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基于广义哈密顿原理Pflüger柱与简支板的有限元模型

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FINITE ELEMENT MODELS BASED ON A GENERALIZED HAMILTON'S PRINCIPLE FOR PFLUGER'S ROD AND ITS RELATIVE PLATE

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摘要

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摘要 本文首先对Pflüger柱以简单的方式与工程上习惯的形式列出它的广义哈密顿变分泛函,遂使这一非保守问题广义保守化。据此变分原理进行了有限元离散尝试性试验、讨论了这种有限元离散的特点、以显式提供了一种单元模型全部对称的矩阵。在证实Pflüger柱以发散型失稳之后,指出采用通常的瑞利商迭代技术便可简单地获得临界载荷。算例印证了理论也显示了数值上的效力。对于类似的简支矩形板,文中指出可利用Pflüger柱的单元矩阵简单地获得板有限条模型的有关矩阵。

关键词:

Abstract: A generalized Hamilton's principle for analysis of Pflüger's rod and its relative plate is provided in engineering form by a quite simple approach, so that the problem of a nonconservative system is transformed into that of a generalized conservative system. According to this variational principle, an attempt to undertake the discrete tests of finite elements has been made and the features of the finite models are discussed in brief. A set of symmetric matrices for an element model are given in explicit form. After it is confirmed that instability of pflüger's rod is caused by divergence, not by flutter, it is pointed out that the critical load can be determined by applying the conventional iterative technique for Rayleigh quotient. Some numerical examples have verified this model. At last, as an interesting extension, a finite stripe model for analysis of simply supported rectangular plate subjected to follower forces has been derived by using the matrices mentioned above and tested preliminarily.

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