

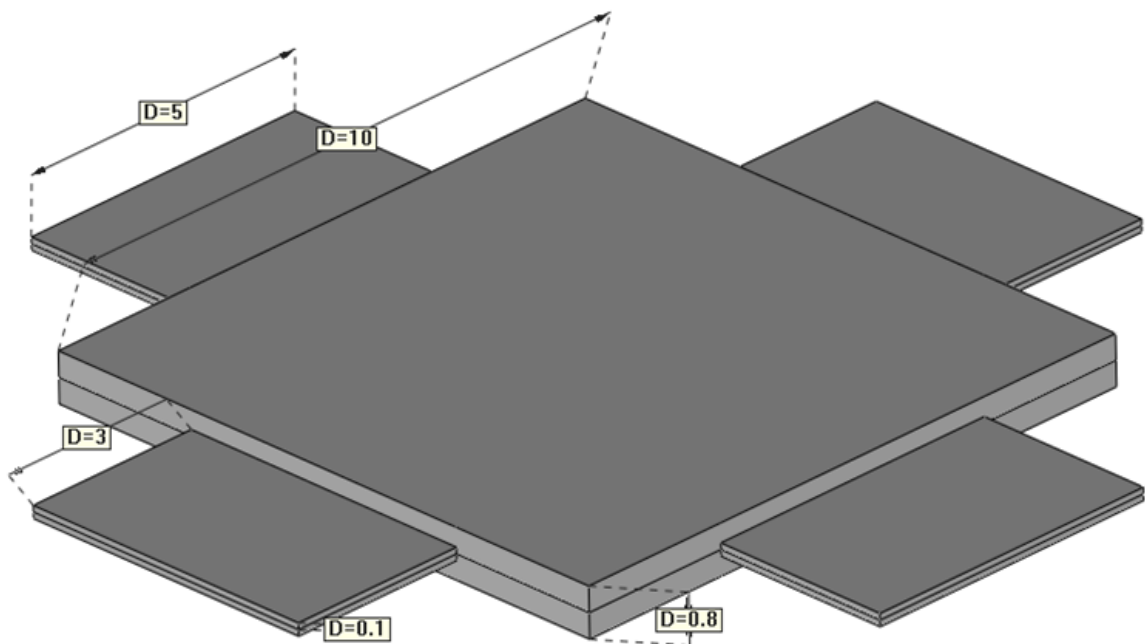
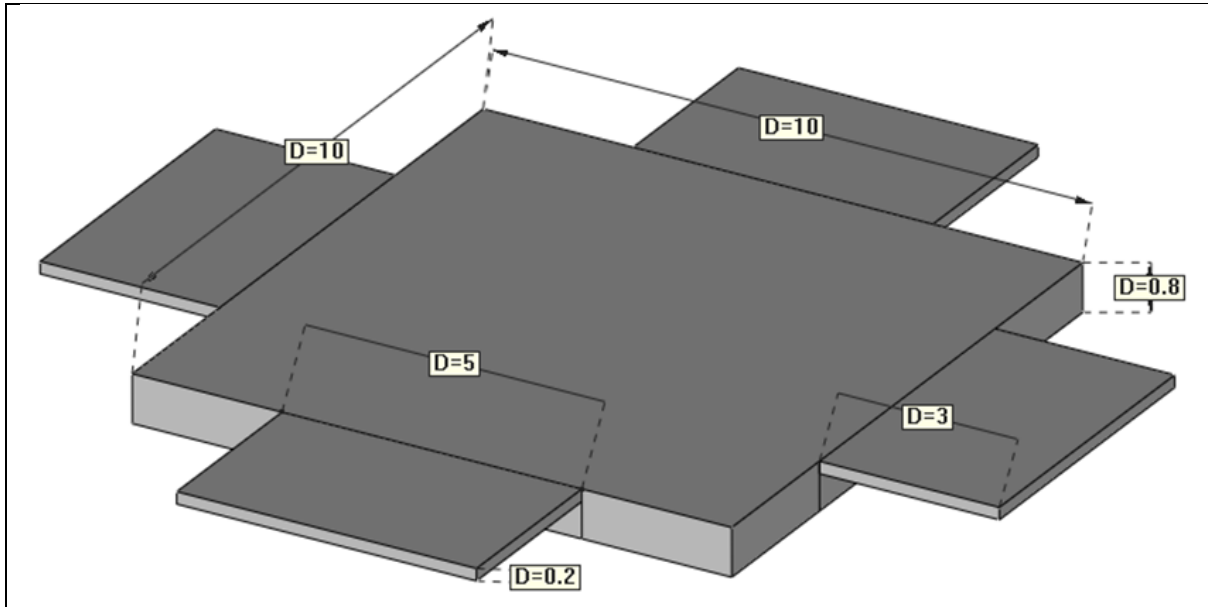
Computational Structural Mechanics **and Dynamics**

Plate

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a) Think first and answer later.

What kind of strategy (theory, elements, integration rule, boundary conditions, etc) will you use for solving the following problems:



ANS.

In fig. 1 we can see a whole plate and in fig. 2 we can see two plates welded or jointed together. Both are same, symmetric so to reduce the computation we can take advantage of symmetry along both x and y axis and we can consider only 1 quarter part of the geometry for computation.

