PAPER - 9

COMPLEX ANALYSIS - I

Objectives

This course provides

(i) a modern treatment of concepts and techniques of complex function theory

(ii) To gain knowledge about the complex number system, the complex function and complex integration.

UNIT-I: Complex numbers and Elementary functions

Complex Number system, complex numbers –Algebraic properties-Point at Infinity Stereographic Projection-Function of a complex variable-Mappings-Elementary Functions- The Logarithmic function- Branches of log Z.
Sections 1-10, 21-30.

UNIT-II: Analytic functions

Definitions of Limits -Continuity-Derivatives and Differentiation formula-Cauchy-Riemann equations-Cauchy-Riemann equations in polar form-properties of Analytic functions-Necessary and sufficient conditions for Analytic functions-problems. Sections 11-19.

UNIT-III: Conformal Mappings

Harmonic functions-Determination of Harmonic conjugate and Analytic functions-conformal mapping-Isogonal mapping-Further properties and examples-transformations of Harmonic functions.
Sections 20, 76-80.

UNIT-IV Mapping by Elementary transformations

The transformations $w=z+d$, $w=1/z$, $w=z^2$, $\overline{w}=\sqrt{z}$, $w = e^z$, $w=\sin z$ Bilinear Transformation andspecial Bilinear Transformation problems.
Sections 31-36, 38-39

UNIT-V: Integrals

Contours - Line Integrals _ Cauchy-Goursat's Theorem (without proof) Cauchy's Integral Formula - Derivatives of Analytic Functions - problems. Sections 43-46, 50-52.

Recommended Text

R.V.Churchill and J.W.Brown, (1984) *Complex Variables and Applications*. McGraw Hill International Book Co., Singapore. (Third Edition)

Reference Books:

1. P. Duraipandian and LaxmiDuraipandian (1976) Complex Analysis: Emerald Publishers, Chennai

2. S. Ponnusamy. (2000) Foundations of Complex Analysis, Narosa Publishing House, New Delhi

3. Murray R. Spiegel. (2005) Theory and Problems of Complex Variable. Tata-Mcgraw Hill Edition, New Delhi.