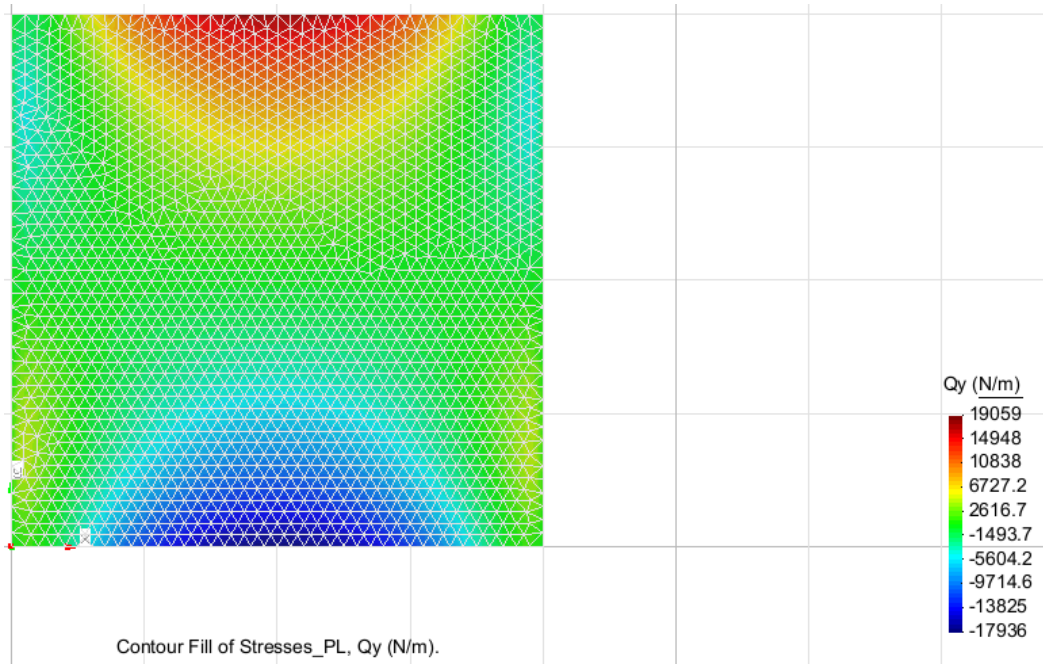- -9714.6
- -13825
- -17936

Fig.9 Stress Qy at triangular Reissner-Midlin elements with 6 nodes

Analysis:

The meshes types are finer which results in deflection in all three type to be almost similar and close to 0.

Type Qx	Max Stress (N/m)	Min Stress (N/m)
CLLL	16783	-16783
DKT	2.4905e+05	-2.9596e+05
Reissner-Midlin	18585	-19070

By analyzing the results at stress Qx in this three types of meshes we can see that in CLL that the maximum and minimum stress are equal to each other. In DKT mesh it is almost the same but the result in maximum and minimum stress are not that big enough they are close to 0. In Reissner-Midlin type mesh the result are not the same for maximum and minimum.

Type Qy	Max Stress (N/m)	Min Stress (N/m)
CLLL	16783	-16783
DKT	1.9669e+05	-2.4083e+05
Reissner-Midlin	19059	-17936

