P R E F A C E.

The present work is the out-come of the research carried out by me in the field "Topological and Distributional aspects of Integral Transforms and their applications" at Government Engineering College, Jabalpur, (M.P.) and at Marathwada University, Aurangabad (M.S.).

This thesis consists of ten chapters each divided into several sections. The formulae and results in each section are numbered progressively. For instance (4.2-5) denotes the fifth formula of the second section in the chapter four. References to the literature are given in full at the end of each chapter. In the text, they have been referred to, by putting within rectangular brackets the serial number of the reference, where-ever necessary; the page of the reference and the number of the result have also been given, i.e. [5, p. 11] means the result is on the page 11 of the fifth reference.

In the end, an appendix is added which consists of the two published research papers.

The zero chapter is devoted to the historical background development and the survey of the literature
in the context of the research work accomplished in the subsequent chapters of this thesis.

In the first, second and third chapters the several interesting topological and algebraic properties of integral transforms namely, Fourier Transform, Integral Transform with linear Kernel and Laplace Transform of two variables have been obtained.

In the chapters fourth, fifth, sixth, and seventh, the following initial and boundary value problems by the application of Hankel transformation of generalized functions with initial and boundary conditions as generalized functions, have been solved.

(i) Axisymmetric Dirichlet problem for a thick plate with boundary conditions as Distributions.

(ii) Diffusion of heat in solid medium with initial condition as Distribution.

(iii) The Biharmonic equation and its solution with boundary condition as a distribution.

(iv) The symmetrical free vibrations of a thin elastic plate with initial condition as a generalized function.
In chapter eighth we have constructed a new class of testing function space \( \mathcal{MH}_{a,b,k}^{\mu} \) and using it other spaces \( \mathcal{MH}_{a,b,k}^{\mu} \) and the countable union space \( \mathcal{MH}(\eta, \alpha) \) have been constructed. We have also proved that \( \mathcal{MH}_{a,b,k}^{\mu} \) is a complete locally convex, bornological Hausdorff topological t-space and obtained different important properties of above spaces.

In the ninth chapter by using the spaces defined in the eighth chapter, we have constructed the new spaces \( \tilde{\mathcal{MH}}_{a,b,k}^{\mu} \) and \( \tilde{\mathcal{MH}}_{a,b,k}^{\mu} \). It has been proved that the mapping \( \mathcal{R} : \mathcal{MH}_{a,b,k}^{\mu} \to 2\pi i \phi \) is an isomorphism from \( \tilde{\mathcal{MH}}_{a,b,k}^{\mu} \) onto \( \mathcal{MH}_{a,b,k}^{m,\mu} \). We have also defined the conventional Mellin-Hankel transformation on \( \mathcal{MH}_{a,b,k}^{m,\mu} \) and we have generalized the conventional Mellin-Hankel transformation to Mellin-Hankel Transform of generalized functions.