Preface

Most theoretical investigations of the flow of viscous incompressible fluids are based on the consideration of the laminar flow since it portrays the fundamental features of viscous flows. In the laminar flow, the fluid particles move in a system of parallel planes. The velocity of fluid particle is in direction, everywhere the same and in magnitude proportional to the distance from some fixed plane of the system. The relation between the shearing stress and the rate of angular deformation is governed by Stokes's law. This hypothesis and the further assumption that the fluid is incompressible make the fundamental Stokes-Navier's equations amenable to integration which is otherwise impossible in the general case. The topic has provided exact solutions to many problems of practical interest as has been reported in a large number of research papers.

The present work aims at studying certain problems of laminar flow of viscous incompressible fluid under applied forces and natural conditions. The programme is spread over six chapters. These chapters, in succession, are concerned with flow over rigid base, flow through tubes, flow through porous concentric cylinders, flow of heterogeneous fluid, flow over corrugated bed, and flow due to surface loads. Synopsis of work, review of allied works, and discussions of the results are given in the general introduction and also in the introduction of each paper.

On this occassion, I take the opportunity of expressing my deep gratitude and indebtedness to my teacher Dr. Panchanan Bhattacharyya, M.A.,Ph.D., of the Department of Mathematics, University of North Bengal, for his kind supervision and guidance, at every stage of the work. I am immensely thankful to the University of North Bengal and the University Grants Commission, New Delhi, for various facility and award of Scholarship, without which this work would not have been possible. I express my gratefulness to Dr. Santi Ranjan Das Gupta, Head of the Department of Mathematics for his interest and encouragement during the work. Thankful acknowledgements are due to teachers and co-researcher of the Department of Mathematics, North Bengal University for their untiring cooperation during the work.

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