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PREFACE

This issue of *Communications in Mathematical Analysis* is devoted to various aspects of Analysis, Operator Theory and their applications in problems of Mathematical Physics.

In particular, in this volume there are studied the compactness of commutators of convolution type operators with piecewise quasicontinuous data on weighted Lebesgue spaces with Muchkenhoupt weights, regularizers of Mellin pseudodifferential operators with slowly oscillating symbols of limited smoothness, the diffraction by a half-plane with different face impedances on an obstacle perpendicular to the boundary by using the theory of Wiener-Hopf and Hankel type operators on Bessel potential spaces.

It is shown that the discrete series of irreducible unitary representation spaces of the non-compact group $SO(2,1)$ can be naturally interpreted as discrete versions of the linear harmonic oscillator in standard non-relativistic quantum mechanics.

Several papers in this volume are devoted to the structural analysis of Toeplitz operators with various specific classes of generating symbols and of the algebras generated by such Toeplitz operators. In particular, Toeplitz operators with quasi-radial symbols acting on the weighted Bergman space on the unit ball, Toeplitz operators with quasi-radial quasi-homogeneous symbols acting on the weighted pluriharmonic Bergman spaces on the unit ball, and Toeplitz operators with angular symbols acting on the Bergman spaces on the upper half-plane are studied. The Fredholm symbol algebras for the $C^*$-algebra generated by Toeplitz operators with piecewise quasicontinuous symbols and for the $C^*$-algebra generated by Toeplitz operators with piecewise continuous and slowly oscillating symbols, both acting on the Bergman space on the unit disk, are described.

The conditions of mappability of nonlinear control systems with multi-dimensional control to linear ones by a change of state variables and control or a change of variables only are obtained. The solution of problems of exact controllability and exact observability for a wide class of control delayed systems of neutral type is obtained on the basis of the moment problem approach. A numerical method of finding of a control realizing the transfer of the Timoshenko beam rotating in horizontal plane from one position of rest to another and minimizing the used energy is given. The problem of global robust feedback syntheses of a bounded control for a disturbed canonical system with an unknown bounded perturbation is investigated. An algorithm for the solution of the truncated matrix Hausdorff moment problem in the case of an odd number moments is given. Decompositions of the Blaschke-Potapov factors of the truncated Hausdorff matrix moment problem are constructed for the cases of odd and even numbers of moments via the Stieltjes parameters. The solvability of an inverse spectral problem is studied for the Sturm-Liouville differential operators on hedgehog-type graphs with generalized matching conditions.

The following problems of mathematical physics are investigated. The transmission and reflection coefficients for the scattering of a particle on one-dimensional potential are

calculated by means of Spectral Parameter Power Series (SPPS). Dispersion decay estimates for solutions of the one-dimensional discrete wave equations are obtained. Evolution of solitons is investigated in the framework of an extended nonlinear Schrödinger equation, including a pseudo-stimulated-Raman-scattering term. By means of the variational approximation it is studied the dynamics and stability boundaries for fundamental solitons in a two-dimensional self-attracting Bose-Einstein condensate, trapped in the quasiperiodic optical lattice, with the amplitude subject to periodic time modulation. The electromagnetic field generated by a source moving through a dispersive lossy metamaterial is studied. The Cherenkov radiation in a far zone is considered with the use of 2D stationary phase method. It is shown that the Maxwell-Lorentz equations with Abraham's rotating extended electron, rewritten in the Euler angles, imply the standard Euler-Lagrange and Hamiltonian equations. A porous 3D system, where the material porosity forms a percolating spanning cluster and the light nanoemitters are randomly incorporated into such a cluster, is studied. To find the optimal optical path between the radiated nanoemitters, the Fermat principle was used. The evolution of energy of perturbations in barotropic atmosphere is also studied.

Finally, a survey of recent developments on a parabolic version of uniform rectifiability and parabolic singular integrals is presented.

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