By analyzing the results at Stress Qy in the three types of the meshes we can see that in CLLL the results are exactly the same as at Qx the maximum stress is equal the minimum and equal to the same 16783 and -16783. At DKT the results are not so close to each other but they are different from the other two meshes. At Reissner-Midlin the max and min stress are not equal to each other and also greater than in the other two meshes.
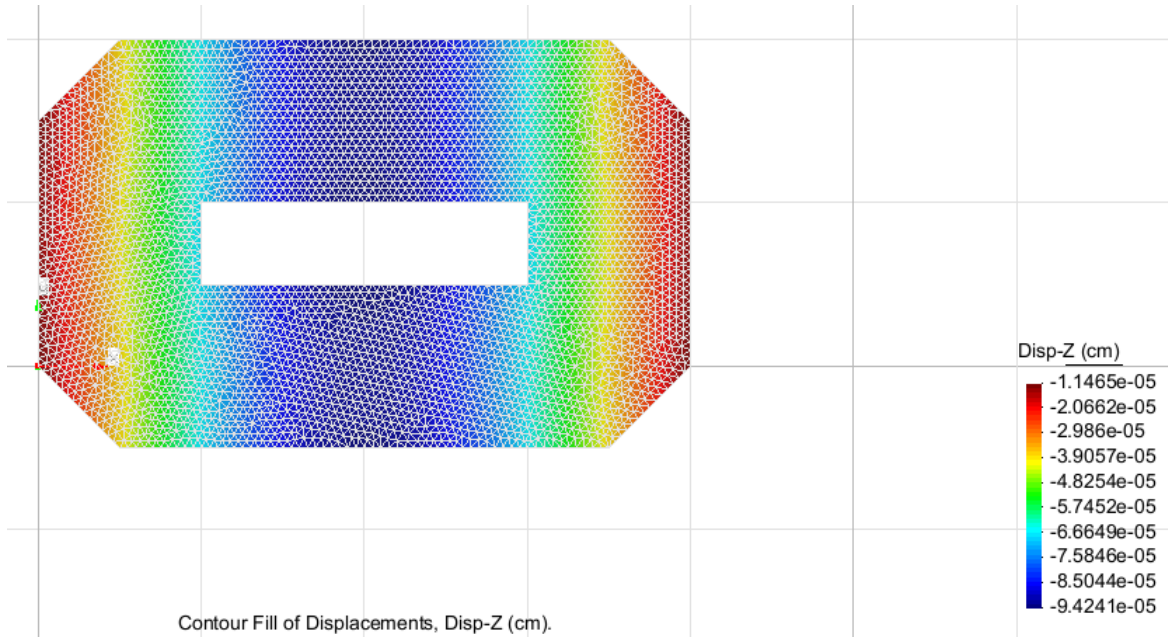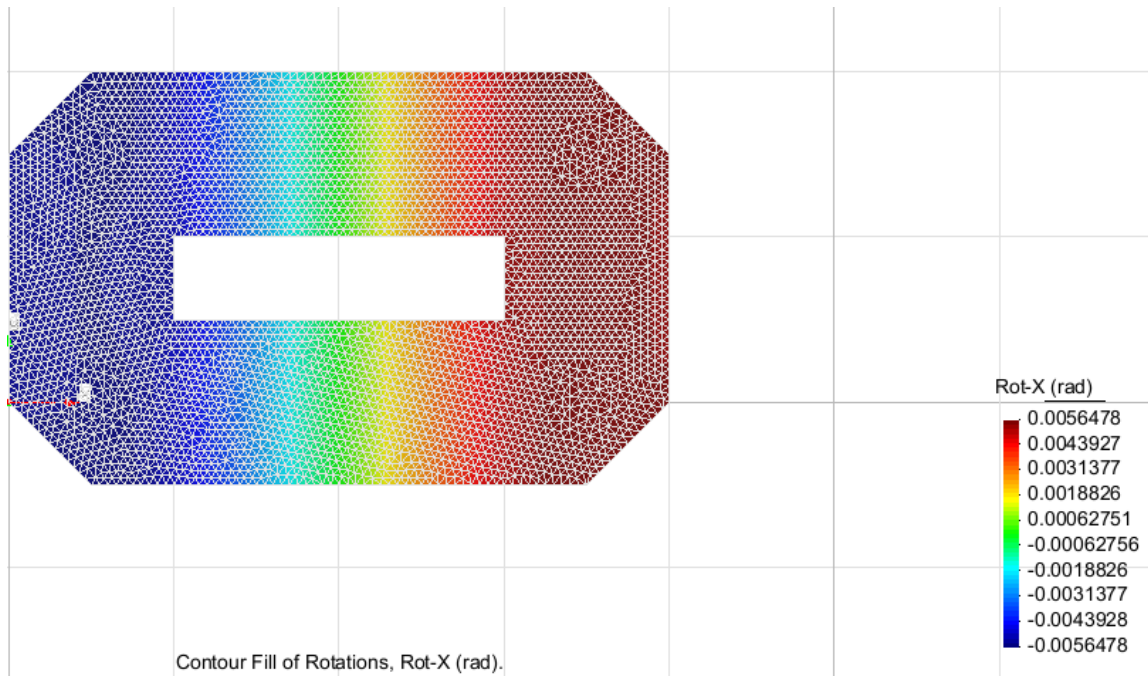
Q2 Thin plate with internal hole

Contour Fill of Displacements, Disp-Z (cm).

Disp-Z (cm)
- -1.1465e-05
- -2.0662e-05
- -2.986e-05
- -3.9057e-05
- -4.8254e-05
- -5.7452e-05
- -6.6649e-05
- -7.5846e-05
- -8.5044e-05
- -9.4241e-05

Fig.10 Displacement at Z

Contour Fill of Rotations, Rot-X (rad).

