

Book review

Linear and Non-Linear Numerical Analysis of Foundations

Edited by John W. Bull. Taylor & Francis, Abingdon, 2009. ISBN 978-0-415-42050-1, £110.00, 452 pp.

There is a shortage of books on numerical analysis of foundations, and in this respect this book is certainly a more-than-welcome addition to the bookshelf of any geotechnical or structural engineer dealing with foundations. The book has many contributors from academia and practice. Whereas this inevitably adds to the variety of topics covered, and particularly the approaches used in the analysis of the various types of foundations, the 'academic' quality and 'practical' applicability of the topics presented in 14 chapters vary.

A wide range of foundations are covered, such as shallow, pile, offshore bucket, ground anchors, embankment and dam foundations. A variety of static and dynamic (including seismic) loading conditions are considered. Different approaches to numerical analysis are also described, including, *inter alia*: finite-element and finite-difference methods, upper- and lower-bound limit analysis, limit equilibrium analysis, and semi-analytical methods. There is even a valuable contribution dedicated to probabilistic methods to evaluate the risk of ground investigations, with an informative example applicable to a typical pad footing foundation.

The broadest contribution is certainly made to the analysis of piles and pile foundations; five chapters in total, covering single piles, pile groups and combined pile raft foundations under (a) static vertical and lateral loading, (b) seismic loading in non-liquefiable and liquefiable soils, and (c) loading due to negative skin friction. Thorough treatment is also given to subjects such as

- (a) the uplift capacity of inclined plate ground anchors
- (b) bearing capacity of shallow foundations under static and seismic ground conditions

- (c) numerical modelling of geosynthetic reinforced soil walls
- (d) cyclic soil mobility and associated lateral ground deformations due to earthquake loading.

Quite often the information provided is state-of-the-art coverage of the specific subjects considered.

Some of the subject matter is rarely covered in standard geotechnical textbooks, and so inclusion of this material in the book is likely to initiate a significant interest among the readers. Topics in this category include semi-analytical approaches for analysing ground vibrations caused by trains moving over elevated bridges with pile foundations, and free vibrations of industrial chimneys and communication towers, taking into account the soil flexibility.

Topics treated by the finite-element (and finite-difference) method of analysis will naturally arouse most curiosity. The analyses described are generally advanced, and will not therefore appeal to the majority of students. However, researchers and practitioners will surely find a wealth of material of use and interest, although important aspects of the analyses, such as the constitutive models used and, in particular, derivation of suitable model parameters, are not covered to a great extent. Nevertheless, the examples provided clearly demonstrate recent significant advances made in the numerical analysis of foundations, and their applicability in solving many complex practical soil/structure interaction problems.

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