Table of Contents

**Editorial Introduction** ......................................................... vii

*D. Alpay, J. A. Ball, I. Gohberg, L. Rodman*

**Realization and factorization for rational matrix functions with symmetries** ........... 1
  0. Introduction ........................................................................... 1
  1. Preliminaries .......................................................................... 4
  2. Axiomatic theory ..................................................................... 8
     2.1 Admissible automorphisms ............................................... 8
     2.2 General theory .................................................................... 14
  3. The associated group ............................................................. 16
     3.1 Realization theorems, the associated matrix, and examples ............ 16
     3.2 Factorization within the associated group ................................. 19
  4. Type Ia symmetries ............................................................... 23
  5. Type Ib symmetries ............................................................... 27
  6. Type IIa symmetries .............................................................. 32
  7. Type IIb symmetries .............................................................. 41
  8. Degree preserving automorphisms of $GL_n(\mathbb{R})$ .................. 44
  9. Continuous and analytic automorphisms of $GL_m(\mathbb{R})$ ........... 55
References .................................................................................. 59

*D. Alpay, P. Dewilde, H. Dym*

**Lossless inverse scattering and reproducing kernels for upper triangular operators** .... 61
  1. Introduction ............................................................................ 62
  2. Preliminaries .......................................................................... 69
  3. A pair of transforms ............................................................. 76
  4. An elementary Blaschke factor ............................................... 84
  5. Lis and linear fractional transformations .................................. 90
  6. An approximation problem .................................................... 96
  7. Reproducing kernel subspaces of Hilbert Schmidt operators .......... 102
  8. Operator ranges ..................................................................... 113
  9. References ............................................................................ 133

*J. A. Ball, M. Rakowski*

**Zero-pole structure of nonregular rational matrix functions** .............................. 137
  0. Introduction ........................................................................... 137
  1. Pole pairs .............................................................................. 139
  2. Orthogonality in $\mathbb{R}^n$ ................................................... 148
  3. Zero structure ........................................................................ 153
  4. Functions with a given local null-pole structure ......................... 175
References .................................................................................. 191