

## Analysis Qualifying Exam

### Syllabus

#### A. Review of Advanced Calculus

1. Functions, Limits, Connected sets and compactness.
2. Monotone sequences and functions, uniform continuity, The Cauchy Criterion. Limit superior and inferior.
3. Differentiation and Integration. Mean Value Theorem, Taylor's formula, Fundamental Theorem of Calculus, Conditional and absolute convergence, Improper integrals.
4. Uniform convergence.

*Books:* W. Rudin, Principles of Mathematical Analysis  
John M. Howie, Real Analysis

#### B. Real Analysis

1. Uniform convergence and integration, functions of bounded variation, Riemann's condition, Lebesgue's conditions.
2. Lebesgue integration. Difference between Riemann and Lebesgue integrability.
3.  $L^2$  and  $L^p$  -spaces.

*Books:* T. Apostol, Mathematical Analysis  
Royden and Fitzpatrick, Real Analysis

#### C. Complex Analysis.

1. Complex numbers, stereographic projection and Riemann sphere.
2. Complex differentiability, Cauchy-Riemann equations, power series. Basic functions.
3. Cauchy integral formula and Taylor expansion.
4. Isolated singularities and meromorphic functions. Laurent expansions and Residue Theorem. Residue Calculus.
5. Conformal mappings and Linear fractional transformations.

*Books:* J. Bak and D. Newman, Complex Analysis.  
J. Marsden, M. Hoffman, Basic Complex Analysis