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Abstract

The purpose of this research is to analyse the free vibration of composite laminated conical shells based on higher order shear deformation theory. The vibrational behavior of multi-layered conical shells are analyzed for simply suppoted end condition. The coupled differential equations in terms displacement and rotational functions are obtained. These displacement and rotational functions are invariantly approximated using cubic and quantic spline. A generalized eigenvalue problem is obtained and solved numerically for an eigenfrequency parameter and an associated eigenvector of spline coefficients. The different materials are used to show the parametric effects of shell's length ratio, cone angle, stacking sequence and number of lamina on the frequency of the conical shells. The numerical results obtained using spline approximation are validated through exsisting literature.

Key words: free vibration, higher order shear deformation, composite, splines, conical shells

1. Introduction

Composite laminates exhibits a greater scatter as compared to single layer and homogenous material structures owing to large number of parameters associated with manufacturing processes. Composite materials have the ability to tailor the mechanical properties. Moreover, the composite offer high stiffness to weight ratio, strength to weight ratios, better temperature resistant and shock absorbent characteristics than the homogeneous ones. It is also that the laminated composite plates exhibit large thickness effects than the structures made of homogeneous materials.

Number of higher-order theories were developed to accurately evaluate the transverse shear stresses which effectively exists in thick shells. In higher-order theories the displacements are expanded up to any desired degree in trems of thickness coordinates