

**Description :**

Natural frequency of a square plate is analyzed and compared.

**Reference :**

NAFEMS Manual. Solution Retrieved from Ansys verification problem (VMP09-T12).

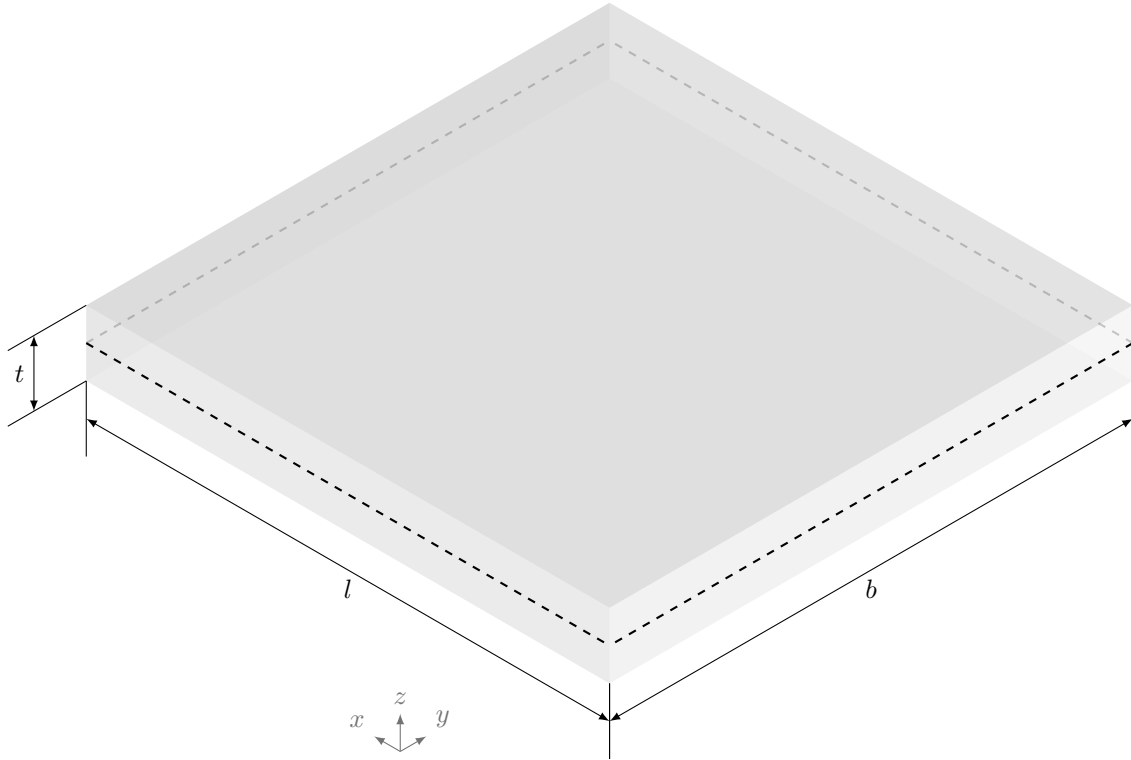
**Material and Geometric data :**

Figure 1: VMP09

Table 1: Input Data

Material Property		Geometric Data		Loading Data
Young's Modulus ( $E$ )	2E11 $pa$	Length ( $l$ )	10 $m$	Nil
Poission's Ratio ( $\nu$ )	0.3	Breath ( $b$ )	10 $m$	
Density ( $\rho$ )	8000 $Kg/m^3$	Thickness( $t$ )	0.05 $m$	

**Mesh and boundary condition :**

Table 2: FEM and Boundary condition data

Direchlet Boundary				Neumann Boundary			
Geo -Entity	$w$	$\theta_x$	$\theta_y$	Geo -Entity	$F_z$	$M_x$	$M_y$
line {1,2,3,4}	Free	Free	Free	Nil			

