

Contents :

1. Numerical methods and mathematical formulations

- Numerical formulation of engineering problems
- Mathematical modelling
- Variational formulations
- Approximation methods
- Numerical treatment of boundary-value problems
- Computational algorithms

2. Finite element methods

- Finite element formulations
- Low-degree finite elements
- Approximation and accuracy
- Meshes and nodes
- Element formulation
- Applications to mechanics and engineering

The contents preview specifically lists “**On the analysis of forming problems in natural formulation**” and “**Method to increase the accuracy of lowdegree element...**” among the opening contributions.

3. Fictitious-region and domain methods

- Fictitious-region methods
- Treatment of complicated domains
- Boundary conditions
- Numerical approximation
- Applications to mathematical physics

The book specifically includes “**The fictitious regions method in problems of mathematical...**” beginning around page 29.

4. Numerical linear algebra

- Solution of large systems of linear equations
- Iterative methods
- Conjugate-gradient methods
- Matrix factorization
- Cholesky factorization
- Incomplete Cholesky factorization
- Sparse matrices
- Convergence

The indexed vocabulary of the volume explicitly includes **Cholesky, conjugate gradient, incomplete Cholesky factorization, matrix, iteration and convergence.**

5. Partial differential equations

- Numerical solution of PDEs
- Elliptic problems
- Parabolic problems
- Boundary-value problems
- Diffusion equations
- Poisson-type equations
- Discretization techniques

6. Fluid mechanics

- Numerical fluid mechanics
- Navier–Stokes equations
- Incompressible flow
- Viscous flow
- Velocity fields
- Pressure
- Boundary conditions
- Numerical simulation

The volume's indexed terms specifically include **Navier–Stokes equations, incompressible, velocity, viscosity, flux and fluid.**

7. Transonic and compressible flows

- Transonic flow
- Compressible flow
- Numerical schemes
- Shock-related phenomena
- Stability
- Computational fluid dynamics

Transonic flow appears prominently among the indexed subjects of the volume.

8. Nonlinear problems

- Nonlinear equations
- Nonlinear boundary-value problems
- Nonlinear operators
- Numerical approximation
- Iterative solution techniques
- Stability and convergence

9. Free-boundary problems

- Free boundaries
- Moving boundaries
- Variational formulations
- Numerical approximation

- Applications in forming and mechanics

10. Optimization and computational methods

- Numerical optimization
- Optimization algorithms
- Parameter optimization
- Optimal solutions
- Computational techniques
- Engineering optimization

11. Inverse problems

- Inverse problems
- Parameter identification
- Inverse operators
- Numerical reconstruction
- Stability of inverse calculations

The term “**inverse problem**” is explicitly present in the indexed terminology of the volume.

12. Computational mechanics

- Solid mechanics
- Structural analysis
- Deformation
- Stress and strain
- Numerical mechanics
- Finite element applications

13. Plasma and electromagnetic applications

- Plasma physics
- Magnetic problems
- Diffusion
- Electromagnetic phenomena
- Numerical computation
- Physical simulation

The book's indexed terms include **magnetic, plasma and tokamak**, indicating applications to computational plasma physics.

14. Engineering applications

- Mechanical engineering
- Forming processes
- Structural problems
- Fluid-flow applications
- Physical modelling
- Computer simulation

15. Numerical algorithms and computational implementation

- Algorithms
- Discretization
- Iterative computation
- Computer implementation
- Numerical efficiency
- Accuracy
- Convergence
- Stability