

## TABLE OF CONTENTS

	Page
<b>PREFACE.....</b>	<b>v</b>
<b>TABLE OF CONTENTS .....</b>	<b>vii</b>
<b>INTRODUCTION.....</b>	<b>1</b>
<b>PART A INTERPOLATION AND TIME-INVARIANT SYSTEMS.....</b>	<b>7</b>
<b>I. INTERPOLATION PROBLEMS FOR OPERATOR-VALUED FUNCTIONS.....</b>	<b>9</b>
I.1. PRELIMINARIES ABOUT NOTATION AND TERMINOLOGY .....	9
I.2. NEVANLINNA-PICK INTERPOLATION.....	15
I.3. TANGENTIAL NEVANLINNA-PICK INTERPOLATION .....	17
I.4. CONTROLLABILITY OPERATORS AND INTERPOLATION .....	20
I.5. TANGENTIAL HERMITE-FEJER INTERPOLATION .....	22
I.6. THE NEHARI EXTENSION PROBLEM.....	30
I.7. SARASON INTERPOLATION.....	33
I.8. NEVANLINNA-PICK INTERPOLATION VIEWED AS A SARASON PROBLEM.....	35
I.9. TWO-SIDED NUDELMAN INTERPOLATION .....	38
I.10. THE TWO-SIDED SARASON PROBLEM.....	40
I.11. A FILTERING PROBLEM.....	42
NOTES TO CHAPTER I.....	49
<b>II. PROOFS USING THE COMMUTANT LIFTING THEOREM.....</b>	<b>51</b>
II.1. THE COMMUTANT LIFTING THEOREM .....	51
II.2. PROOF OF THE STANDARD LEFT NEVANLINNA-PICK INTERPOLATION THEOREM .....	55
II.3. PROOF OF THE NEHARI EXTENSION THEOREM .....	56

II.4. PROOF OF THE SARASON THEOREM .....	59
II.5. PROOF OF THE TWO-SIDED NUDELMAN THEOREM.....	60
II.6. PROOF OF THE TWO-SIDED SARASON THEOREM .....	69
NOTES TO CHAPTER II .....	71
<b>III. TIME INVARIANT SYSTEMS.....</b>	<b>73</b>
III.1. STATE SPACE ANALYSIS.....	73
III.2. CONTROLLABILITY AND OBSERVABILITY.....	76
III.3. POINT EVALUATION.....	83
III.4. REALIZATION THEORY.....	86
III.5. ANTICAUSAL REALIZATIONS .....	94
III.6. COMPUTING THE HANKEL FORM .....	99
III.7. COMPUTING THE PROJECTION IN THE SARASON PROBLEM.....	102
III.8. EXPLICIT CONVERSION FORMULAS .....	113
III.9. CONNECTING NUDELMAN AND TWO-SIDED SARASON PROBLEMS .....	116
III.10. ISOMETRIC AND UNITARY SYSTEMS .....	122
NOTES TO CHAPTER III .....	130
<b>IV. CENTRAL COMMUTANT LIFTING .....</b>	<b>131</b>
IV.1. MINIMAL ISOMETRIC LIFTINGS .....	131
IV.2. THE CENTRAL INTERTWINING LIFTING .....	135
IV.3. CENTRAL INTERTWINING LIFTING FORMULAS .....	145
IV.4. CENTRAL INTERTWINING LIFTING QUOTIENT FORMULAS .....	148
IV.5. THE CENTRAL SCHUR SOLUTION.....	154
IV.6. THE QUASI OUTER FACTOR FOR $D_{B_\gamma}^2$ .....	159
IV.7. MAXIMUM ENTROPY .....	168
IV.8. SOME MIXED BOUNDS FOR THE CENTRAL INTERTWINING LIFTING .....	179
IV.9. A MIXED TWO-SIDED SARASON RESULT .....	185
NOTES TO CHAPTER IV .....	190

<b>V. CENTRAL STATE SPACE SOLUTIONS.....</b>	191
V.1. THE CENTRAL FORMULA FOR NEVANLINNA-PICK .....	191
V.2. CENTRAL NEVANLINNA-PICK SOLUTIONS .....	203
V.3. THE CENTRAL HERMITE-FEJER SOLUTION .....	206
V.4. THE CENTRAL FORMULA FOR THE SARASON PROBLEM.....	211
V.5. CENTRAL NEHARI SOLUTIONS .....	218
V.6. CENTRAL NUDELMAN SOLUTIONS .....	227
V.7. THE CENTRAL TWO BLOCK SOLUTION.....	239
V.8. THE FOUR BLOCK PROBLEM.....	250
NOTES TO CHAPTER V .....	259
<b>VI. PARAMETERIZATION OF INTERTWINING LIFTINGS AND ITS APPLICATIONS .....</b>	261
VI.1. THE MÖBIUS TRANSFORMATION .....	261
VI.2. THE SCHUR PARAMETERIZATION .....	265
VI.3. RECOVERING THE SCHUR CONTRACTION .....	269
VI.4. CONSTRUCTING THE SCHUR CONTRACTION.....	271
VI.5. THE REDHEFFER SCATTERING PARAMETERIZATION .....	278
VI.6. THE PARAMETERIZATION FOR $\ A\  < \gamma$ .....	288
VI.7. THE NEVALINNA-PICK PARAMETERIZATION .....	292
VI.8. THE NEHARI PARAMETERIZATION .....	297
VI.9. THE TWO BLOCK PARAMETERIZATION .....	302
NOTES TO CHAPTER VI.....	308
<b>VII. APPLICATIONS TO CONTROL SYSTEMS.....</b>	309
VII.1. FEEDBACK CONTROL .....	309
VII.2. THE YOUNG PARAMETERIZATION.....	313
VII.3. MIXED $H^\infty$ AND $H^2$ CONTROL PROBLEMS .....	318
VII.4. A TWO BLOCK CONTROL PROBLEM.....	327
VII.5. THE MULTIVARIABLE CASE .....	334
NOTES TO CHAPTER VII.....	341

