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Elasto-plastic behaviour of sandwich cylindrical shell panels with a flexible core

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The linear static elasto-plastic behaviour of sandwich cylindrical shell panels under a generally distributed loading with thick flexible core is studied. The core modeling is based on high-order theory (HOT) of sandwich structures in which the in-plane stresses of the core are neglected. The faces are modeled based on Kirchhoff-Love shell theory. The materials of the faces and the core are assumed to be isotropic with linear work hardening behaviour. The incremental Prandtl-Reuss plastic flow theory is used in this analysis. Using the principle of virtual displacements, the governing equations are derived and solved for any sort of boundary conditions based on an iterative elastoplastic harmonic differential quadrature method (EP-HDQM). To validate the results of present study, various responses in different sandwich shell panel configurations are compared with the results from finite element software Ansys. The results obtained provide a good insight into the design of sandwich shell panels. The results show that by increasing the core to the face thickness ratio (hc/hf) or decreasing the core flexibility, the lateral loading corresponding to the initiation of yield increases. By increasing the flexibility of the core, the effect of hc/hf on initiation of yield is negligible. Furthermore, the core yields after the faces and the plastic region in the core develops faster than the faces. Finally, by increasing the plastic modulus of the core material, the lateral loadings corresponding to the yielding of the 25, 50, and 90% of the three layers increase.

Biography

Famida Fallah is an Assistant Professor and the Vice-Chair for student and cultural affairs of Mechanical Engineering School at Sharif University of Technology. She received her PhD at 2009 from this University. She started her career in Aerospace Research Institute as a Faculty member and the Dean of academic affairs. After 3 years, she got a tenure-track position at Sharif University of Technology. Some teaching courses are Statics, Strength of Materials I and II, Continuum Mechanics, and Theory of Plates and Shells. She has published 9 papers in reputed journals and has been serving as a reviewer for some well-known journals.

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