Nonlinear Analysis and Applications

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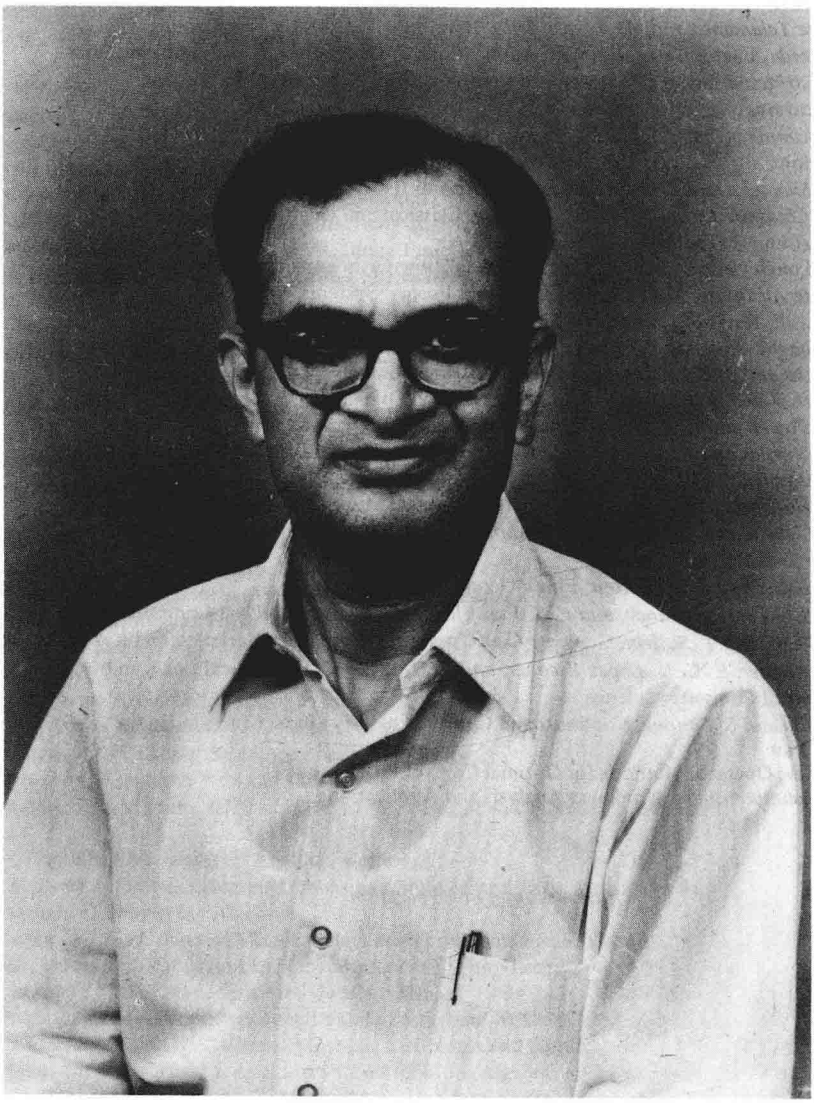

V. LAKSHMIKANTHAM

TRIBUTE

Professor V. Lakshmikantham
On occasion of his 3·4·5-th birthday.

Those who have seen sufficiently many conference volumes will have noticed: It is tradition to praise the sources where the necessary evil, the money, comes from but it is unusual to praise those who convinced the sources to spend it. Although not done by the right person, it is the right time to break the rule: This is the seventh conference of a series organized by the same man and his team at the same place, and this man became sixty years old at the same time. Seven has often been considered a magic number and it may turn out to be so, since it is not obvious that the seventh will be exceeded by an eighth one, and sixty years is a very long time to live, especially if they are filled out by so many activities as in the case of our man who celebrates his jubilee.

