

# CONTENTS

Chapter I	Symmetric cones	
1	Convex cones	1
2	Examples	7
3	The characteristic function of a cone	10
4	Symmetric cones as Riemannian symmetric spaces	15
	Exercises	18
	Notes	23
Chapter II	Jordan algebras	
1	Definitions and first properties	24
2	The minimal polynomial	27
3	The quadratic representation	32
4	Derivations and automorphisms	35
	Exercises	38
	Notes	41
Chapter III	Symmetric cones and Euclidean Jordan algebras	
1	Euclidean Jordan algebras	42
2	The cone of squares in a Euclidean Jordan algebra	46
3	The Jordan algebra associated with a symmetric cone	49
4	Simple Euclidean Jordan algebras	51
5	The group $G$ and the invariant metric	55
	Exercises	58
	Notes	61
Chapter IV	The Peirce decomposition in a Jordan algebra	
1	The Peirce decomposition	62
2	Systems of idempotents	68
3	Boundary structure of a symmetric cone	72
4	Jordan algebra representations	74
	Exercises	77
	Notes	80
Chapter V	Classification of Euclidean Jordan algebras	
1	Hurwitz algebras	81
2	The algebras $Herm(m, A)$	86
3	The classification	92
	Exercises	98
	Notes	99

Chapter VI	Polar decomposition and Gauss decomposition	
1	Derivations and automorphisms revisited	100
2	Polar decomposition	102
3	Gauss decomposition	105
4	The Laplace–Beltrami operator of a symmetric cone	115
	Exercises	120
	Notes	121
Chapter VII	The gamma function of a symmetric cone	
1	The gamma function	122
2	Riesz integrals	131
3	Positivity of the Riesz distributions	136
	Exercises	141
	Notes	142
Chapter VIII	Complex Jordan algebras	
1	Complexifications	144
2	The structure group of a semi-simple Jordan algebra	146
3	Jordan canonical form	150
4	Formally real Jordan algebras	153
5	Existence of a Euclidean real form	154
	Exercises	160
	Notes	161
Chapter IX	Tube domains over convex cones	
1	Some definitions and basic facts	162
2	Reproducing kernel and Bergman kernel	164
3	The Bergman space of a tube domain	172
4	The Hardy space of a tube domain	178
5	Poisson kernel, Bergman–Shilov boundary	181
	Exercises	184
	Notes	185
Chapter X	Symmetric domains of tube type	
1	The tube domain over a symmetric cone	187
2	The Cayley transform	189
3	The group $G(\Sigma)$	193
4	The bounded domain $D$ and its Shilov boundary	198
5	The automorphism groups $G(T_\Omega)$ and $G(D)$ and their Lie algebras	204
	Exercises	213
	Notes	217

Chapter XI	Conical and spherical polynomials	
1	The Fischer inner product	220
2	Decomposition of the space of polynomials	223
3	Spherical polynomials	228
4	Norm computations	230
5	Expansion of some $K$ -invariant polynomials	234
	Exercises	236
	Notes	239
Chapter XII	Taylor and Laurent series	
1	Spherical Taylor series	240
2	Decomposition of the space $L^2(\Sigma)$	245
3	Laurent series	249
	Exercises	258
	Notes	259
Chapter XIII	Function spaces on symmetric domains of tube type	
1	The spaces $\mathcal{H}_\nu^2$	260
2	The Wallach set	264
3	Hardy spaces	269
4	Hua equations	276
	Exercises	284
	Notes	288
Chapter XIV	Invariant differential operators and spherical functions	
1	Invariant differential operators	290
2	The inner product in the spaces $\mathcal{H}_\nu(D)$	298
3	Spherical functions	303
4	Spherical Fourier transform	307
5	The $c$ -function	311
	Exercises	316
	Notes	317
Chapter XV	Special functions	
1	Hypergeometric functions	318
2	Bessel functions	320
3	The Gauss hypergeometric functions	329
4	Hankel transform and Laguerre polynomials	341
	Exercises	347
	Notes	348

Chapter XVI	Representations of Jordan algebras and Euclidean Fourier analysis	
1	Wishart distributions	349
2	Hankel transform	350
3	Generalized $K$ -Bessel functions	355
4	Zeta integrals	359
	Exercises	362
	Notes	363
	Bibliography	364
	Notation	378
	Index	381