

Book Review

K. Washizu: **Variational Methods in Elasticity and Plasticity**, Pergamon Press, Oxford, 1968, 348 pages.

Professor Washizu has set himself the task to give a comprehensive account of the importance, both fundamentally and practically, of variational methods in elasticity and plasticity.

A basic knowledge of variational calculus, elasticity and plasticity is assumed, which means that the book is aimed at advanced students and workers in the field.

The first two chapters are devoted to small displacement theory of elasticity, they contain a presentation of the principles of virtual work and complementary virtual work and of related variational principles. Of course the methods of Ritz and Galerkin to obtain approximate solutions are reviewed. However, the emphasis is on the derivation of the governing equations and of the corresponding boundary conditions and not on the numerical treatment of the problems considered. The following chapters treat the same variational principles in the case of finite displacements in Cartesian and curvilinear coordinate systems. This more fundamental first part of the book is concluded by a treatment of initial stress and strain problems, problems of stability and dynamic problems.

The second part of the book is devoted to an application of variational methods to a number of particular problems in the theory of elasticity. They include the torsion of bars and the consideration of beams, plates, shells and structures. Also here the emphasis is more on the derivation of equations and boundary conditions than on computational aspects.

The third part of the book, comprising about twenty pages, gives an idea about the incorporation of plasticity and treats the deformation theory and the flow theory.

In a number of appendices either basic information is given about certain topics or special problems are considered. The last appendix increases the value of the book very much by presenting about seventy pages of selected problems, thus giving the reader a chance to test his knowledge.

In the reviewer's opinion Professor Washizu has performed a fine piece of work by writing this book. It is a treasure box of a very large number of problems, especially in the theory of elasticity, presented in a most systematic way.

Two critical remarks can be made:

- Due to the large number of topics considered the treatment had to be concise and hence requires often more than the basic knowledge claimed to be necessary for understanding;
- Throughout the book only the necessary conditions for the equivalence of the differential operator and the minimum functional problem are considered. This implies that the treatment is strictly formal. The book certainly would have gained in depth when a chapter on sufficient conditions was added.

Nevertheless, the book should be warmly recommended to all those entering or being in the field.

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