國立中正大學數學系博士班資格考

筆試考試範圍

98 年 5 月 20 日第 8 次課程暨招生委員會通過

科目名稱	代數 Algebra
主要內容	1. Group Theory: group action, Sylow's theorems, classification of finite groups of small order, finitely generated abelian groups, free groups. 2. Ring Theory: commutative rings, localization, polynomial rings. 3. Field Theory: field extensions, Galois theory, splitting fields, algebraic closures, normality, finite fields. 4. Module Theory: finitely generated modules over a PID.
參考用書	T. W. Hungerford, *Algebra*, Chapters I---V.

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科目名稱	微分方程 Differential Equations
主要內容	1. Existence and uniqueness theorems of solutions 2. Continuation of solutions 3. Dependence of solutions to initial data and parameters 4. Linear systems with constant coefficients 5. Floque theory 6. Stability of equilibria 7. Planar systems, limit cycles and the Poincare-Bendixon theorem 8. Oscillation and comparison theorems for linear 2^{nd} order equations 9. Eigenvalue problems
參考用書	E. Coddington and N. Levinson, *Theory of Ordinary Differential Equations*, Robert E. Krieger Publishing Company, 1984. (Chapter 1 – Chapter 3, Chapter 7 – Chapter 16.)

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科目名稱	實變函數 Real Analysis
主要內容	1. Set theory and general topology. 2. Measure theory, Lebesgue integral, convergence theorems, Lp classes. 3. Absolute continuity, Radon-Nikodym theorem. 4. Product measures, Fubini's theorem. 5. Open mapping theorem, Banach-Steinhause theorem, Hanh-Banach extension theorem. 6. Compact Operators, Self-adjoint operators, Spectral theory.
參考用書	1. R. Wheeden and A. Zygmund, *Measure and Integral*, 1978. Chapter 1 — Chapter 8. 2. A. Friedman, *Foundations of Modern Analysis*, Dover Publications, Inc., 1982. Chapter 1 — Chapter 6.

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科目名稱	統計學 Statistics
主要內容	Random Variables and Transformations, Distribution Functions, Important Distributional Models, Moments and Inequalities, Characteristic Functions, Stochastic Independence, Limit Theorems, Order Statistics, Unbiasedness, Sufficiency, Completeness, Point Estimation, Interval Estimation, Maximum Likelihood Estimators, Contingency Tables, Goodness-of-fit Tests, Likelihood Ratio Tests, Optimal Tests, Consistency, Asymptotic Normality, Multivariate Normal Distributions, Linear Regression, Analysis of Variance, Bayesian Statistics, Fundamental Nonparametric Statistics.
參考用書	1. Lehmann, E L. and Romano, Joseph P., *Testing Statistical Hypotheses*, Springer.（Chapter1~Chapter3） 2. Lehmann, E. L. and Casella, George, *Theory of Point Estimation*, Springer.（Chapter1~Chapter5）

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科目名稱	微分幾何 Differential Geometry
主要內容	1. Differentiable manifolds; Riemann manifolds 2. Theory of connections 3. Geodesics; Convex neighborhood 4. Curvature 5. Jacobi fields 6. Isometric immersions 7. Complete manifolds; Hope-Rinow and Hadamard theorems
參考用書	M.P. do Carmo, *Riemannian geometry*, Boston: Birkhauser, 1993. (Chapter 1 – Chapter 7)

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科目名稱	複變函數 Complex Analysis
主要內容	5. Analytic functions: Cauchy-Riemann equations; power series; harmonic functions. 6. Complex integration: Cauchy's theorem;Goursat's theorem; Cauchy's integral formula; residue theorem; computation of definite integrals by residues. 7. Conformal mapping: linear fractional transformations and cross ratio; mappings by elementary functions; Riemann mapping theorem. 8. Singularities: classification of isolated singularities; Laurent series; Casorati-Weierstrass theorem; Picard's theorems. 9. Geometric function theory: winding numbers and the argument principle; open mapping theorem; maximum modulus principle; Schwarz lemma; three-circle theorem. 10. Analytic continuation: Schwarz reflection principle; continuation along a path; monodromy theorem. 11. Convergence and Approximation: normal families; Hurwitz's theorem; Runge's theorem; Mittag-Leffler's theorem; infinite products; factorization theorems of Weierstrass and Hadarmard.
參考用書	1. J.B. Conway, *Functions of one complex variable*, 2nd edition, 1978. 2. L.V. Ahlfors, *Complex analysis*, McGraw-Hill book co., 1966.

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科目名稱	機率論 Probability
主要內容	12. Probability spaces, Probability Measure and Random Variables, Product Measure and Integration. 13. Mathematical Expectation, Convergence and Independence. 14. The Laws of Large Numbers and The Law of Iterated Logarithm. 15. Distributions and Characteristic Functions, Infinite Divisibility and Related Laws. 16. The Central Limit Problem, Stable Distributions. 17. Conditioning, Martingales and Stopping Times. 18. Stochastic Inequalities.
參考用書	3. Probability: Theory and Examples, 2nd ed. by Durrett, R. Duxbury, Press. 4. Probability and Measure, 3rd ed. by Patrick Billingsley.

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科目名稱	數值分析
主要內容	**(1) Numerical Linear Algebra:** ● Stability of algorithms, condition number estimators, round-off error analysis; ● Direct and iterative methods, least square methods, numerical eigenvalue problems. **(2) Numerical Analysis and Numerical ODEs:** ● Polynomial and spline interpolations; ● Numerical integration and orthogonal polynomials; ● Root-finding for nonlinear equations: convergence theory, Newton's methods ● Methods for initial-value problems ● Shooting method and finite difference method for two-point boundary value problems.
指定用書 及章節	**(1) B. N. Datta,** ***Numerical Linear Algebra and Applications***, Brooks/Cole, 1995, QA184.D37: Chap. 3, 5-8, 11. **(2) J. Stoer and R. Bulirsch,** ***Introduction to Numerical Analysis*****, Springer**, 1980, QA297.S8213: Chap. 2, 3, 5, 7.
參考用書 及章節	● D. S. Watkins, Fundamentals of Matrix Ccomputations, 2nd ed., John Wiley & Sons, 2002, QA188 W38: Chap. 1-3, 5-7 ● G. H. Golub, C. F. Van Loan, Matrix Computation, 3rd ed., Johns Hopkins University Press, 1996, QA188 G65: Chap. 2-5, 7-10 ● Quarteroni, R. Sacco, F. Saleri, *Numerical mathematics*.2nd ed., Springer 2007, QA297 Q83: Chap. 1-12