



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI  
SHORT ABSTRACT OF THESIS

Name of the Student : Arun Kumar Bhardwaj  
Roll Number : 186123005  
Programme of Study : Ph.D.  
Thesis Title : Some Spaces of Holomorphic Functions and Their Applications  
Name of Thesis Supervisor(s) : Dr. Rajesh Kumar Srivastava  
Thesis Submitted to the Department/ Center : Mathematics  
Date of completion of Thesis Viva-Voce Exam : 20.12.2023  
Key words for description of Thesis Work : Holomorphic function, Hilbert transform, Model space, Toeplitz kernel

---

**SHORT ABSTRACT**

In this dissertation, we consider several problems in complex analysis.

In the first part, we study about an explicit formula for the Hilbert transform. The celebrated integral transforms such as Fourier transform, Laplace transform, and Hilbert transform have tremendous applications in various branches of science and engineering. However, unlike to Fourier or Laplace transform, very few functions have an explicit formula for their Hilbert transforms. In this dissertation, we obtain an explicit formula for the Hilbert transform of  $\log|f|$ , for the function  $f$  in Nevanlinna class having continuous extension to the real line. This family is the largest possible for which such a formula for the Hilbert transform of  $\log|f|$  can be obtained. The formula is very general and implies several previously known results.

In the second part, we consider the multipliers between model spaces. The main interest of this chapter is to obtain a characterization of the algebra of multipliers in the non-Hilbert setting, that is, for the case  $p \neq 2$ . The main thrust of this chapter is that: for the case  $p \neq 2$  the algebra of multipliers denies to obey some results obtained before for the case  $p=2$ . In this chapter, we also proved that the algebra of multipliers does not allow a "perturbation" in inner functions without altering the algebra.

In the last part, we prove some results on the triviality of Toeplitz kernels with certain symbols, uniqueness set for model spaces, and determination of meromorphic inner functions with some data.