Deformation analysis of forced 3-D beams under rotating condition

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ABSTRACT

The deformation behavior of rotating beams with linear pre-twisted angle along the length are studied in details using finite element analysis based on theory of three dimensional beam elements. Application of Hamilon's principle of dynamics leads to equations of motion of an element, where the consistent mass matrix, the linear stiffness matrix, the inertial damping and stiffnes matrices due to frame rotation, and the geometric stiffening stiffness matrix due to tension preload (centrifugal foces) are derived. A structural module for analysis of deformation is then developed to find the deformation of beams under rotating condition.Various geometric parameters of the beams as well as a number of total pre-twisted angles,beam root angles, beam rotating speed, and radii o hub, are assumed so that effects of such parameters on the displacement of the rotating beams may be realized.

Keywords : pre-torsion angle、rotating beam、hamiliton law、displacement、pretension

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