论文摘要

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弹性地基上非线性弹性材料矩形薄板的弯曲

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摘　　要：平板的非线性问题,除几何上的非线性效应外,还有物理上的非线性.探讨了弹性地基上矩形薄板的物理非线性问题.以整幂次多项式应力-应变本构关系为基础,根据Kirchheff-levy薄板理论和Iliushin小弹塑性形变理论,建立了非线性弹性材料矩形薄板的总势能表示式,得出用Ritz法求解所需的含待定参数的线性方程组,并以弹性地基承受均布荷载的四边简支矩形板为例,计算出总势能,进而得出所承受的荷载与板中间挠度的关系式.研究结果表明,物理非线性对挠度的影响可用1个3次方程表达,这对某些设计工程是不容忽视的.

关键字：平板;弹性地基; Ritz法;弯曲

Bending of rectangular plates with non-linear elastic material on elastic foundation

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Abstract: In addition to geometric nonlinear effect, nonlinear problem of plate is physically nonlinear. The former was studied by many researchers, the latter was few. In recent years because of research, development and application of new material, new mechanical model should be constituted. This paper considered physical nonliear problemof the thin rectangular plates with elastic foundation. The author, depending on powder polynomial stress-strain constructive relationship, by Kirchheff-levy theory of the thin plates and small elastic-plastic deflection theoryof the Iliushin, established formulation of all the potential energy of rectangular thin plates using nonlinear elastic characteristic of material, and obtained linear equation group with nondeterminate parameter using Ritz method. The author took a rectangular thin plate simply supported along its all boundary, carrying a uniformly distributed load, for example, calculated all potential energy, obtained relationship carrying load and deflection plates middle surface. The results show physical nonlinear effective on deflection can be expressed as a cubic equation.

Key words:plate; elastic foundation; Ritz method; bending