

USING AN IMPROVED HSDT-DEFORMATION THEORY IN ORDER TO BUILD UP A MATHEMATICAL MODEL FOR THE VIBRATIONS OF AN ORTHOTROPIC COMPOSITE BAR MAKING A SPATIAL MOTION

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Rezumat. Acest articol arată cum se poate construi un model matematic pentru vibrațiile unei bare compozite având simetrie elastică (ortotropică) considerând mai întâi mișcarea sa ca un solid rigid și, apoi, considerând o teorie a deformațiilor HSDT de ordinul al treilea în acord cu condițiile de compatibilitate Saint-Venant și, într-un mod foarte original, a condițiilor Gay pentru mișcarea barei ca un corp deformabil. În final este arătat un algoritm bazat pe diferențe divizate pentru a rezolva modelul.

Abstract. This workpaper shows how to build up a mathematical model for the vibrations of a composite bar having elastic symmetry (orthotropic) considering first its motion as "rigid" body and, next, considering an HSDT-deformation theory of third order in full respect of Saint-Venant compatibility conditions and – in a very original way – of Gay conditions for the motion of the bar as a deformable body. Finally, a divided differences based algorithm designed to solve the mathematical model is shown.

Keywords: HSDT-Deformation, Model, Composite, Vibrations

1. Introduction

There are a lot of attempts to model the elastic behavior and dynamics of composite materials [1], [2] and, especially the elastic behavior and dynamics of composite bars [3], [4].

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