His mathematical work is governed by invention and exploitation of comparison techniques in the qualitative theory of various types of equations such as differential, functional-differential, Volterra integral and ordinary integro-differential equations, but some of his early papers from the late fifties have also "exotic" titles such as "The nonlinear torsion of an orthotropic cylinder" or "On self-reciprocal functions for double Hankel transforms". On the other extreme, he studied differential equations in abstract spaces already in the early sixties and continued to do so till today. This is only one example out of many showing his constant interest in learning new things from different areas, in particular by fruitful discussions with many colleagues. As in other cases of research workers who

write lots of papers, two things are self-evident. First, some of his numerous students who studied his papers carefully had a relatively easy start in publishing papers which improve or generalize some of his results, and secondly we can only give a lower bound for the exact number of papers, namely the 187 listed in [1]. Fortunately most of this flood was canalized by research monographs [2]-[7], of which [2] has soon become a standard reference text. Since in former times his age was considered the right one to start writing wise books, we may expect to see more of them in the future; in fact he has already plans for a "Theory of oscillation for differential equations with deviating arguments" (with B.G. Zhang and G.S. Ladde) and a "Theory of difference equations and numerical analysis" (with D. Trigiante).

By his example he influenced many people, brought several of them back to hard research work, and was always concerned about the young generation getting their careers started in one of the fields of his interest. This was facilitated by his additional activities as a chairman at UTA and the University of Rhode Island over many years, as an editor of the journals "Nonlinear Analysis" and "Stochastic Analysis and Applications" and as associate editor of "Applicable Analysis", "Journal of Mathematical Analysis and Applications", "Applied Mathematics and Computation", "Journal of Mathematical and Physical Sciences", "Journal of Nigerian Mathematical Society" and "International Journal of Sciences and Engineering".

This short dedication should have brought to light that he has enough reason to celebrate and that he will not rest on his laurels in the future, since also at this stage it is still possible to improve and to make considerable progress, as many examples from history clearly demonstrate.

Klaus Deimling

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PREFACE

The VIIth International Conference on *"Nonlinear Analysis and Applications"* was held at the University of Texas at Arlington during July 28th to August 1st, 1986. The conference was sponsored by the U.S. Army Research Office and the University of Texas at Arlington. It is a pleasure to acknowledge the financial support received from the various sponsoring agencies which made the conference possible.

The present volume consists of the proceedings of this Seventh Conference. It includes papers that were delivered as invited talks and research reports. There were well over ninety talks and twenty-one countries were represented.

The aim of the conference was to feature recent trends in theory and applications of Nonlinear Analysis. The contents of this proceedings are very broad including theory as well as real world applications. The works in some cases reflect collaborative efforts between mathematicians and other scientists and engineers. Indeed there are talks concerned with controllability and optimization problems, Hamiltonian Systems based on Morse index theory, illposed problems, scattering theory and Navier Stokes equations. Several papers deal with qualitative behavior of solutions nonlinear evolution equations as well as various kinds of partial differential equations including singularly perturbed systems. There is a group of papers which investigates modeling of combustion problems, neural networks, ecological and biological systems, population dynamics, and models of forecasting and suspension bridges. A set of papers deal with fixed point theory relative to cones, multivalued and weakly inward maps. A few papers discuss dynamical systems relative to stability, bifurcation and chaos. Some related papers develop numerical techniques employing finite element and iterative methods.

In summary, this book attempts to put together the works of a wide range of mathematical scientists. The problems are both theoretical as well as computational, deterministic as well as stochastic and the models include differential equations with and without delay, as well as Volterra integral and integro-differential equations.

I wish to express my special thanks to my colleagues Professors Steve Bernfeld, C. Corduneanu, G.S. Ladde and Fred Payne, and our secretaries Mrs. Gloria Brown, Mrs. Sandra Weber, Ms. Glenna Borri and Ms. Mary Parker for helping me in planning and organizing the conference, and assisting me during the conference. Finally, my immense thanks are due to Mrs. Vickie Kearn and the production staff at Marcel Dekker, Inc. for their cooperation in publishing this volume.

V. Lakshmikantham

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