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On Generating Functions of Hypergeometric Polynomials by Group-theoretic Method

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Dedicated to Prof. Hari M. Srivastava on his 75^{th} ***birth anniversary***

Abstract: In this paper we have obtained some novel generating functions of ${}_2F_1(-n, \alpha; \gamma + n; x)$ - the modified form of Hypergeometric polynomials ${}_2F_1(-n, \alpha; \gamma; x)$ by utilizing L. Weisner's group-theoretic method of obtaining generating functions. In section-2, we obtain a set of infinitesimal operators by giving suitable interpretations to both the index (n) and the parameter (γ) of the polynomial under consideration, known as raising and the lowering operators has been introduced and on showing that they generate a four dimensional Lie algebra, we have obtained, in section-3, a novel generating functions of the Hypergeometric polynomials which in turn yields a number of new and known results on generating functions.
Keywords: Generating functions,Hypergeometric polynomials,Jacobi polynomials.
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1. Introduction

The Hypergeometric polynomials [5] ${}_2F_1(-n, \alpha; \gamma; x)$ is a solution of the following ordinary differential equation:

$$[x(1-x)\frac{d^2}{dx^2} + \{\gamma + (n - \alpha - 1)x\}\frac{d}{dx} + n\alpha]y = 0. \tag{1.1}$$

In this paper we have encountered a problem on generating functions of ${}_2F_1$(-n, $\alpha; \gamma + n; x)$ - the modified form of ${}_2F_1(-n, \alpha; \gamma; x)$ by employing the method of Weisner [2-4] with the suitable interpretations of n, γ simultaneously. Weisner's