

博士班資格考試筆試各科目考試範圍與參考書目

Guidelines of Qualify Exams for admission to official candidacy for the PhD degree

常微分方程(ODE)

考試範圍 (Scope) :

1. Fundamental Theory and First-Order Systems:

Local Existence and Uniqueness of Solutions of I.V.P., Continuation of Solutions, Continuous Dependence Properties, Differentiability of Initial Conditions and Parameters, Differential Inequalities.

2. Linear Systems and Higher-Order Equations:

Introduction to Linear Systems, Fundamental Matrices, Linear Systems with Constant Coefficients, Two-Dimensional Linear Autonomous Systems, Linear Systems with Periodic Coefficients, Adjoint Systems, Sturm's Comparison Theorem and Sturm-Liouville Boundary Value Problems, Distributions, Green's Function, Fredholm Alternative.

3. Stability and Dynamical Behavior of Nonlinear Systems:

Definitions of Stability, Linearization, Saddle Point Property, Orbital Stability, Travelling Wave Solutions, Introduction to Dynamical Systems, Lyapunov Functions, Simple Oscillatory Phenomena, Gradient Vector Fields.

4. Planar Systems and Bifurcation Theory:

Poincaré-Bendixson Theorem, Levinson-Smith Theorem.

參考書目 (References):

- The primary reference for this exam is
[1] Sze-Bi Hsu and Kuo-Chang Chen, Ordinary Differential Equations with Applications, Volume 23, World Scientific, 2022.
- The secondary reference, particularly for supplemental problems and exercises, is
[2] William E. Boyce and Richard C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 11th Edition, Wiley, 2017.
- [3] Morris W. Hirsch and Stephen Smale, Differential Equations, Dynamical Systems, and Linear Algebra, Academic Press, 1974.