



# Table of Contents

---

<b>Preface</b> .....	9
<b>Glossary of symbols</b> .....	13
<b>Chapter 1 INTRODUCTION AND DEFINITIONS</b>	
1.1 Gamma, Beta and Related Functions .....	19
1.2 The Gaussian Hypergeometric Function .....	29
1.3 The Confluent Hypergeometric Function .....	36
1.4 The Generalized Hypergeometric Function .....	41
1.5 The $E, G, H$ and Related Functions .....	45
1.6 Hypergeometric Functions of Two Variables .....	52
1.7 Hypergeometric Functions of Several Variables .....	60
1.8 The Classical Orthogonal Polynomials .....	71
1.9 Other Polynomial Systems and Generalizations .....	75
1.10 Generating Functions .....	78
1.11 Examples of Well-Known Generating Functions .....	82
Problems .....	86
<b>Chapter 2 SERIES REARRANGEMENT TECHNIQUE</b>	
2.1 Some Useful Lemmas .....	100
2.2 Description of the Series Rearrangement Technique .....	103
2.3 Applications to Jacobi Polynomials .....	104
2.4 Generating Functions for Gegenbauer (or Ultraspherical) Polynomials .....	125
2.5 Generating Functions for Laguerre Polynomials .....	131
2.6 Miscellaneous Results .....	136
Problems .....	161
<b>Chapter 3 DECOMPOSITION TECHNIQUE</b>	
3.1 A Hypergeometric Series Identity .....	200

3.2	Generating Functions for Jacobi Polynomials . . . . .	201
3.3	Generating Functions for Laguerre Polynomials . . . . .	207
	Problems . . . . .	209
<b>Chapter 4 OPERATIONAL TECHNIQUES</b>		
4.1	Use of Integral Operators . . . . .	218
4.2	Use of Differential Operators . . . . .	238
4.3	Some Multiple-Integral Operational Techniques . . . . .	247
	Problems . . . . .	259
<b>Chapter 5 FRACTIONAL DERIVATIVE TECHNIQUE</b>		
5.1	Fractional Derivatives and Hypergeometric Functions . . . . .	284
5.2	Linear Generating Functions . . . . .	291
5.3	Bilinear Generating Functions . . . . .	294
5.4	Convergence Conditions . . . . .	300
	Problems . . . . .	303
<b>Chapter 6 LIE ALGEBRAIC TECHNIQUE</b>		
6.1	Lie Groups . . . . .	311
6.2	Lie Algebras and One-Parameter Subgroups . . . . .	314
6.3	Homomorphism . . . . .	319
6.4	Linear Differential Operators . . . . .	320
6.5	Preliminary Observations . . . . .	323
6.6	The Laguerre Function $L_n^{(\alpha)}(x)$ . . . . .	326
6.7	The Hypergeometric Function ${}_2F_1[-n, \beta; \gamma; x]$ . . . . .	334
6.8	The Modified Laguerre Function $L_n^{(\alpha-n)}(x)$ . . . . .	339
6.9	Expansions Involving Two-Variable Hypergeometric Functions . . . . .	343
	Problems . . . . .	349
<b>Chapter 7 GENERATING FUNCTIONS VIA LAGRANGE'S EXPANSION AND GOULD'S IDENTITY</b>		
7.1	Some Useful Consequences of Lagrange's Expansion . . . . .	354
7.2	A Theorem of Brown . . . . .	357
7.3	Generalizations by Srivastava and Zeitlin . . . . .	359
7.4	Further Results of Srivastava and Buschman . . . . .	368
7.5	Carlitz's Theorem on Mixed Generating Functions . . . . .	375
7.6	A Multiparameter and Multivariable Extension of Carlitz's Theorem . . . . .	378
	Problems . . . . .	384

**Chapter 8 EQUIVALENCE THEOREMS AND BILATERAL  
GENERATING FUNCTIONS**

8.1	An Equivalence Theorem on Generating Functions . . . . .	402
8.2	A Theorem on Bilateral Generating Functions . . . . .	411
8.3	Generalizations of the Theorem of Singhal and Srivastava . . . . .	414
8.4	Further Generalizations and Applications to Special Sequences . . . . .	416
8.5	Multivariable Extensions . . . . .	437
	Problems . . . . .	442

**Chapter 9 GENERATING FUNCTIONS FOR SYSTEMS IN SEVERAL  
VARIABLES AND MULTILINEAR EXTENSIONS OF  
CLASSICAL RESULTS**

9.1	A Multivariable Generating Function of Srivastava . . . . .	455
9.2	A Generalization of Theorem 1 . . . . .	457
9.3	Further Generalizations . . . . .	459
9.4	Some Multiple Generating Functions of Carlitz and Srivastava . . . . .	462
9.5	Multiple-Series Extensions of Some Classical Results . . . . .	467
9.6	Generating Functions Involving Laurent Series . . . . .	475
	Problems . . . . .	489

<b>Bibliography</b> . . . . .	503
-------------------------------	-----

<b>Index</b> . . . . .	562
------------------------	-----