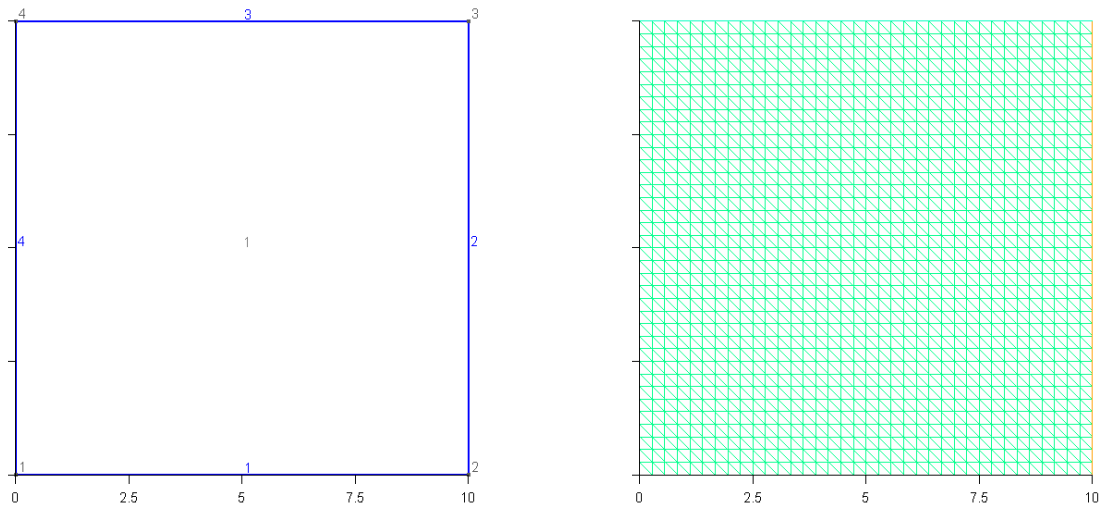


Figure 2: Geomentry and Mesh of TIM68

#### Analytically solution :

Retrieved Natural frequencies from reference manuals are

Mode 4 = 1.622  $Hz$

Mode 5 = 2.360  $Hz$

Mode 6 = 2.922  $Hz$

Mode 7 = 4.233  $Hz$

Mode 8 = 4.233  $Hz$

Mode 9 = 7.416  $Hz$

#### Result and error analysis :

The Natural modes obtained are plotted in the below figures.

For each natural frequency the error percentage is

Mode 4 = 0.0018 %

Mode 5 = 0.0042 %

Mode 6 = 0.061 %

Mode 7 = 0.911 %

Mode 8 = 0.902 %

Mode 9 = 0.645 %

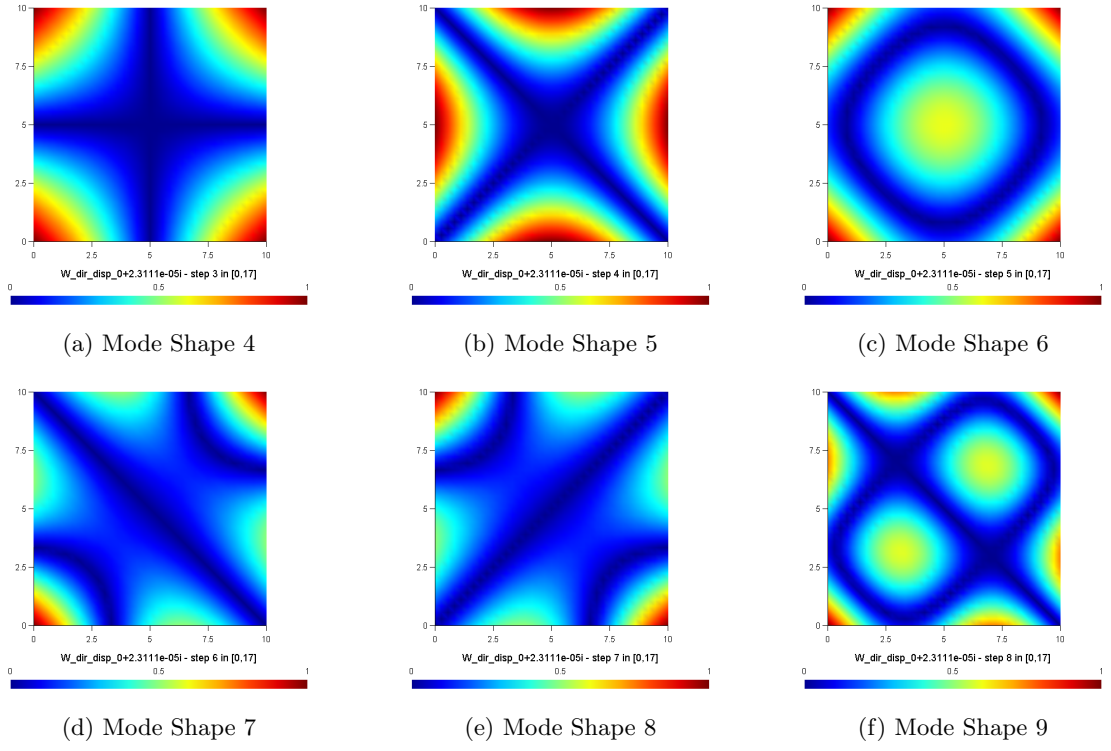


Figure 3: Natural Modes of a Square Plate