

Contents

Introduction	1
Chapter 1	
Factorization of Operator-valued Transfer Functions	
1.1 Realization of operator-valued functions	16
1.2 A factorization method	20
1.3 Factorization of rational operator-valued functions	24
Chapter 2	
Operator Identities and S-Nodes	
2.1 Elementary properties of S -nodes	29
2.2 Symmetric S -nodes	34
2.3 Inherited properties of factors	35
Chapter 3	
Continual Factorization	
3.1 The main continual factorization theorem	39
3.2 Bounded operator-valued functions	43
Chapter 4	
Spectral Problems on the Half-line	
4.1 Basic notions of spectral theory	49
4.2 Direct and inverse spectral problems	54
4.3 Livšic-Brodskiĭ nodes and the spectral theory of canonical systems	61
Chapter 5	
Spectral Problems on the Line	
5.1 Spectral data of a canonical system	67
5.2 Spectral problems and S -nodes	72
5.3 The inverse spectral problem	74
Chapter 6	
Weyl-Titchmarsh Functions of Periodic Canonical Systems	
6.1 Multipliers and their behavior	77
6.2 Weyl-Titchmarsh functions	82
6.3 Singular points of the Weyl-Titchmarsh matrix function	85
Chapter 7	
Division of Canonical Systems into Subclasses	
7.1 An effective solution of the inverse problem	95
7.2 Two principles of dividing a class of canonical systems into subclasses	100

Chapter 8**Uniqueness Theorems**

- 8.1 Monodromy matrix and uniqueness theorems 107
- 8.2 Spectral data and uniqueness theorems 112

Chapter 9**Weyl Discs and Points**

- 9.1 Basic notions 117
- 9.2 Symmetric operators and deficiency indices 122
- 9.3 Weyl-Titchmarsh matrix functions on the line 125
- 9.4 Weyl-Titchmarsh matrix function of a system
with shifted argument 127

Chapter 10**A Class of Canonical Systems**

- 10.1 Asymptotic formulas 132
- 10.2 Spectral analysis 139
- 10.3 Transformed canonical systems 143
- 10.4 Dirac-type systems 145
- 10.5 An inverse problem 147
- 10.6 On the limit Titchmarsh-Weyl function 150

Chapter 11**Classical Spectral Problems**

- 11.1 Generalized string equation (direct spectral problem) 153
- 11.2 Matrix Sturm-Liouville equation (direct spectral problem) 159
- 11.3 Inverse spectral problem 163

Chapter 12**Nonlinear Integrable Equations and the Method
of the Inverse Spectral Problem**

- 12.1 Evolution of the spectral data 167
- 12.2 Some classical nonlinear equations 172
- 12.3 On the unique solvability of the mixed problem 177
- 12.4 A hierarchy of nonlinear equations and asymptotic behavior
of Weyl-Titchmarsh functions 180

Comments 185

References 193

Index 201