

## Contents

<i>Preface</i>	<i>page vii</i>
1 Turbulent Transport of Temperature Fields	1
1.1 Hydrodynamic Turbulence: Dimensional Analysis	1
1.2 Spectra of Temperature Fluctuations: Dimensional Analysis	7
1.3 Turbulent Transport of Temperature Fields: Dimensional Analysis	13
1.4 Multi-Scale Approach	19
1.5 Turbulent Transport of Temperature Fields: Quasi-Linear Approach	23
1.6 Turbulent Transport of Temperature Fields: Spectral Tau Approach	29
1.7 Ranges of Validity of Various Analytical Methods	33
1.8 Further Reading	36
2 Particles and Gases in Density-Stratified Turbulence	40
2.1 Turbulent Transport of Particles: Dimensional Analysis	40
2.2 Turbulent Transport of Particles: Quasi-linear Approach	48
2.3 Turbulent Transport of Particles: Spectral Tau Approach	57
2.4 Turbulent Transport of Inertial Particles	61
2.5 Compressibility Effects on the Turbulent Transport of Particles	68
2.6 Further Reading	81
3 Turbulent Transport of Magnetic Fields	89
3.1 Magnetohydrodynamic Equations	89
3.2 Spectra of Magnetic Fluctuations: Dimensional Analysis	94

3.3	Turbulent Transport of Magnetic Fields: Dimensional Analysis	99
3.4	Turbulent Transport of Magnetic Fields: Quasi-linear Approach	105
3.5	Turbulent Transport of Magnetic Fields: Spectral Tau Approach	116
3.6	Compressibility Effects	122
3.7	Mean-Field Dynamo	137
3.8	Further Reading	142
4	Analysis Based on Budget Equations	155
4.1	Budget Equations for Non-Stratified Turbulence	155
4.2	Budget Equations for Stably Stratified Turbulence	162
4.3	Further Reading	170
5	Path-Integral Approach	177
5.1	Turbulent Transport of Temperature Field	177
5.2	Turbulent Transport of Particles	182
5.3	Turbulent Transport of Magnetic Field	187
5.4	Further Reading	194
6	Practice Problems and Solutions	197
6.1	Practice Problems on Turbulent Transport	197
6.2	Solutions to the Practice Problems on Turbulent Transport	214
	<i>Notations and Definitions</i>	225
	<i>References</i>	230
	<i>Author Index</i>	253
	<i>Subject Index</i>	259