Review before first exam - What you should know?

Chapters 0

- Characteristics of CFD as compared to other approaches of studying fluid dynamics
- Basic computer architectures – differences, pros and cons, definitions of various related terms
- Current trend in moving toward distributed memory massively parallel systems
- Vectorization and parallelization concepts and issues
- Amdahl's Law – its derivation and application.
- Code optimization issues

Chapters 1

- ODE versus PDE
- Order and linearity of PDE's
- Classification of first-order, second-order PDE's and systems of first-order PDE's
- Three canonical forms of 2nd-order PDE's.
- Conversion of 2nd-order PDE in a general form into one of the three canonical forms via coordinate transformation.
- Classification of PDE's according to the existence of characteristics
- Be able to derive the characteristics and compatibility equations for first and second order PDE's and systems of first-order PDE's
- Can use method of characteristics to solve simple problems
- Concepts of domain of dependence (DOD) and domain of influence
- Main characteristics of the DOD for hyperbolic, parabolic and elliptic equations
- Basic types of I.C. and B.C.
- Know something about the well-posedness of PDE systems

Chapters 2

- Use Taylor series expansion/polynomial fitting/method of characteristics-interpolation methods to obtain finite difference approximations
- Be able to derive and discuss truncation errors
- The order of accuracy of F.D. schemes; numerical approach for determining order of accuracy
- The concepts of consistency, stability and convergence, Lax's equivalence theorem
- Methods for determining stability of F.D. schemes
- Be able to perform stability analysis using von Neumann method