World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:18, No:02, 2024

3D Elasticity Analysis of Laminated Composite Plate Using State Space Method

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Abstract : Laminated composite materials have considerable attention in various engineering applications due to their exceptional strength-to-weight ratio and mechanical properties. The analysis of laminated composite plates in three-dimensional (3D) elasticity is a complex problem, as it requires accounting for the orthotropic anisotropic nature of the material and the interactions between multiple layers. Conventional approaches, such as the classical plate theory, provide simplified solutions but are limited in performing exact analysis of the plate. To address such a challenge, the state space method emerges as a powerful numerical technique for modeling the behavior of laminated composites in 3D. The state-space method involves transforming the governing equations of elasticity into a state-space representation, enabling the analysis of complex structural systems in a systematic manner. Here, an effort is made to perform a 3D elasticity analysis of plates with cross-ply and angle-ply laminates using the state space approach. The state space approach is used in this study as it is a mixed formulation technique that gives the displacements and stresses simultaneously with the same level of accuracy.

Keywords : cross ply laminates, angle ply laminates, state space method, three-dimensional elasticity analysis
Conference Title : ICCS 2024 : International Conference on Composite Structures
Conference Location : London, United Kingdom
Conference Dates : February 12-13, 2024