Rot-X (rad)
- 0.0056478
- 0.0043927
- 0.0031377
- 0.0018826
- 0.00062751
- -0.00062756
- -0.0018826
- -0.0031377
- -0.0043928
- -0.0056478

Fig.11 Rotation at X

Contour Fill of Rotations, Rot-Y (rad).

Rot-Y (rad)

0.00087744
0.00068249
0.00048755
0.0002926
9.7657e-05
-9.7288e-05
-0.00029223
-0.00048718
-0.00068212
-0.00087707

Fig.12 Rotation at Y

Contour Fill of Stresses_PL, Qx (kN/m).

Qx (kN/m)

2.2244
1.732
1.2396
0.74716
0.25475
-0.23766
-0.73006
-1.2225
-1.7149
-2.2073

Fig.13 Stress Qx

Contour Fill of Stresses_PL, Qy (kN/m).

Qy (kN/m)
1.6523
1.2884
0.92452
0.56064
0.19675
-0.16713
-0.53102
-0.8949
-1.2588
-1.6227

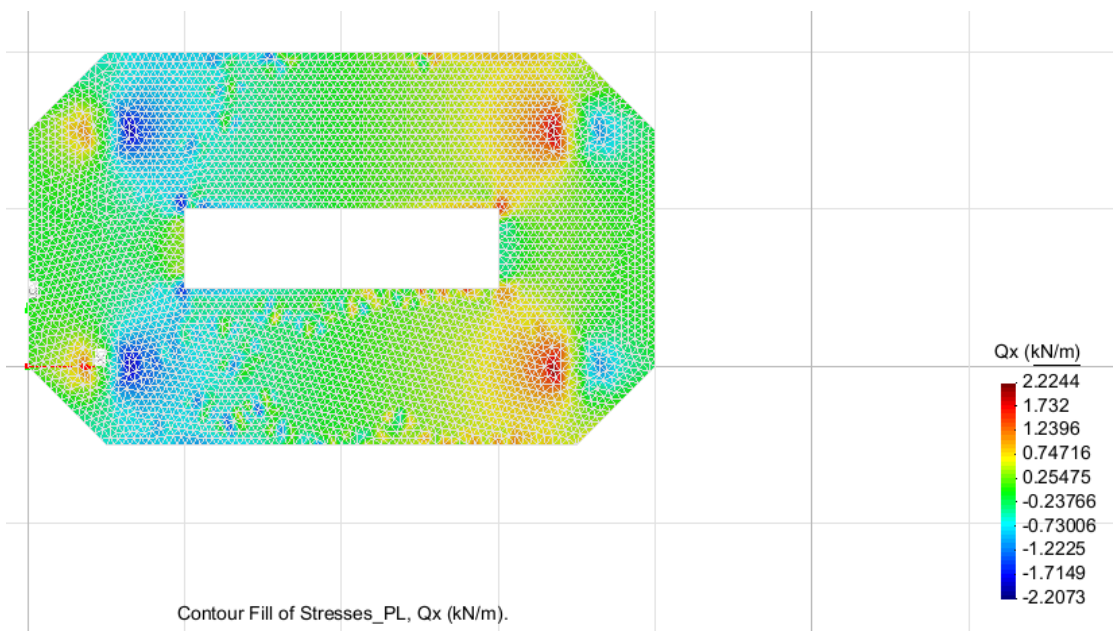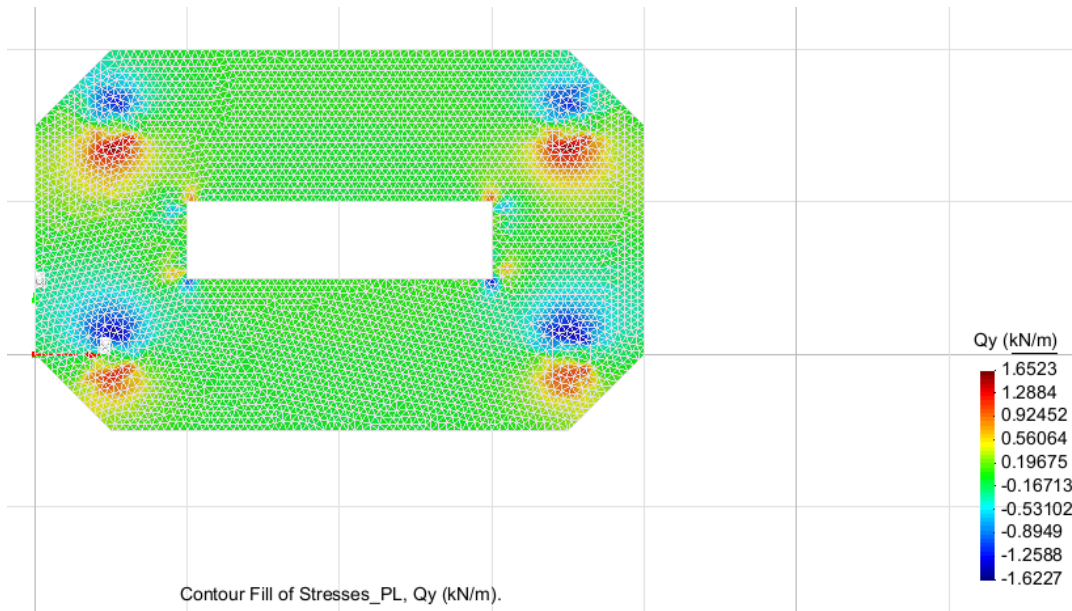**Fig.14 Stress Qy**

