CONTENTS

	Preface	vii
	Introduction	xi
	Nomenclature	xv
1	RADIANT TRANSFER IN PROBLEMS OF HEAT	
	IKANSFER	. 1
1.1	Radiant Heat Transfer in Thermophysics and Gas Dynamics	1
1.2	Tools of Radiation Gas Dynamics	7
1.3	Integration of the Transport Equation over Angles	11
2	INTEGRATION OVER FREQUENCY	15
2.1	Optical Spectra of Real Systems; Role of Spectral Lines	15
2.2	Limiting Approximations	17
2.3	Local Averaging	20
2.4	Milne-Eddington Approximation	27
2.5	Nonlocal Averaging	28
2.6	Integral Methods	32
3	METHOD OF PARTIAL CHARACTERISTICS	37
3.1	Effective Optical Density	37
3.2	Partial Intensity	39
3.3	Calculation of Radiation Transfer in Three-Dimensional Systems with	
	Arbitrary Distribution of Parameters	45
3.4	One-Dimensional Models	51
3.5	Features Specific to the Use of the Method of Partial Characteristics	57
3.6	Limits of Applicability of the Method of Partial Characteristics	59

ţ,

v



4	METHOD OF EFFECTIVE POPULATIONS	65
4.1	Spectral Optical Characteristics; Role of Interaction	65
4.2	Composition and Thermodynamic Properties of Low-Temperature Plasma	66
4.3	Method of Effective Populations	72
4.4	Effective Statistical Weights and Effective Populations	80
4.5	Convergence of Spectral Series Toward the Photoionization Limit	. 84
4.6	Optical Shift	86
4.7	Continuous Spectrum; Integral Formulas	93
4.8	Dense Plasma	99
4.9	Summary	101
5	CALCULATION OF PARTIAL CHARACTERISTICS	103
5.1	General Spectral Elements; Real Contour of Spectral Lines;	
	Convolutions, Multiple Structure, and Shift	103
5.2	Practical Calculation of Partial Characteristics	105
5.3	Hydrogen	107
5.4	Argon	108
5.5	Air	111
5.6	Gaseous Carbon Dioxide: Energy Levels, Matrix Elements, and Rotational Structure	116
6	CONCLUSION	123
	APPENDIX	125
	Use of Tables	125
	Description of Tables	129
	Hydrogen	130
	Tables of Partial Intensities (Sources) for Computing Flux Fields	
	(Flux Divergence)	130
	Tables of Partial Sinks for Computing Flux Field Divergence	154
	Argon	171
	Tables of Partial Intensities (Sources) for Computing Flux Fields	
	(Flux Divergence)	171
	Tables of Partial Sinks for Computing Flux Field Divergence	196
	Air	213
	Tables of Partial Intensities (Sources) for Computing Flux Fields	
	(Flux Divergence)	213
	Tables of Partial Sinks for Computing Flux Field Divergence Tables of Partial Fluxes (Sources) for Computing Flux Fields (Flux	238
	Divergence) Using the Plane Slab Model	254
	Tables of Partial Sinks for Computing Flux Field Divergence Using	
	the Plane Slab Model	279
	Carbon Dioxide	296
	Tables of Partial Intensities for Computing Flux Fields (Flux	
	Divergence)	296
	REFERENCES	303