Description :

A simply Supported square plate with distributed load (q).

Reference :

S.Timoshenko , S . Woinowsky , Theory of Plates and Shells , pg:116, Article : 30 .

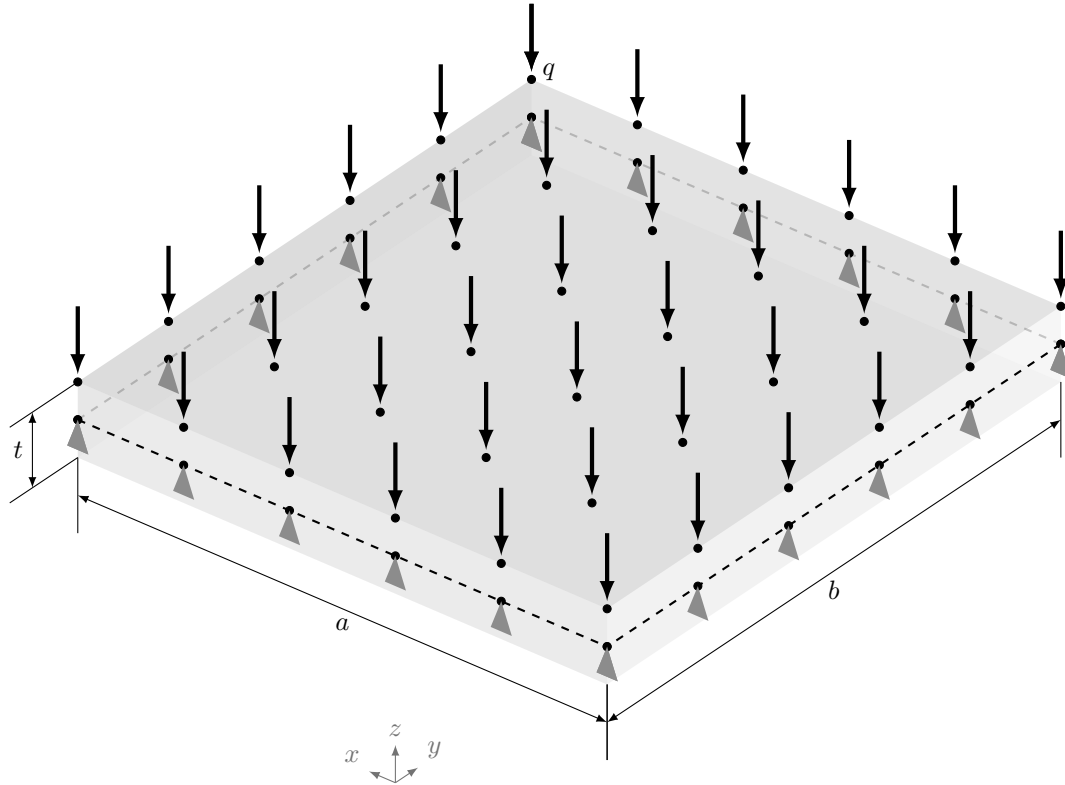**Material and Geometric data :**

Figure 1: TIM116

Table 1: Input Data

Material Property		Geometric Data		Loading Data	
Young's Modulus (E)	2E11 pa	Length (a)	10 m	Distributed Load (q)	1000 N/m^2
Poission's Ratio (ν)	0.3	Breath (b)	10 m		
		Thickness(t)	0.1 m		

Mesh and boundary condition :

Analytically solution :

The w_{max} which is the w displacement at the middle of the plate is given by

$$w_{max} = 0.00406 \frac{qb^4}{D} \tag{1}$$

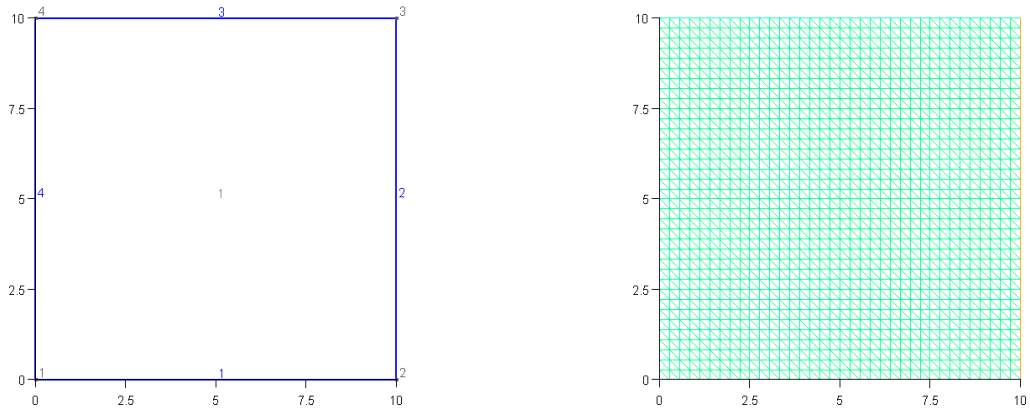The analytically solution of the problem is calculated as $w_{max} = -0.0022167m$

