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复合材料层合板壳通用单元和等网格加筋板壳的局部稳定性

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A GENERAL FINITE ELEMENT OF LAMINATED COMPOSITE AND LOCAL STABILITY OF ISOGRID PLATE AND SHELL

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摘要

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摘要 本文根据多变量拟协调罚函数法构造了15自由度三角形复合材料层合板壳厚薄通用单元。文中以各向同性和等网格加筋板壳的局部稳定性为算例,证明了该单元的有效性,并讨论了结构跨厚比 a/h ,弹性模量比 E_1/E_2 、铺设角,铺层数以及边界支承条件与剪切效应和耦合效应间的关系。

关键词:

Abstract: The present paper, by using Tang's multi-variable quasi-conforming and penalty element technique, establishes a general propose shear flexible triangular finite element for laminated composite plates and/or shells, which can be afforded for stress and stability analysis of practical, engineering laminated composite structures. The element consists of two-rotation and three displacement variables as generalized degrees of freedom per node. Numerical examples for local stability analysis are presented for isotropic plates and laminated composite isogrid plates and shells as well. Based on the examination of numerical results, the following conclusion are given: (1)The shear effect on the critical load of laminated composite plates would be gradually strengthened as the ratio of thickness to span of the plate or the ratio of moduli E_1/E_2 increases. (2)The shear effect on the critical load of laminated composite plates would be gradually strengthened as the supporting constraints along the edge of plate are strengthened. (3)The shear effect on the critical load of the triangular laminated composite plate would be stronger than of the square laminated composite plate with the same ratio of thickness to span, moduli E_1/E_2 , and the same supporting constraints along the edge.

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