Both the plates are thin so we should use Reissner-Mindlin theory. In fig 1 the t/L ratio is 0.5:0.8 so we have to use full Reissner-Mindlin integration theory, on the other hand t/L ratio for fig 2 is 0.25:0.8 so we have to use reduced Reissner-Mindlin integration theory.

For both the problems we should use clamped boundaries at the origin edge, and zero x directional motion and zero rotation in x as well as y direction.

To reduce computation cost as well as optimizing accuracy we can use triangular or quadrilateral element for calculation.

2. Define and verify a patch test mesh for the MCZ element. Discuss the results observed.

Ans.

For the patch test various codes are provided I choose the first one and the results are plotted. The external loads are changed to 0. The displacement field used is as follows

$$w = x + y$$

$$u = [w \ w/x \ w/y]$$

$$= [w \ 1 \ 1]$$

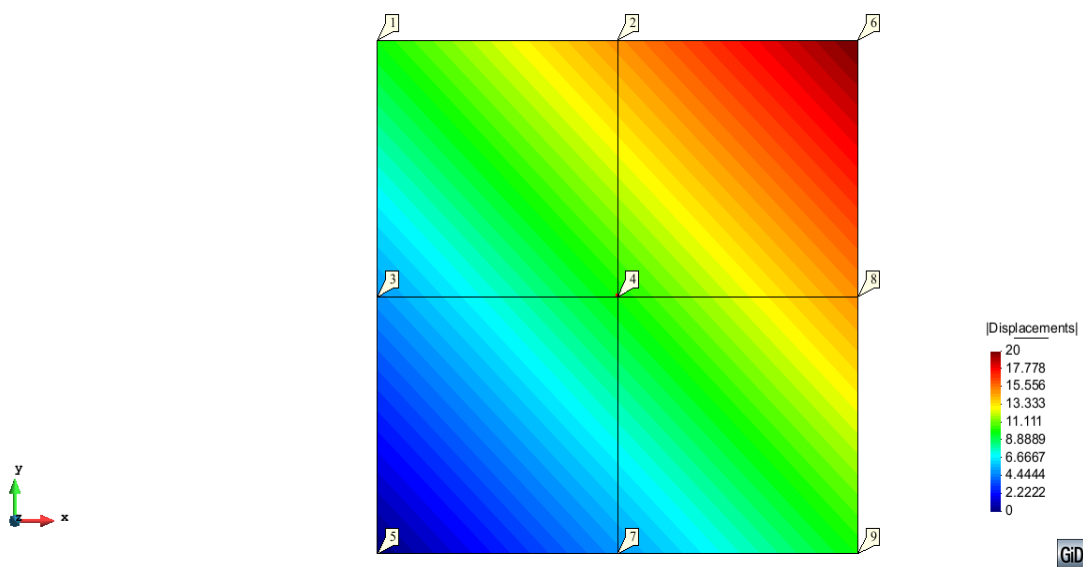
So the displacement for the boundary node is

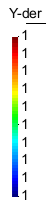
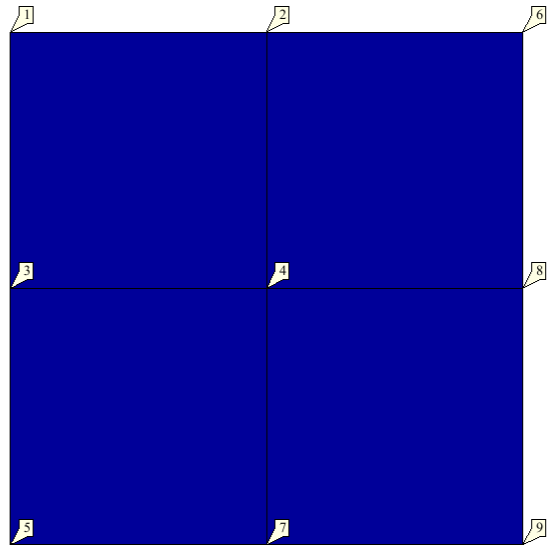
U1	10	1	1
U2	15	1	1
U3	5	1	1
U5	20	1	1
U6	10	1	1
U7	5	1	1
U8	15	1	1
U9	10	1	1

To take the results at node 4 we did the patch test

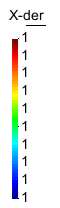
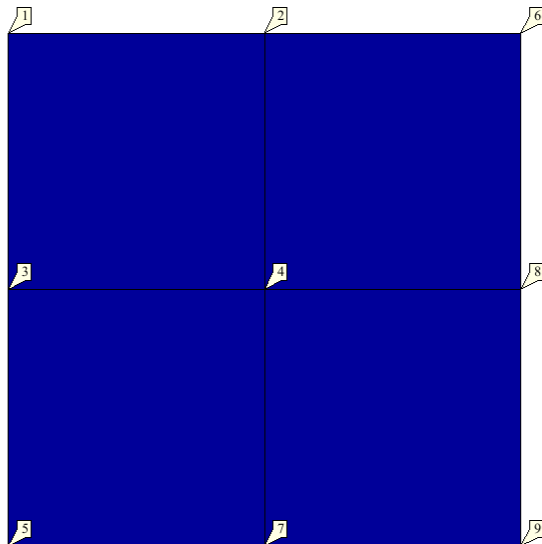
$$u_4 = [10 \ 1 \ 1]^T$$

The results are put into GiD and as per the model it shows that the actual results are 10 which matches with displacement as well bending angle is 1 which matches with prescribed displacements





GiD



GiD