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下卧基岩双层地基上刚性圆板的扭转振动

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摘要 运用积分变换的方法研究了下卧基岩双层地基上刚性圆板在简谐扭矩作用下的动力响应问题。假设地下水位以上地基为单相弹性层，以下为饱和两相介质，结合上表面为混合边界条件、下边界为刚性基岩以及弹性层与饱和土层接触面处位移和应力连续等条件，得出了刚性圆板扭转时的对偶积分方程。通过数学方法化对偶积分方程为第二类Fredholm积分方程，求解了相应的动力响应问题。数值分析结果表明，层厚和土层的剪切模量比对扭转振动影响较大。

关键词 岩土力学；弹性单相介质；饱和土；扭转振动；动力响应

分类号

TORSIONAL VIBRATION OF A RIGID CIRCULAR PLATE RESTING ON DOUBLE-LAYERED SUBGRADE WITH ROCK SUBSTRATUM

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Abstract

By using the technology of Hankel transform，the torsional vibration of a rigid circular plate resting on double-layered subgrade overlaying bedrock is discussed. Taking the soil above the groundwater table as elastic single-phase layer and the soil below the groundwater table as saturated medium，considering the mixed boundary condition at the upper surface，the fixed boundary condition at the lowest surface and that the stress and displacement at the interface of the layers are continuous，the dual integral equations are established. By mathematical methods，the dual integral equations are reduced to Fredholm integral equations of the second kind. Subsequently，the dynamic compliance coefficients of the foundation，the equivalent stiffness and equivalent damping of the subgrade，the angular amplitude of the foundation are expressed explicitly. Selected numerical studies indicate that the height of the stratum and the shear moduli¢ ratio between the layers have pronounced effect on the results.

Key words rock and soil mechanics；elastic single-phase medium；saturated soil；torsional vibration；dynamic response

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