

Simply supported thin square plate

REFERENCE Selected Benchmarks for Forced Vibration, Ref . R0016, NAFEMS, Glasgow, 1993

MODEL FILENAME Thin square plate_FrDir.nfx

A dynamic system consisting of a thin square cantilever plate is shown in Figure 1. Time-variation of the load is selected: harmonic loads containing single frequency. Load is uniformly distributed spatially and applied in the transverse direction of the plate. The peak displacement and stress are obtained in the frequency domain. The results are obtained at the center point using direct method. The results from the NAFEMS benchmark problems are taken as reference.

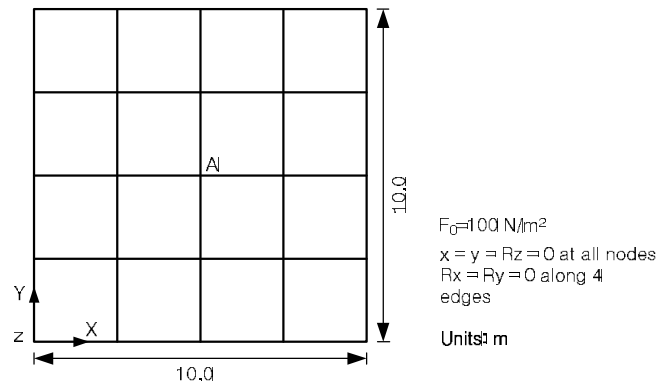


Figure.1. Simply supported thin square plate model

Material data	Young's modulus	$E = 200 \text{ GPa}$
	Poisson's ratio	$\nu = 0.3$
	Density	$\rho = 8000 \text{ kg/m}^3$
	Mass proportional damping	$\alpha = 0.299 \text{ sec}^{-1}$
	Stiffness proportional damping	$\beta = 1.339 \times 10^{-3} \text{ sec}$
Section property	Thickness	$t = 0.05 \text{ m}$
Forcing function	Harmonic	$F = F_0 \sin \omega t \quad \omega = 2\pi f$

* Rayleigh damping coefficients, α and β are chosen to give 0.02 damping in the dominant first mode.

Table 1. Peak responses and frequency of thin plate subjected to harmonic loads

		Peak u_z^A [mm]	Peak σ^A [MPa]	Peak frequency [Hz]
Reference		45.42	30.03	2.377
Element type	Number of elements	Direct	Direct	Direct
QUAD-4	8x8	45.12	31.68	2.415