Abstract

The subject of special functions is of vital importance due to it’s roles and applications in so many mathematical aspects. Many researchers paid their attention to study in this field of Mathematics. Also, the special functions has great deal with applications in pure and applied mathematics. They are appears in different frameworks. They are often used in combinatorial analysis, and even in statistics. In the past few decades, the discoveries of new special functions and its applications to new areas of mathematics have initiated a resurgence of interest in this field. Moreover, in recent years, particular cases of long familiar special functions have been clearly defined and applied these concepts to orthogonal polynomials.

The process of obtaining generating functions takes place by many methods. Lie group and integral transform are considered of the recent methods for obtaining such kind of generating relations. The aim of this study is to obtain generating functions for some polynomials and special functions by using Lie group theoretic approach and Laplace transform.
Most of these generating relations are considered as generalizations of previous results that have been obtained before. This study comprises some new generating functions for some polynomials such as Laguerre, Legendre, Hermite, Jacobi, Gegenbauer and Bessel polynomials. Also generating functions for some special functions of three variables such as Exton’s functions have been established. The main methods used in our work for obtaining the generating relations are Lie group theoretic method and Laplace transform. This study consists of six chapters.

Chapter 1, includes a historical background, definitions and some relations that are of great concern with the study of generating functions. Through this chapter we aims at introducing the reader to the several classes of special functions, which occur rather frequently in the study of generating functions. In an attempt to make the chapter self-contained, we give the definitions and important properties of such elementary functions as Gamma and Beta functions, and then proceed to the hyper geometric functions in one, two and more variables, which pervade the bulk of the thesis.

In chapter 2, we obtained a new generating functions for Laguerre polynomials. Also, we have obtained results which can be considered as generalizations of the results that have been studied previously. We includes these results in our chapter 3.

In chapter 4, we used the Laplace transform techniques to obtained a new generating functions for Exton’s functions.

In chapter 5, by using Weisner’s method, operators has been found,
from which we have been established new generating functions for Legendre polynomials and results in consent with Gegenbauer polynomials has been focused.

We conclude all the results that we obtained during this study in our chapter 6.

Please be note that findings and investigations during this study has been published in peer revived indexed international journals and two of which have been communicated.