

عنوان مقاله:

Double Fourier Cosine Series Method for the Flexural Analysis of Kirchhoff Plates on Winkler Foundations

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خلاصه مقاله:

This study presents the double Fourier cosine series method for solving the flexural problem of Kirchhoff plates resting on an elastic foundation of the Winkler type. The problem is a boundary value problem represented by a fourth order partial differential equation. For the case of simply supported edges, the Dirichlet boundary conditions are identically satisfied by double Fourier cosine series if the plate centre becomes the origin of the Cartesian coordinates. A Fourier cosine series assumption for the unknown deflection function and the known load distribution results in an algebraic problem for the unknown Fourier parameters of the series; which is solved to obtain the deflection function. The paper presents general solutions for deflection and bending moments for arbitrary transverse load distribution and specific solutions for the deflections and bending moments for the specific cases of point load at arbitrary point, and at the centre, uniformly distributed load over the entire plate and sinusoidal load. It was found that the solutions obtained in this study were exact solutions and this was because the double Fourier cosine series used for the deflection shape functions were exact shape functions that satisfies all the Dirichlet boundary conditions. Furthermore, the trial solution was made to satisfy the boundary value problem at all points in the solution domain.

کلمات کلیدی:

.Double Fourier cosine series, Kirchhoff plate, Winkler foundation, Boundary value problem

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