<b>PART B NONSTATIONARY INTERPOLATION AND TIME-VARYING SYSTEMS.....</b>	343
<b>VIII. NONSTATIONARY INTERPOLATION THEOREMS .....</b>	345
VIII.1. NONSTATIONARY NEVANLINNA-PICK INTERPOLATION .....	345
VIII.2. NONSTATIONARY TANGENTIAL NEVANLINNA-PICK INTERPOLATION .....	347
VIII.3. NONSTATIONARY TANGENTIAL HERMITE-FEJER INTERPOLATION .....	350
VIII.4. NONSTATIONARY NEHARI INTERPOLATION.....	355
VIII.5. NONSTATIONARY SARASON INTERPOLATION .....	356
VIII.6. NONSTATIONARY NUDELMAN INTERPOLATION.....	357
VIII.7. NONSTATIONARY TWO-SIDED SARASON INTERPOLATION .....	359
NOTES TO CHAPTER VIII .....	360
<b>IX. NONSTATIONARY SYSTEMS AND POINT EVALUATION.....</b>	363
IX.1. TIME VARYING SYSTEMS .....	363
IX.2. NONSTATIONARY CONTROLLABILITY AND OBSERVABILITY .....	367
IX.3. POINT EVALUATION.....	373
IX.4. FROM NONSTATIONARY SYSTEMS TO STATIONARY SYSTEMS .....	378
IX.5. A NONSTATIONARY FILTERING PROBLEM.....	380
NOTES TO CHAPTER IX .....	382
<b>X. REDUCTION TECHNIQUES: FROM NONSTATIONARY TO STATIONARY AND VICE VERSA .....</b>	383
X.1. SPATIAL FEATURES .....	383
X.2. OPERATOR FEATURES .....	387
NOTES TO CHAPTER X .....	392

<b>XI. PROOFS OF THE NONSTATIONARY INTERPOLATION THEOREMS BY REDUCTION TO THE STATIONARY CASE.....</b>	393
XI.1. THE STANDARD NONSTATIONARY NEVANLINNA-PICK INTERPOLATION THEOREM .....	393
XI.2. THE NONSTATIONARY VERSION OF NEHARI'S THEOREM .....	401
XI.3. THE NONSTATIONARY SARASON INTERPOLATION THEOREM.....	410
XI.4. THE NONSTATIONARY VERSION OF NUDELMAN'S THEOREM .....	414
XI.5. THE NONSTATIONARY TWO-SIDED SARASON INTERPOLATION THEOREM .....	419
NOTES TO CHAPTER XI.....	422
<b>XII. A GENERAL COMPLETION THEOREM .....</b>	423
XII.1. THE THREE CHAINS COMPLETION THEOREM .....	423
XII.2. PROOF BY ONE STEP EXTENSIONS .....	430
XII.3. AN EXPLICIT SOLUTION OF THE THREE CHAINS COMPLETION PROBLEM.....	433
XII.4. MAXIMUM ENTROPY .....	440
XII.5. A QUOTIENT FORMULA FOR THE CENTRAL INTERPOLANT .....	452
XII.6. THE CASWELL-SCHUBERT THEOREM.....	461
NOTES TO CHAPTER XII.....	467
<b>XIII. APPLICATIONS OF THE THREE CHAINS COMPLETION THEOREM TO INTERPOLATION.....</b>	469
XIII.1. ABSTRACT NONSTATIONARY INTERPOLATION .....	469
XIII.2. APPLICATION TO NEVANLINNA-PICK INTERPOLATION .....	473
XIII.3. APPLICATION TO THE NEHARI PROBLEM .....	475
XIII.4. APPLICATION TO THE TWO-SIDED SARASON PROBLEM.....	476
XIII.5. APPLICATION TO THE NUDELMAN PROBLEM.....	478
XIII.6. THE THREE CHAINS COMPLETION PROBLEM AND THE FOUR BLOCK PROBLEM .....	488
NOTES TO CHAPTER XIII .....	495

<b>XIV. PARAMETERIZATION OF ALL SOLUTIONS OF THE THREE CHAINS COMPLETION PROBLEM .....</b>	497
<b>XIV.1. MAIN THEOREM .....</b>	497
<b>XIV.2. PROOF OF MAIN THEOREM (first part) .....</b>	505
<b>XIV.3. PROOF OF MAIN THEOREM (second part).....</b>	507
<b>XIV.4. THE CASE OF DECREASING SPACES .....</b>	518
<b>XIV.5. THE NONSTATIONARY NEHARI PARAMETERIZATION .....</b>	522
<b>NOTES TO CHAPTER XIV .....</b>	532
<b>APPENDIX ON FACTORIZATION OF MATRIX-VALUED FUNCTIONS .....</b>	533
<b>A.1. SQUARE OUTER SPECTRAL FACTORIZATIONS .....</b>	533
<b>A.2. INNER-OUTER FACTORIZATIONS.....</b>	545
<b>NOTES TO APPENDIX.....</b>	559
<b>REFERENCES.....</b>	561
<b>LIST OF SYMBOLS .....</b>	575
<b>INDEX.....</b>	581