Special functions and their generating relations arise in a diverse range of applications in harmonic analysis, multivariate statistics, quantum physics, molecular chemistry and number theory. The majority of the functions used in technical and applied mathematics have originated as the result of investigating practical problems. The study of special functions is not only useful for mathematics but for physics, engineering, science, statistics and for technology also.

In the present work, we explore the interconnection of the general double and triple functions introduced by Appell and Kampé de Fériet [6], Lauricella [50], Horn [30; p.36], Saran [73], Srivastava [84], [81], Exton [30] and many others and discuss their expansions, summations, identities, transformations and reductions. This work is an attempt to give new results and to unify and generalize certain results scattered in literature by various researchers such as Srivastava and Manocha [95], Rassias and Srivastava [71], Brown [15], Chen, Chyan and Srivastava [21], Carlitz [19], Beniwal and Saran [12], Exton [33], Srivastava, Pathan and Bin Saad [97], Pandey and Srivastava [61], Prudnikov et.al. [69] Pathan and Bin Saad [64], Das [23], Brafman [13], Burchnall and Chaundy [17], Karlsson [44], [45], Pathan and Khan [65] and others.

This thesis comprises of six chapters. Each chapter is divided into a number of sections. Equations have been numbered chapterwise. The equations are numbered in such a way that, when read as decimals they stand in their proper order. For example, the bracket (a.b.c) specified the result, in which the last decimal place represents the equation number, the middle one represents the section and the first indicates the chapters to which it belongs.

The thesis has been made selfcontained by the inclusion, in chapter 1, of the breif treatment of the definitions and notations of the special functions with their convergence conditions. This chapter intended to provide an introduction
to a variety of hypergeometric functions together with other special functions used in the thesis. This would serve two purposes. First, it does discuss the basic concepts of the functions, more or less from scratch. Second, it seeks to place the study of later chapters in such a way that explicit references may be applied and be brought gradually to a level of the considerable proficiency.

Chapter 2 aims at presenting a number of representations of generalized Voigt functions in terms of special functions of mathematical physics. In particular, several general expansions involving generalized Bessel, Laguerre and Weber polynomials, Appell's and Kampé de Féret functions are established. Generating functions involving Srivastava's triple hypergeometric function, Kampé de Féret function.

In chapter 3, we present several (presumably new) classes of generating functions for Kampé de Féret functions and their extensions in terms of Pathan's function and Srivastava's triple hypergeometric function. We also discuss decomposition technique to derive generating functions for Laguerre polynomials. Many special cases are also discussed.

In chapter 4, we generalize some results on a two variable analogue of generalized Laguerre polynomials, which were given by Beniwal and Saran [12]. Several other generalizations, which indeed are relevant to the present investigation of bilinear and bilateral generating functions involving hypergeometric functions of two and three variables are also considered. Also, we use recent results of Exton, to establish certain generating relation of hypergeometric functions of two and three variables. These formulas are rather peculiar, in that they become tautological if any attempt is made to reduce the general case of double series to single series. Some interesting special cases of our results are also discussed.

In chapter 5, we have developed a multivariable generalization of bilateral series of functions of Appell's, Srivastava, Kampé de Féret and generalized Kampé de Féret involving Laurent series with the help of a result recently given by Sri-
vastava, Pathan and Bin Saad. In this chapter, we also corrected some results of Pandey and Srivastava [61]. In addition, we obtain some bilateral generating relations of hypergeometric functions of two and three variables. Also, some of the special cases are discussed.

Chapter 6 is devoted to establish certain representations of Bessel functions in terms of Srivastava’s triple series, Appell’s double series and Gauss series. An application to the formulas of Exton, Pathan and Bin Saad, Pathan and Khan, M. K. Das, Burchnall and Chaundy and Srivastava and Karlsson yields some transformations formulas of hypergeometric series. Some special cases of interest are also given.

This thesis concludes with bibliography and an appendix which contains reprints of a few published papers.

A part of our work has been published/accepted/communicated for publication. A list of research papers is given below.


(3) Certain transformations and reduction formulae for hypergeometric functions, South East Asian Journal of Mathematics and Mathematical Sciences, 1 No. 3 (2003), (To appear)

This paper is also presented at 68th annual conference of “Indian Mathematical Society” (2002) held at Kolhapur, India.

(4) Some transformations of multiple hypergeometric series (communicated).
This paper is also presented at 67th annual conference of “Indian Mathematical Society” (2001) held at Aligarh, India.

(5) On bilateral generating relations involving hypergeometric series (communicated).

(6) On transformations of certain hypergeometric functions of two and three variables (communicated).

(7) On generalized Voigt functions (communicated).

(8) Some general families of generating functions for the Kampé de Fériet function (communicated).