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Static and Dynamic Analysis of Hyperboloidal Helix Having Thin Walled Open and Close Sections

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Abstract : The static and dynamic analyses of hyperboloidal helix having the closed and the open square box sections are investigated via the mixed finite element formulation based on Timoshenko beam theory. Frenet triad is considered as local coordinate systems for helix geometry. Helix domain is discretized with a two-noded curved element and linear shape functions are used. Each node of the curved element has 12 degrees of freedom, namely, three translations, three rotations, two shear forces, one axial force, two bending moments and one torque. Finite element matrices are derived by using exact nodal values of curvatures and arc length and it is interpolated linearly throughout the element axial length. The torsional moments of inertia for close and open square box sections are obtained by finite element solution of St. Venant torsion formulation. With the proposed method, the torsional rigidity of simply and multiply connected cross-sections can be also calculated in same manner. The influence of the close and the open square box cross-sections on the static and dynamic analyses of hyperboloidal helix is investigated. The benchmark problems are represented for the literature.

Keywords : hyperboloidal helix, squared cross section, thin walled cross section, torsional rigidity
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