J. of Ramanujan Society of Math. and Math. Sc. **ISSN : 2319-1023**
Vol.2, No.2 (2014), pp. 71-76

AN EXTENSION OF BILATERAL GENERATING FUNCTIONS OF GEGENBAUER POLYNOMIALS

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Abstract : In this note, we have obtained a novel extension of a bilateral generating relations involving modified Gegenbauer polynomials, $C_n^{\lambda+n}(x)$ from the existence of quasi-bilinear generating relation by group-theoretic method.

1. Introduction:

The Gegenbauer polynomials, $C_n^\lambda(x)$ is defined by [2]:

$$C_n^\lambda(x) = \sum_{p=0}^{[\frac{n}{2}]}(-1)^p \; \frac{(\lambda)_{n-p}(2x)^{n-2p}}{p! \; (n-2p)!}.$$

In[1], the quasi bilateral generating function is defined by

$$G(x,u,w) = \sum_{n=0}^{\infty} a_n \; p_n^{(\alpha)}(x) \; q_m^{(n)}(u) \; w^n,$$

where a_n,the coefficients are quite arbitrary and $p_n^{(\alpha)}(x)$, $q_m^{(n)}(u)$are two special functions of orders n, m and of parameters α and n respectively.If $q_m^{(n)}(u) \equiv p_m^{(n)}(u)$,the generating relation is known as quasi bilinear.

The aim at presenting this note is to prove the existence of a more general generating relation from the existence of a quasi-bilinear generating relation involving modified Gegenbauer polynomials by group theoretic method. In [3], authors have proved the following theorem on bilateral generating functions involving $C_n^{\lambda+n}(x)$, a modified form of $C_n^\lambda(x)$ by group-theoretic method.

Theorem 1: If there exists a unilateral generating relation of the form

2010 *Mathematics Subject Classification.* 33C45, 33C65.
Key words and phrases. Gegenbauer polynomials,Generating functions.