J. of Ramanujan Society of Math. and Math. Sc. **ISSN : 2319-1023**
Vol.6, No.1 (2017), pp. 79-90

ON CONTINUED FRACTIONS AND LAMBERT SERIES

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Dedicated to Prof. K. Srinivasa Rao on his 75^{th} ***Birth Anniversary***

Abstract: In this paper, we have established certain results involving continued fractions and Lambert series.

Keywords and Phrases: Lambert series, continued fractions, q-shifted factorial, basic hypergeometric series.

2010 Mathematics Subject Classification: 33D15, 11B65.

1. Introduction, Notations and Definitions

The q-shifted factorial is defined by,

$$(a;q)_n = \begin{cases} 1, & n = 0 \\ (1-a)(1-aq)...(1-aq^{n-1}), & n \geq 1 \end{cases}$$

Also,

$$(a;q)_{-n} = \frac{q^{n(n+1)/2}}{(-a)^n(q/a;q)_n}$$

The generalized basic hypergeometric series is given by,

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

where max. $(|q|, |z|) < 1$.

A generalized bilateral basic hypergeometric series is defined by,

$${}_r\Psi_r\left[\begin{array}{l} a_1, a_2, ..., a_r; q; z \\ b_1, b_2, ..., b_r \end{array}\right] = \sum_{n=-\infty}^{\infty} \frac{(a_1;q)_n(a_2;q)_n...(a_r;q)_n z^n}{(b_1;q)_n(b_2;q)_n...(b_r;q)_n},$$