

# Table of Contents

Introduction . . . . .	1
Chapter 1. Co-Involutive Hopf-Von Neumann Algebras	7
1.1 <i>Von Neumann Algebras and Locally Compact Groups</i> . . . . .	8
1.2 <i>Co-Involutive Hopf-Von Neumann Algebras</i> . . . . .	13
1.3 <i>Positive Definite Elements in a Co-Involutive Hopf-Von Neumann Algebra</i> . . . . .	19
1.4 <i>Kronecker Product of Representations</i> . . . . .	23
1.5 <i>Representations with Generator</i> . . . . .	30
1.6 <i>Fourier-Stieltjes Algebra</i> . . . . .	36
Chapter 2. Kac Algebras . . . . .	44
2.1 <i>An Overview of Weight Theory</i> . . . . .	45
2.2 <i>Definitions</i> . . . . .	55
2.3 <i>Towards the Fourier Representation</i> . . . . .	58
2.4 <i>The Fundamental Operator <math>W</math></i> . . . . .	60
2.5 <i>Haar Weights Are Left-Invariant</i> . . . . .	66
2.6 <i>The Fundamental Operator <math>W</math> Is Unitary</i> . . . . .	71
2.7 <i>Unicity of the Haar Weight</i> . . . . .	76
Chapter 3. Representations of a Kac Algebra; Dual Kac Algebra . . . . .	83
3.1 <i>The Generator of a Representation</i> . . . . .	84
3.2 <i>The Essential Property of the Representation <math>\lambda</math></i> . . . . .	89
3.3 <i>The Dual Co-Involutive Hopf-Von Neumann Algebra</i> . . . . .	92
3.4 <i>Eymard Algebra</i> . . . . .	97
3.5 <i>Construction of the Dual Weight</i> . . . . .	101
3.6 <i>Connection Relations and Consequences</i> . . . . .	104
3.7 <i>The Dual Kac Algebra</i> . . . . .	111

Chapter 4. Duality Theorems for Kac Algebras and Locally Compact Groups . . . . .	124
4.1 <i>Duality of Kac Algebras</i> . . . . .	125
4.2 <i>Takesaki's Theorem on Symmetric Kac Algebras</i> .	130
4.3 <i>Eymard's Duality Theorem for Locally Compact Groups</i> . . . . .	136
4.4 <i>The Kac Algebra <math>K_s(G)</math></i> . . . . .	140
4.5 <i>Characterisation of the Representations and Wendel's Theorem</i> . . . . .	144
4.6 <i>Heisenberg's Pairing Operator</i> . . . . .	152
4.7 <i>A Tatsuuma Type Theorem for Kac Algebra</i> . . .	158
Chapter 5. The Category of Kac Algebras . . . . .	161
5.1 <i>Kac Algebra Morphisms</i> . . . . .	162
5.2 <i><math>\mathbb{H}</math>-Morphisms of Kac Algebras</i> . . . . .	166
5.3 <i>Strict <math>\mathbb{H}</math>-Morphisms</i> . . . . .	172
5.4 <i>Preliminaries About Jordan Homomorphisms</i> . .	174
5.5 <i>Isometries of the Preduals of Kac Algebras</i> . . .	176
5.6 <i>Isometries of Fourier-Stieltjes Algebras</i> . . . .	184
Chapter 6. Special Cases: Unimodular, Compact, Discrete and Finite-Dimensional Kac Algebras . . . .	192
6.1 <i>Unimodular Kac Algebras</i> . . . . .	193
6.2 <i>Compact Type Kac Algebras</i> . . . . .	197
6.3 <i>Discrete Type Kac Algebras</i> . . . . .	208
6.4 <i>Krein's Duality Theorem</i> . . . . .	213
6.5 <i>Characterisation of Compact Type Kac Algebras</i> .	219
6.6 <i>Finite Dimensional Kac Algebras</i> . . . . .	232
Postface . . . . .	243
Bibliography . . . . .	245
Index . . . . .	255