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Numerical Modelling of Laminated Shells Made of Functionally Graded Elastic and Piezoelectric Materials

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Abstract : This paper focuses on implementation of the sampling surfaces (SaS) method for the three-dimensional (3D) stress analysis of functionally graded (FG) laminated elastic and piezoelectric shells. The SaS formulation is based on choosing inside the nth layer In not equally spaced SaS parallel to the middle surface of the shell in order to introduce the electric potentials and displacements of these surfaces as basic shell variables. Such choice of unknowns permits the presentation of the proposed FG piezoelectric shell formulation in a very compact form. The SaS are located inside each layer at Chebyshev polynomial nodes that improves the convergence of the SaS method significantly. As a result, the SaS formulation can be applied efficiently to 3D solutions for FG piezoelectric laminated shells, which asymptotically approach the exact solutions of piezoelectricity as the number of SaS In goes to infinity.

Keywords : electroelasticity, functionally graded material, laminated piezoelectric shell, sampling surfaces method
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