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On numerical analysis of axisymmetric thick circular cylindrical shells based on higher order shell theories by segmentation method

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Abstract

Numerical analysis is carried out in this paper for thick circular cylindrical shells using higher order shell theory. In orthogonal curvilinear coordinate system, all equations are derived with the inclusion of the additional quadratic and cubic terms in the Taylor's series expansions of the both in-plane as well as the transverse displacement components for the improvement of bending behaviour of the shell. Assuming $(h/R)^2 \ll 1$, a rigorous formulation involving the reduction of a three-dimensional elasticity problem to a two-dimensional one, based partly upon the Reissner's variational principle, is presented. These equations are algebraically manipulated to be in the form of a coupled system of first-order differential equations in terms of the intrinsic dependent variables. These are then solved by a segmentation method – numerical integration technique for various combinations of material and geometric parameters. The theory is shown to result in a partial differential equation system of sixteenth order.

Keywords

Higher order shell theory, segmentation method, sandwich cylinder, clamped free cylinder

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