利用差分法计算基于Spencer分析模式的边坡稳定可靠度

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摘要　　首先研究边坡稳定Spencer分析模式的过程和特点，归纳出安全系数的计算流程，发现Spencer模式下边坡稳定可靠度计算的难题在于安全系数是隐函数，导致偏导数无法计算，由此引进差分方法近似求解偏导数问题。其次依据复合函数求导方法，推导采用验算点方法求解Spencer模式下边坡稳定可靠度过程中各项偏导数的计算公式和可靠度指标的线性逼近循环迭代方法。基于上述研究，给出完整的验算点求解Spencer模式边坡稳定可靠度方法的7个分析步骤，以及每一步中的具体计算方法。最后采用该方法分析一个工程问题，并与蒙特卡洛模拟结果进行比较。结果表明，两者的计算结果十分接近；该方法精度可满足工程要求，同时工作量大大少于蒙特卡洛模拟方法，具有较好的工程应用价值。

关键词　　边坡工程；Spencer分析模式；差分；可靠度；验算点方法

分类号

RELIABILITY OF SLOPE STABILITY BASED ON SPENCER ANALYTICAL PATTER BY DIFFERENCE METHOD

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Abstract

The mechanical process and characteristics of slope stability based on Spencer analytical pattern are introduced firstly；and the calculation flowchart of safety factor is also given. It is found that the difficulty in slope stability analysis with Spencer analytical pattern is that the partial derivatives can not be computed because the safety is an implicit function. So difference method is introduced to solve the partial derivatives approximately. Based on the derivation of compound function，the formula of each item of partial derivative and the iterative method with linear approximation to compute reliability are deduced under the condition that design point method is used to obtain the reliability of slope stability based on Spencer analytical patterns. According to the above-mentioned research，seven steps to analyze reliability of slope stability by the design point method based on Spencer analytical pattern and concrete method of each step are given. At last an engineering example is analyzed with the method；and the result is compared with that obtained by Monte Carlo method. It is shown that the results obtained from the two methods are similar and the precision satisfies engineering request；and the workload of the introduced method is much little than that of Monte Carlo method. So it will be greatly valuable to engineering practice.

Key words　 slope engineering；Spencer analytical pattern；difference；reliability；design point method

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