Out-of-Plane Free Vibrations of Circular Rods

Authors : Faruk Firat Çalim, Nurullah Karaca, Hakan Tacettin Türker

Abstract : In this study, out-of-plane free vibrations of a circular rods is investigated theoretically. The governing equations for naturally twisted and curved spatial rods are obtained using Timoshenko beam theory and rewritten for circular rods. Effects of the axial and shear deformations are considered in the formulations. Ordinary differential equations in scalar form are solved analytically by using transfer matrix method. The circular rods of the mass matrix are obtained by using straight rod of consistent mass matrix. Free vibrations frequencies obtained by solving eigenvalue problem. A computer program coded in MATHEMATICA language is prepared. Circular beams are analyzed through various examples for free vibrations analysis. Results are compared with ANSYS results based on finite element method and available in the literature.

Keywords : circular rod, out-of-plane free vibration analysis, transfer matrix method

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