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Interpolation error; 3.10 Gradient estimates; 3.11 Exercises; 3.12 Bibliography; 4. One-dimensional integration; 4.1 Introduction; 4.2 Local coordinate Jacobian; 4.3 Exact polynomial integration; 4.4 Numerical integration; 4.5 Variable Jacobians; 4.6 Exercises; 4.7 Bibliography; 5. Error estimates for elliptic problems; 5.1 Introduction; 5.2 Error estimates; 5.3 Hierarchical error indicator; 5.4 Flux balancing error estimates; 5.5 Element adaptivity; 5.6 H-adaptivity; 5.7 P-adaptivity; 5.8 HP-adaptivity; 5.9 Exercises
5.10 Bibliography 6. Super-convergent patch recovery; 6.1 Patch implementation database; 6.2 SCP nodal flux averaging; 6.3 Computing the SCP element error estimates; 6.4 Hessian matrix; 6.5 Exercises; 6.6 Bibliography; 7. Variational methods; 7.1 Introduction; 7.2 Structural mechanics; 7.3 Finite element analysis; 7.4 Continuous elastic bar; 7.5 Thermal loads on a bar; 7.6 Reaction flux recovery for an element; 7.7 Heat transfer in a rod; 7.8 Element validation; 7.9 Euler's equations of variational calculus; 7.10 Exercises; 7.11 Bibliography; 8. Cylindrical analysis problems; 8.1 Introduction
8.2 Heat conduction in a cylinder 8.3 Cylindrical stress analysis; 8.4 Exercises; 8.5 Bibliography; 9. General interpolation; 9.1 Introduction; 9.2 Unit coordinate interpolation; 9.3 Natural coordinates; 9.4 Isoparametric and subparametric elements; 9.5 Hierarchical interpolation; 9.6 Differential geometry; 9.7 Mass properties; 9.8 Interpolation error; 9.9 Element distortion; 9.10 Space-time interpolation; 9.11 Exercises; 9.12 Bibliography; 10. Integration methods; 10.1 Introduction; 10.2 Unit coordinate integration; 10.3 Simplex coordinate integration; 10.4 Numerical integration
10.5 Typical source distribution integrals

Sommario/riassunto

This key text is written for senior undergraduate and graduate engineering students. It delivers a complete introduction to finite element methods and to automatic adaptation (error estimation) that will enable students to understand and use FEA as a true engineering tool. It has been specifically developed to be accessible to non-mathematics students and provides the only complete text for FEA with error estimators for non-mathematicians. Error estimation is taught on nearly half of all FEM courses for engineers at senior undergraduate and postgraduate level; no other existing textbook for th