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层状横观各向同性地基上异性矩形薄板的弯曲解析解

Bending analytic solutions of anisotropic rectangular plates with four free edges on the transversely isotropic elastic multilayered subgrade

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中文关键词： 横观各向同性 层状地基 各向异性 四边自由矩形薄板 弯曲 解析解

英文关键词:transversely isotropic multilayered subgrade anisotropic rectangular thin plate with four free edges bending analytic solution

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中文摘要:

选用更具广泛性的层状横观各向同性弹性地基模型，来分析四边自由各向异性矩形地基板的弯曲解析解。先基于直角坐标下横观各向同性体的静力胡海昌通解，借助双重傅换及矩阵传递法，获得层状横观各向同性地基的静力位移场和应力场；然后将异性薄板的弯曲控制方程，与基于层状横观各向同性弹性地基的位移解建立的板与地基变形协调方程合，先按对称性分解，再用三角级数法，得出层状横观各向同性弹性地基上四边自由各向异性矩形薄板的弯曲解析解，包括地基反力、板的挠度及板的内力的解析表达式。克服了的弊端，取消了对地基反力的假设，且避免了矩阵指数函数的计算；同时考虑了地基的层状性及板和地基的各向异性，从而得到板的内力及地基反力更切实际的分布规律。算例结献的有限元结果吻合良好，证明本文方法是切实可行的。

英文摘要:

In this paper,the bending solutions of anisotropic rectangular thin plate with four free edges on the transversely isotropic elastic multilayered subg were analyzed.First,based on Hu Haichang's theory and using Fourier transformation and transferring matrix method,both displacement and stress of the transv isotropic elastic multilayered subgrade can be achieved.Then it combines the governing equation of bending of anisotropic rectangular thin plate with four f edges on the elastic foundation with deformation compatibility equation of the plate and foundation based on static integral transform solution of the displacement on the transversely isotropic elastic multilayered subgrade loaded with arbitrary vertical load.According to symmetrical decomposition and then triangular series method,we obtained the analytical bending solution of anisotropic rectangular thin plate with four free edges on the transversely isotropi elastic multilayered subgrade.That is,the analytical expressions of the foundation reaction force,the deflection of the plate and the internal force of the were derived.It overcomes the drawbacks of the numerical method,cancels the assumptions of the ground reaction force,and avoids the calculation of the matri exponential function; as well as considers the layer of the foundation and the difference between the plate and the foundation,so as to obtain more realisti distribution law of the internal force of the plate and the foundation reaction.The agreements between the numerical results and the literature results prov the method in this paper is practical and achievable.

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