ABSTRACT

At the present time, it would be difficult to find any area of Applied mathematics, Physics, Statistics and various branches of science and technology in which one would not encounter generating functions of special functions and theory of Integral Transforms.

The main purpose of the present thesis is to develop distinct integral representations and explicit expressions or expansions of generalized Voigt functions involving classical functions of mathematical physics and multi-variable hypergeometric functions which are mainly based on the theory of integral transforms.

Many specific physical problems are related to Bessel functions in one way or other way (See Navelet [15]). Drouffe and Navelet [3]) have been led to consider the integral representation corresponding to the absorption related to Bessel functions. Taking into account that Voigt functions $K(x,y)$ and $L(x,y)$ play an important role in diverse field of physics such as astrophysical spectroscopy and theory of neutron reactions, such functions attract not only physicists but also mathematicians as is made clear in recent
work of Srivastava and Miller [22], Fettis [8], Fried and Conte [9], Exton [6], Siddiqui [20], Klusich [14], Srivastava, Pathan and Kamarujjama [24], and Kamarujjama [11] etc.

Because of growing importance of generating functions, special attention is also given to develop the theory of generating functions of special functions, which are partly bilateral and partly unilateral and their applications. Such type of generating functions can be obtained by series manipulations and integral transforms techniques. On these lines, much work has been done by several authors e.g. Exton [7], Pathan and Yasmeen [18], Srivastava and Pathan [23], Kamarujjama, Husain and Aftab [12], Pathan and Kamarujjama ([16], [17]). The Laurent expansions of special functions and mixed generating functions occur frequently in quantum mechanics (see Schiff [19], Exton [5], Andrews [1] Srivastava & Monocha [21], Erdelyi [4] and Brychkov, Glaeske, Prudnikov and Tuan [2].

The present thesis comprises six chapters which are given below:

Chapter-1: Introduction, definitions and Notations.
Chapter-2: Integral transform associated with Bessel’s function.

Chapter-3: Integral transform associated with Hyper-Bessel function.

Chapter-4: On certain partly bilateral and partly unilateral generating functions.

Chapter-5: A certain class of multiple generating functions involving Mittag-Leffler’s functions.

Chapter-6: A certain class of multiple generating functions.

Chapter 1 aims at introduction of several classes of special functions which occur rather more frequently in the study of integral transforms and generating functions.

Chapter 2 aims at presenting some known representation of Voigt function and multiindices and multivariables study of the unified (generalized) Voigt functions are given which play an important role in several diverse field of physics. Some representations and series expansions including multidimensional classical polynomials (Laguerre and Hermite) of mathematical physics are established.
Chapter 3 provides an interesting extension of the work of various authors Exton [6], Srivastava and Miller [22] and Klusch [14]. Some new integrals involving Hyper-Bessel function are presented and multiindices representation of unified Voigt function is obtained.

Chapter 4 begins by introducing a new class of interesting generating relation (partly bilateral and partly unilateral) involving Mittag-Leffler's functions. The result of Exton [7] which is partly bilateral and partly unilateral is generalized. We used series manipulation technique to construct explicitly the appropriate generating functions. A number of known results of Kamarujjama and Khursheed [13] Exton [7] are obtained as special cases.

Chapter 5 presents certain class of multiple generating function involving Mittag-Leffler's functions, $E_\alpha, E_{\alpha,\beta}$, and entire function intimately connected with $E_{\alpha,\beta}$, given by Wright [25], see also [4]. A generating function involving Mittag-Leffler's function is given as result I and its generalization as result II and result III deals in a similar way with the entire function. Some interesting (known and new) multiple generating function are also function as special
cases and a generating function of Hyper-Bessel function is also obtained.

In chapter 6 we obtain a general result on multiple generating function involving product of Hubbell and Srivastava function [10] with essentially arbitrary co-efficient. By appropriate specializing these co-efficient a number of (known and new) multiple generating functions are obtained as special cases.
REFERENCES:


