MONOGRAPHS

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Asymptotical Methods and Their Applications in Shells Theory

(with I.V. Andrianov)
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SUMMARY

This monograph is devoted to the new challenging applications of asymptotic approaches with a special emphasis on the shells theory. In many cases asymptotic analysis does not only give the qualitative and quantitative results but sometimes also yields the relations between various physical theories. For example, many new results in the fields of statics and dynamics of thin elastic cylindrical shells are obtained.

In Chapter 1 a brief history and an overview of the existing asymptotical approaches are given. The updated state-of-the-art and the perspectives of the asymptotic approaches are outlined. The asymptotic series convergence, Padé approximations, advantages and disadvantages of the asymptotic techniques are illustrated and discussed.

One of the most important problems occurring during the asymptotic analysis is related to the definition of "small" (perturbation) parameter. One would expect to have a possibly the largest value of the "small" parameter. An estimation of reliability of the obtained results does not belong to easy tasks, since the majorant inequalities should be used. Hence, very often the results obtained are verified numerically. Nowadays, the asymptotic methods possess large applications, also in mechanics of continuous systems like beams, plates, shells, etc.

The analysis of thin-walled structures is carried out in Chapter 2. First, in Section 2.1 the introduction to the considered problem is given. Analysis of the boundary value problems in theory of smooth cylindrical shells is carried out in Section 2.2. The fundamental relations are formulated and asymptotic boundary value problems are outlined. Then the fundamental boundary value problems of the statics are formulated and the limiting relations of higher order approximations are derived. The Green function approach is introduced. A comparison of the obtained results with other methods is carried out. Finally, the dynamical boundary conditions are analysed. Section 2.3 is devoted to the analysis of boundary value problems of theory of orthotropically designed cylindrical shells. This section is organized in a similar way of the previous one.

Preface & Contents

Book Review