Figure 2: Geomentry and Mesh of TIM116

Table 2: FEM and Boundary condition data

Direchlet Boundary				Neumann Boundary			
Geo -Entity	w	θ_x	θ_y	Geo -Entity	F_z	M_x	M_y
line {1,2,3,4}	Fixed	Free	Free	Area {1}	1000 N/m^2		

Result and error analysis :

The maximum displacement of the domain is our solution . w displacement at middle is $-0.0022144m$.

$$error\% =\mid \frac{w_{analytical} - w_{FEM}}{w_{analytical}} \mid \times 100 \qquad (2)$$

So the Error percentage is 0.1%.

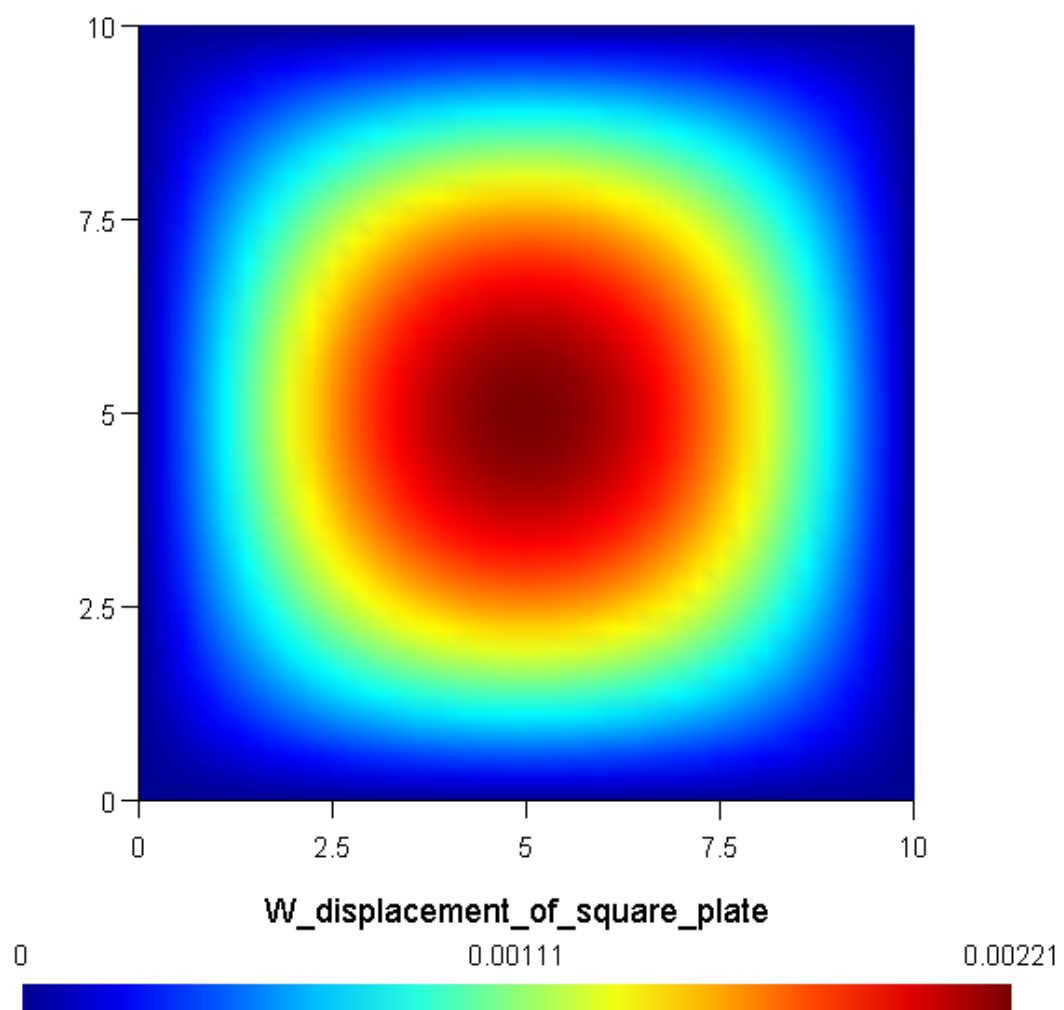W_displacement_of_square_plate

0   0.00111   0.00221

Figure 3: FEM solution plot

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