

PRELIMINARY EXAMINATION TOPICS LIST FOR COMPLEX ANALYSIS

1. Complex Number System and Extended Complex Plane
2. Properties of Analytic Functions and Harmonic Functions
 - (a) Cauchy-Riemann Equations
 - (b) Conformality
3. Power Series and Analyticity
4. Properties of Elementary Functions
 - (a) Mapping Properties
 - (b) Branch-of-Log
 - (c) Mbius Transformations
5. Complex Integration
 - (a) Index of a Closed Curve
 - (b) Cauchy's Theorem
 - (c) Cauchy Integral Formula
 - (d) Morera's Theorem
6. Properties of Analytic Functions
 - (a) Zeros of an Analytic Function
 - (b) Identity Theorem
 - (c) Open Mapping Theorem
 - (d) Maximum Modulus Theorem
 - (e) Schwarz's Lemma
 - (f) Liouville's Theorem
 - (g) Fundamental Theorem of Algebra
7. Singularities
 - (a) Laurent Expansions
 - (b) Residue Theorem
 - (c) Argument Principle
 - (d) Rouch's Theorem
 - (e) Jensen's Theorem
8. Spaces of Analytic Functions
 - (a) Normality and Montel's Theorem

- (b) Hurwitz's Theorem
 - (c) Riemann Mapping Theorem
 - (d) Weierstrass Factorization
9. Spaces of Meromorphic Functions
- (a) Runge's Theorem
 - (b) Mittag-Leffler Theorem
10. Special Functions
- (a) Gamma Function
 - (b) Beta Function
 - (c) Zeta Function
11. Harmonic Functions
- (a) Dirichlet Problem
 - (b) Mean Value Theorem
 - (c) Maximum Principle
 - (d) Poisson Formula
 - (e) Harnack's Theorem
 - (f) Green's Function
12. Analytic Continuation
- (a) Schwarz Reflection Principle
 - (b) Schwarz-Christoffel Formula