水 利 学 报
JOURNAL OF HYDRAULIC ENGINEERING
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考虑底面摩阻效应的弹性地基梁微分算子级数法

Differentiator series calculation method for beams on elastic foundation considering frictional effect of bottom surface

中文关键词: 弹性地基梁 纵横向耦合变形 底面摩阻效应 微分算子 微分算子级数法

英文关键词: beam on elastic foundation vertical-horizontal coupling distortion frictional effect of bottom surface differential operator differentiator series calculation method

基金项目:

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中文摘要:

假定地基为具有切向和法向反力的弹性支承体，考虑弹性地基梁的纵横向耦合变形，根据弹性力学基本原理，从梁体微段分析出发，结合小变形条件下梁体几何方程和线弹性本构关系，导得考虑摩阻效应时关于法向位移和切向位移的微分方程组：在此基础上利用微分算子级数法对微分方程组进行求解，得到考虑纵横向耦合变形和底面摩阻效应时地基梁法向挠度和切向相对位移计算公式。最后对一个地基梁实例进行了计算分析，并对摩阻效应进行了讨论。结果表明，微分算子级数法解答能有效地考虑地基梁纵横向耦合变形特征和底面摩阻效应。

英文摘要:

The subgrade is assumed to be a hinge-spring system with tangential and normal reactions, con? sidering the vertical-horizontal coupling distortion of beam on elastic foundation. Based on the principles of elasticity and analysis of micro-segment of beam, the differential equation of normal displacement and tangential displacement under the condition of small deformation is deduced, in which the combination of geometric equation and linear-elastic constitutive equation of beam are considered. The differential equation is solved by means of differentiator series calculation met-hod, and the calculation formulas for normal deflection and tangential relative displacement are deduced considering vertical-horizontal coupling distortion and frictional effect of bottom surface. An example for beam on elastic foundation is analyzed and frictional resistance is discussed. The results show that the vertical-horizontal coupling distortion and effect of tangential frictional resistance can be considered effectively in the differentiator series calculation method.

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