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ON DOUBLE SERIES IDENTITIES

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Abstract: In this paper, making use of the most generalized form of Bailey's Lemma due to Andrews [2], an attempt has been made to establish certain double series identities.

Keywords and Phrases: Double series identities, Bailey's Lemma, multiple series, summation formula.

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1. Introduction Notations and Definitions

Throughout this paper we shall adopt the following notation and definition; For any numbers α and q, real or complex and $|q| < 1$, let

$$[\alpha; q]_n \equiv [\alpha]_n = \begin{cases} (1-\alpha)(1-\alpha q)(1-\alpha q^2)...(1-\alpha q^{n-1}) & ; n > 0 \\ 1 & ; n = 0 \end{cases}$$

Accordingly, we have

$$[\alpha; q]_\infty = \prod_{r=0}^{\infty}(1-\alpha q^r).$$

Also,

$$[a_1, a_2, ..., a_r; q]_n \equiv [a_1; q]_n[a_2; q]_n...[a_r; q]_n.$$

We define a basic hypergeometric series,

$$ {}_r\Phi_s \left[\begin{matrix} a_1, a_2, ..., a_r; q; z \\ b_1, b_2, ..., b_s; q^\lambda \end{matrix} \right] = \sum_{n=0}^{\infty} \frac{[a_1, a_2, ..., a_r; q]_n z^n q^{\lambda n(n-1)/2}}{[q, b_1, b_2, ..., b_s; q]_n}, \quad (|z| < 1). \quad (1.1)$$