Analysis:

By inspection the displacement at z is very small. Also the rotation is very small and close to 0. The Stress Qx maximum is 2.2244 kN/m and the minimum -2.2073 kN/m which is bigger then the stress in Qy with maximum 1.6523 kN/m and minimum -1.6227kN/m.
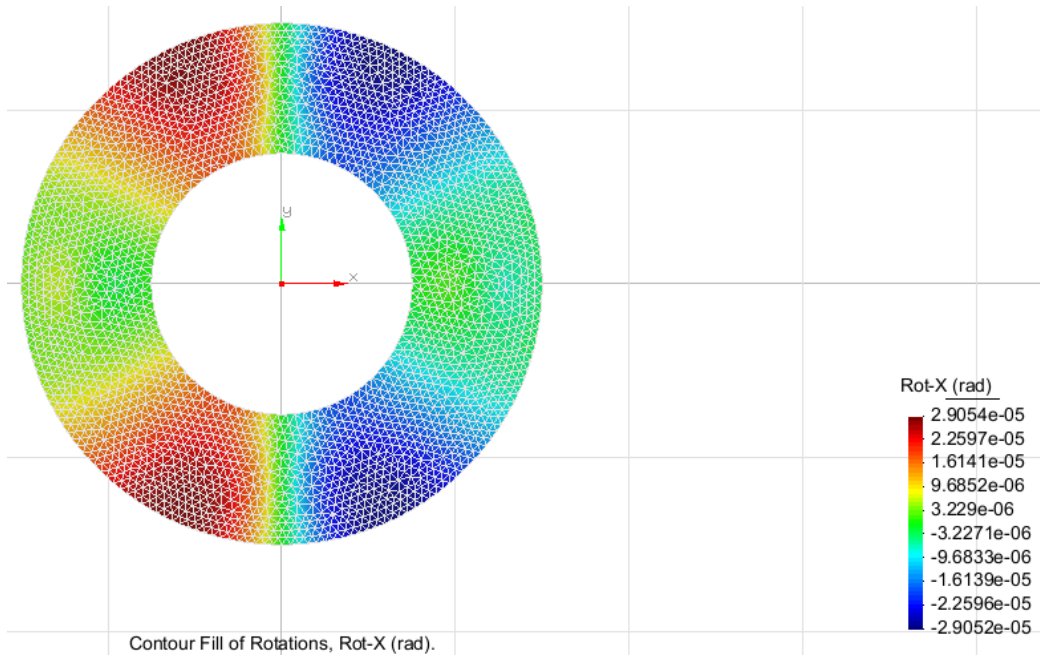
Q3 Thick circular plate with internal hole

Contour Fill of Displacements, Disp-Z (cm).

Disp-Z (cm)
-4.714e-10
-2.8136e-08
-5.58e-08
-8.3465e-08
-1.1113e-07
-1.3879e-07
-1.6646e-07
-1.9412e-07
-2.2179e-07
-2.4945e-07

Fig.15 Displacement at Z

Rot-X (rad)

2.9054e-05
2.2597e-05
1.6141e-05
9.6852e-06
3.229e-06
-3.2271e-06
-9.6833e-06
-1.6139e-05
-2.2596e-05
-2.9052e-05

Contour Fill of Rotations, Rot-X (rad).

Fig.16 Rotation at X

Rot-Y (rad)

2.9054e-05
2.2598e-05
1.6142e-05
9.6852e-06
3.2289e-06
-3.2274e-06
-9.6837e-06
-1.614e-05
-2.2596e-05
-2.9053e-05

Contour Fill of Rotations, Rot-Y (rad).

Fig.17 Rotation at Y

Contour Fill of Stresses_PL, Qx (kN/m).

