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PARTITION GENERATING FUNCTIONS AND CONTINUED FRACTIONS

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Dedicated to Prof. A.K. Agarwal on his 70^{th} ***Birth Anniversary***

Abstract: In this paper, making use of known result, certain continued fraction representations for partition generating functions have been established.

Keyword and Phrases: Partition, Partition generating function, Continued fraction, Rogers-Fine Identity, Lambert series, Generalized Lambert Series.

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1. Introduction, Notations and Definitions

As usual, for a and q complex numbers with $|q| < 1$, define

$$(a;q)_0 = 1$$

$$(a;q)_n = \prod_{r=0}^{n-1}(1-aq^r), \qquad \text{for} \quad n \in \mathbb{N},$$

$$(a;q)_\infty = \prod_{r=0}^{\infty}(1-aq^r), \qquad |q| < 1$$

and

$$(a_1;q)_n(a_2;q)_n...(a_r;q)_n = (a_1,a_2,...,a_r;q)_n$$

An ${}_r\Phi_s$ basic hypergeometric series is defined by ([3], (2.7.2) p. 347) and [1]: (1.2.22), p. 4)

$${}_r\Phi_s\left[\begin{array}{l} a_1,a_2,...,a_r;q;z \\ q,b_1,b_2,...,b_s \end{array}\right] = \sum_{n=0}^{\infty}\frac{(a_1,a_2,...,a_r;q)_n z^n}{(b_1,b_2,...,b_s;q)_n}\{(-1)^n q^{n(n-1)/2}\}^{1+s-r}$$