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Free Vibration Analysis of Non-local Annular Sector Mindlin Plates

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Abstract

The free vibration analysis of non-local annular sector Mindlin plates has been investigated. Mindlin plates at the micro/nano scale are modeled using Eringen's nonlocal elasticity theory, where the small scale effect is taken into consideration. The governing equations are derived using the nonlocal differential constitutive relations of Eringen. For this purpose, the resulted eigenvalue problem is solved numerically by applying the Chebyshev collocation method. The effects of the inner to outer radius ratio, the thickness to outer radius ratio, the nonlocal scale effect, and the boundary conditions on the natural frequencies have been studied.

Keywords: Free vibration, annular sector Mindlin plates, Eringen's nonlocal elasticity theory, Chebyshev collocation method, eigenvalue problem.

1. Introduction

Due to their significant role in different engineering and modern technology fields such as aerospace, communications, composites, electronics, microelectromechanical and nanoelectromechanical systems, micro and nano structures have gained appreciated consideration. These structures have more superior mechanical, electrical, and thermal properties comparing to other structures at the normal length scale. The properties make them ideal for use in highly sensitive and high frequency devices for different applications [1].

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