

Contents

1. E.G. Dyakonov

Iterative Methods Based on Linearization for Nonlinear Elliptic Grid Systems	1
1. Preconditioning and Symmetrization of Linear Systems	2
2. Two-Stage Iterative Methods for Nonlinear Systems	11
3. Choice of Model Grid Operators: Optimal and Nearly Optimal Preconditioning	19
4. Examples of Applications of Two-Stage Iterative Methods for Nonlinear Elliptic Problems	34
References	40

2. V.I. Lebedev

How to Solve Stiff Systems of Differential Equations by Explicit Methods	45
1. Problem Statement and Assumptions	46
2. Formulation of Four Methods Involving Explicit Difference Schemes with Time-Variable Steps	48
3. Implicit Schemes for Linear Equations	50
4. Investigation of Stability and Approximation of Explicit Difference Schemes	51
5. Investigation of Stability and Approximation of Implicit Difference Schemes	53
6. Some Estimates for Polynomials	56
7. Determination of Parameters of Difference Equations	66
8. One Realization of Stable Algorithms	72
9. On Passing Boundary Layers, Estimating Quantities Cou and τ and the DUMKA Code	73
10. Cases of Stiff System Computations	75
References	79

3. G.M. Kobelkov

On Numerical Methods of Solving the Navier-Stokes Equations in "Velocity-Pressure" Variables	81
1. Numerical Methods for Solution of the Stationary Stokes Problem	82
2. Methods for Solving Nonstationary Stokes Problems	97

3.	Numerical Methods for Nonlinear Equations	106
	References	114
4.	R.P. Fedorenko	
	Stiff Systems of Ordinary Differential Equations	117
1.	Linear Stiff Systems	118
2.	A-Stability of Difference Schemes	123
3.	Singularly-Perturbed Systems	126
4.	Numerical Integration of a Singularly-Perturbed System	128
5.	On Regular Stiff Systems	131
6.	Some Applications of the Theory	138
7.	Slow Processes in a Nuclear Reactor	144
8.	On the Accuracy of Euler's Implicit Scheme	146
	References	153
5.	A.A. Zlotnik	
	Convergence Rate Estimates of Finite-Element Methods for Second-Order Hyperbolic Equations	155
1.	Initial-Boundary Value Problem for Second-Order Multidimensional Hyperbolic Equations	156
2.	Three-Level Finite-Element Method with Weight	165
3.	Second-Order Accuracy A Priori Error Estimates	174
4.	Fractional-Order Error Estimates in Nonsmooth Data Classes	179
5.	The $W_{2,h}^1$ and C_h Error Estimates for the One-Dimensional Case	189
6.	Second-Order Hyperbolic Equations of General Form	196
7.	Finite-Element Method with the Splitting Operator	204
8.	Two-Level Finite-Element Method	210
9.	Abstract Second-Order Hyperbolic Equations: Applications to Dynamic Problems of Mechanics	216
	References	217
6.	N.S. Bakhvalov and A.V. Knyazev	
	Fictitious Domain Methods and Computation of Homogenized Properties of Composites with a Periodic Structure of Essentially Different Components	221
1.	Homogenization	223
2.	Fictitious Gradients Method: Perforated Composites	228
3.	Composites with Inclusions of a Soft Material	239
4.	Composites with Inclusions of Soft Materials and with Cavities	252
5.	On a Function Extension on a Torus	259
	References	265
Index	267