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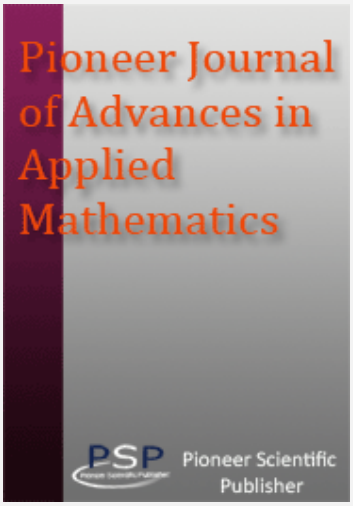

THE EFFECT OF A RESIDUAL STRESS ON WAVE PROPAGATION IN A FLUID-FILLED LAYERED AND FIBERED THICK ELASTIC TUBE

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Abstract

In this study, the propagation of harmonic waves in an initially inflated and axially stretched, elastic tubes filled with viscous fluid is studied. The fluid is assumed to be incompressible and Newtonian. An incompressible, homogeneous, anisotropic and two-layer cylinder where the layers correspond to the Media and Adventitia elastic structural model is used for the compliant arterial wall. The tube is subjected to an initial static inner pressure, an axial stretch and residual circumferential stress caused by opening angle. The governing differential equations of the tube are obtained in cylindrical coordinates, utilizing the theory of "Superposing small deformations on large initial static deformations". The analytical solutions of the equations of motion for the fluid have been obtained. Due to variability of the coefficients of the resulting equations for the solid body, they are solved by finite-difference method. The dispersion relation is obtained as a function of the axial stretch, opening angle and material parameters. The wave speeds and transmission coefficients are numerically calculated and the results are discussed on graphics.

Keywords and phrases: opening angle, constitutive equations, dispersion relation, blood flow.