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NATURAL FREQUENCIES AND MODE SHAPES OF CLAMPED STIFFENED COMPOSITE CONOIDS WITH CUTOUTS

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Abstract: *Natural frequency and mode shapes of clamped stiffened composite conoidal shells with cutout are analyzed using finite element code developed for the purpose by combining an eight noded curved shell element with a three noded curved beam element. The code is validated by solving benchmark problems available in the literature and comparing the results. The size of the cutouts and their positions with respect to the shell centre are varied for cross-ply and angle-ply laminated composite conoids. The effects of these parametric variations on the fundamental frequencies and mode shapes are considered to help practicing engineers dealing with stiffened composite conoids with cutouts central or eccentric.*

Keywords: *laminated composites; stiffened conoidal shell; cutout; clamed; finite element.*

INTRODUCTION

Laminated composite structures are used in various fields of aerospace and civil engineering due to their high specific strength and stiffness. Conoidal shells are used to cover large column free areas. Application of conoids in medical, chemical and food processing industries often necessitates cutouts for the passage of light and service lines. The margins of the cutouts are stiffened to take account of stress concentration effects. An in-depth study including bending, buckling, vibration, impact etc. is required to exploit the possibilities of these curved forms. A generalized formulation for the doubly curved laminated composite shell has been presented using the eight-noded curved quadratic isoparametric finite elements.

Research on conical shell was carried by many researchers like Choi (1984), Ghosh and Bandyopadhyay (1989, 1990), Dey *et al*. (1992) and Das and