Fig. 18 Stress Qx

Contour Fill of Stresses_PL, Qy (kN/m).
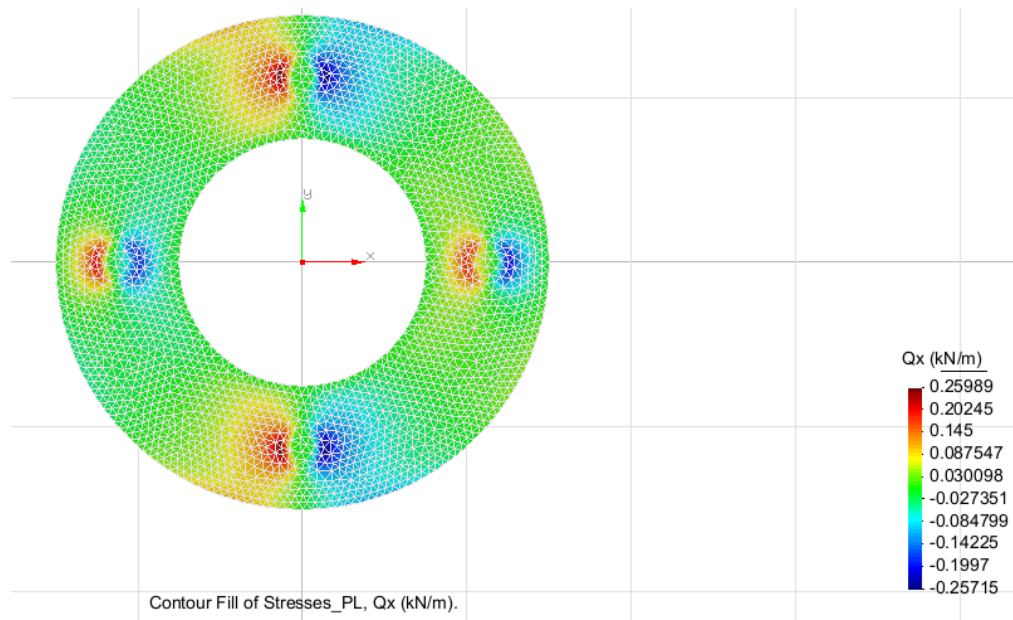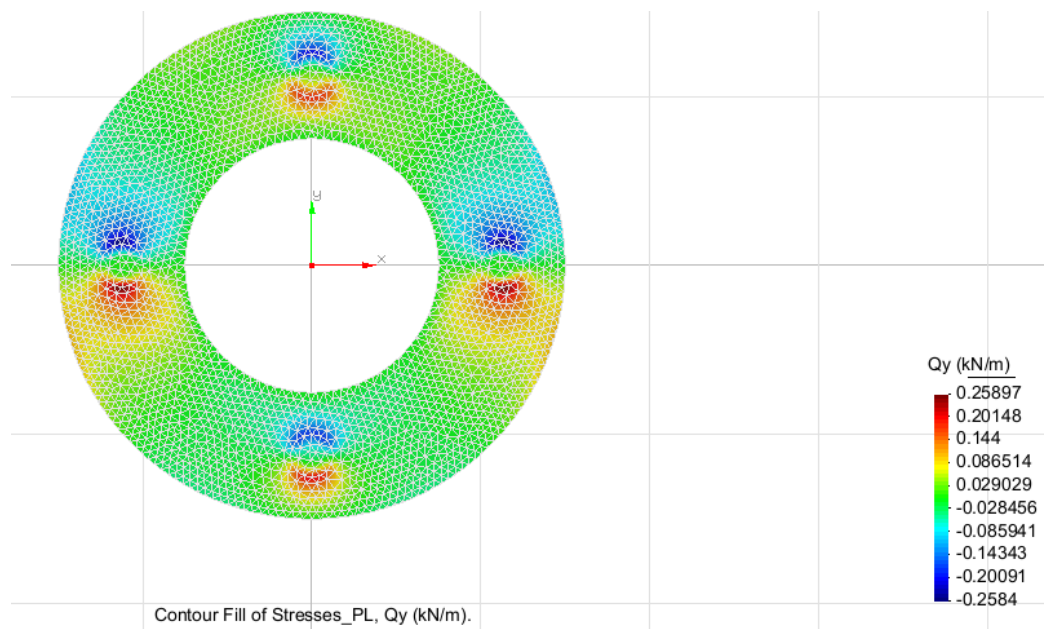
Fig.19 Stress Qy

Analysis:

The Stress at Qx maximum is 0.25989 kN/m and minimum -0.25715 kN/m. Which is almost similar to the stress at Qy with maximum of 0.25897 kN/m and -0.2584 kN/m.