

عنوان مقاله:

Theoretical, numerical, and experimental analyses of free vibrations of glass fiber reinforced polymer plates with central cutouts and free boundaries

محل انتشار:

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خلاصه مقاله:

This study explored the free vibration problem in relation to glass fiber reinforced polymer (GFRP) plates with central cutouts and free boundaries using theoretical, experimental, and numerical methods. The theoretical formulations were derived from the classical lamination plate theory. The rectangular cutout was mathematically modeled into the stiffness matrix of the plate by multiplying Heaviside distribution functions. The theoretical values for the fundamental frequency were obtained by solving the standard eigenvalue problem, and the theoretical solution was validated by comparison to the literature. Modal testing was performed in the laboratory. For additional validation, the accuracy of theoretical and experimental results was checked using the finite element method and ABAQUS. The results of all three methods agreed; thus, the applicability of the Heaviside functions to stiffness modeling of structures with cutouts was proven. It was also observed that the fundamental frequency decreased when cutout size increased.

کلمات کلیدی:

Free vibration, GFRP Plates, Cutout, Free Boundaries

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