

Contents

Preface

Acknowledgments

1 *Kinematics*

1	<i>Introduction</i>	1
2	<i>Lagrangian description</i>	3
3	<i>Eulerian description</i>	7
4	<i>Conservation of mass</i>	11
5	<i>Circulation</i>	16
6	<i>Some potential flows</i>	19
7	<i>Vorticity</i>	35
8	<i>Line vortex</i>	38
9	<i>Vortex sheet</i>	48

2 *Momentum Principle and Ideal Fluid*

10	<i>Conservation of linear momentum</i>	53
11	<i>Mixing and lift</i>	57
12	<i>Equations of motion</i>	63
13	<i>D'Alembert's theorem</i>	66
14	<i>Kelvin's theorem</i>	71
15	<i>Conservation of angular momentum</i>	76

3 *Newtonian Fluid*

16	<i>The Couette experiment</i>	78
17	<i>Constitutive equation</i>	79
18	<i>Kinetic theory</i>	81
19	<i>Some viscous fluid motions</i>	85

4 *Fluids of Small Viscosity*

20	<i>Reynolds number</i>	90
21	<i>A singular perturbation example</i>	92
22	<i>Limit equations for the flat plate</i>	100
23	<i>Discussion of Blasius' solution</i>	106
24	<i>Limit equations with pressure gradient and wall curvature</i>	110
25	<i>Similarity solutions</i>	117
26	<i>Momentum integral</i>	121
27	<i>Separation</i>	123
28	<i>Wake</i>	128

5 *Some Aspects of Rotating Fluids*

29	<i>Bjerknes' theorem</i>	131
30	<i>Rossby number</i>	133
31	<i>Ekman layer</i>	135
32	<i>Taylor-Proudman theorem</i>	139

6 *Some Effects of Compressibility*

33	<i>Thermodynamic state</i>	143
34	<i>Flow initiation</i>	148
35	<i>Conservation of energy</i>	154
36	<i>Shock relations</i>	159
37	<i>Shock structure</i>	167
38	<i>Navier-Stokes equations</i>	171

	<i>Bibliography</i>	175
--	---------------------	-----

	<i>Index</i>	179
--	--------------	-----