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Basic Hypergeometric Series and Fourier Transform

Dr. Ravindra Kumar Yadav
Department of Mathematics,
Sobhasaria Engineering College, Sikar Rajasthan, India

Abstract: In this paper, we shall make use of Bailey's transform and fourier transform, in order to establish summations formulae for basic hypergeometric series.

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1. Introduction, Notations and Definitions

We employ the usual notations

$$[a;q]_n = (1-a)(1-aq)...(1-aq^{n-1}), \qquad n = 1, 2, 3, ...,$$

$$[a;q]_0 = 1,$$

$$[a_1, a_2, ..., a_r; q]_n = [a_1;q]_n[a_2;q]_n...[a_r;q]_n.$$

and for $|q| < 1$,

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

$$[a_1, a_2, ..., a_r; q]_\infty = [a_1;q]_\infty[a_2;q]_\infty...[a_r;q]_\infty.$$

The basic hypergeometric series is defined as,

$${}_r\Phi_s\left[\begin{array}{l} a_1, a_2, ..., a_r; q; z \\ b_1, b_2, ..., b_s \end{array}\right] = \sum_{n=0}^{\infty}\frac{(a_1, a_2, ..., a_r; q)_n z^n}{(q, b_1, b_2, ..., b_s; q)_n}, \tag{1.1}$$

where for convergence $(|z|, |q|) < 1$, if $1 + s = r$ and for $1 + s > r$, $|z| < \infty$.

W.N. Bailey [1] in 1944 established a simple but a very useful transform called as Bailey transform: if

$$\beta_n = \sum_{r=0}^{n}\alpha_r u_{n-r} v_{n+r}$$