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Definite Integral Relation Involving H-Function of Multivariable Function and General Class of Polynomial

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ABSTRACT

In this paper, we obtain an integral relation containing to a product of Fox's H-function [2], , general class of multivariable polynomials srivastava and Garg [11],generalized polynomials srivastava [10] and H-function of several complex variables given by srivastava and panda [14] with general argument of quadratic nature. This paper is capable of yielding numerous result involving classical orthogonal polynomials.

Key Words: Fox's H-function, general polynomials, general class of polynomials, generalized lauricella function, G-function, multivariables H-function

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I. INTRODUCTION

The H-function of several complex variable is defined by Srivastava and Panda [14] as:

$$H[x_1,\ldots,x_r]=H^{0,\lambda:(u',v');\ldots;(u^{(r)},v^{(r)})}_{A,C:[B',D'];\ldots;[B^{(r)},D^{(r)}]}\left[\begin{matrix}[(p):\theta';\ldots;\theta^{(r)}]:[(q'):\Delta'];\ldots;[(q^{(r)}):\Delta^{(r)}];\\ (s):\psi';\ldots;\psi^{(r)}]:[(t'):\delta'];\ldots;[(t^{(r)}):\delta^{(r)}];\end{matrix}\; x_1,\ldots,x_r\right] \qquad \ldots(1.1)$$

The Fox's H-function [2]:

$$H^{L,R}_{P,Q}\left[x\left|\begin{matrix}(m_P,M_P)\\(n_Q,N_Q)\end{matrix}\right.\right]=\sum_{G=0}^{\infty}\sum_{g=1}^{L}\frac{(-1)^G}{G!N_g}\phi_{(\eta_G)}\,x^{\eta_G}, \qquad \ldots(1.2)$$

where

$$\phi_{(\eta_G)}=\frac{\prod\limits_{\substack{j=1\\j\neq g}}^{L}\Gamma(n_j-N_j\eta_G)\prod\limits_{j=1}^{R}\Gamma(1-m_j+M_j\eta_G)}{\prod\limits_{j=L+1}^{Q}\Gamma(1-n_j+N_j\eta_G)\prod\limits_{j=R+1}^{P}\Gamma(m_j-M_j\eta_G)}$$

and

$$\eta_G=\frac{(\eta_g+G)}{\eta_g}$$

The H-function of multivariable in (1.1) converges absolutely if

$$\left|\arg(x_i)\right|<\frac{1}{2}\pi T_i\,, \qquad \ldots(1.3)$$

where

$$T_i = -\sum_{j=1+\lambda}^{A} \theta_j^{(i)} + \sum_{j=1}^{v^{(i)}} \Delta_j^{(i)} - \sum_{j=1+v^{(i)}}^{B^{(i)}} \Delta_j^{(i)} - \sum_{j=1}^{C} \Psi_j^{(i)} + \sum_{j=1}^{u^{(i)}} \delta_j^{(i)} - \sum_{j=1+u^{(i)}}^{D^{(i)}} \delta_j^{i} > 0,$$

$\forall\ i \in (1,\ldots,r)$ …(1.4)

general class of polynomials introduced by srivastava [10] is as follows

$$S_N^M(Z) = \sum_{\ell=0}^{(N/M)} \frac{(-N)_{Mk}}{\ell!} B_{N,k}\, Z^{\ell} \qquad \ldots(1.5)$$

Where M,N are arbitrary positive integer and the coefficients $B_{N,K}$ are arbitrary constant ,real or complex. Srivastava has defined and introduced the general polynomials ([10], p.185, eq.(7))

$$S_{N_1,\ldots,N_s}^{M_1,\ldots,M_s}[z_1,\ldots,z_r] = \sum_{\beta_1=0}^{[N_1/M_1]} \cdots \sum_{\beta_s=0}^{[N_s/M_s]} \frac{(-N_1)_{M_1\beta_1}}{\beta_1!} \cdots \frac{(-N_s)_{M_s\beta_s}}{\beta_s!}$$

$$.B[N_1,\beta_1;\ldots;N_s,\beta_s]\, z_1^{\beta_1} \ldots z_s^{\beta_s}, \qquad \ldots(1.6)$$

where $N_i = 0,1,2,\ldots,\ \forall\ i = (1,\ldots,s)$; $M_1 ,\ldots, M_s$ are arbitrary positive integers and the coefficients B $[N_1,\beta_1 ;\ldots; N_s,\beta_s]$ are arbitrary constants, real or complex.

II. THE MAIN INTEGRAL RESULT

Here we obtain following integral :

$$\int_0^{\infty} w^{1-\beta}(a+bw+cw^2)^{\beta-3/2} H_{P,Q}^{L,R}\left[\left(\frac{w}{a+bw+cw^2}\right)^{\sigma}\middle|\begin{matrix}(m_P,M_P)\\(n_Q,N_Q)\end{matrix}\right]$$

$$.S_{N_1,\ldots N_s}^{M_1,\ldots M_s}\left[z_1\left(\frac{w}{a+bw+cw^2}\right)^{n_1},\ldots,z_s\left(\frac{w}{a+bw+cw^2}\right)^{n_s}\right]$$

$$.S_N^M\left[z\left(\frac{w}{a+bw+cw^2}\right)^{n}\right]$$

$$.H\left[x_1\left(\frac{w}{a+bw+cw^2}\right)^{\sigma_1},\ldots,x_r\left(\frac{w}{a+bw+cw^2}\right)^{\sigma_r}\right]dw$$

$$=\sqrt{\frac{\pi}{c}}\sum_{G=0}^{\infty}\sum_{g=1}^{L}\sum_{\beta_1=0}^{[N_1/M_1]}\cdots\sum_{\beta_s=0}^{[N_s/M_s]}\sum_{\ell=0}^{(N/M)}\frac{(-N)_{Mk}}{\ell!}B_{N,k}\frac{(-1)^G}{G!F_g}\frac{(-N_1)_{M_1\beta_1}}{\beta_1!}\cdots\frac{(-N_s)_{M_s\beta_s}}{\beta_s!}\Phi(\eta_G)$$

$$B[N_1,\beta_1;\ldots;N_s\beta_s]\,z_1^{\beta_1}\ldots(z_s)^{\beta_s}\,z^{\ell}\,(b+2\sqrt{ca})^{\beta-\sigma\eta_G-\sum_{i=1}^{s}\eta_i\beta_i-1}$$

$$.H_{A+1,C+1:[B',D'];\ldots;[B^{(r)},D^{(r)}]}^{0,\lambda+1:(u',v');\ldots;(u^{(r)},v^{(r)})}\left[\begin{matrix}x_1(b+2\sqrt{ca})^{-\sigma_1}\\ \vdots\\ x_r(b+2\sqrt{ca})^{-\sigma_r}\end{matrix}\middle|\begin{matrix}[\beta-\sigma\eta_G-\sum_{i=1}^{s} n_i\beta_i:\sigma_1;\ldots;\sigma_r],\\ \\ [(s):\Psi';\ldots;\Psi^{(r)}],\end{matrix}\right.$$

$$\left.\begin{matrix} [(p):\theta';\ldots;\theta^{(r)}] & :[(q'):\Delta'];\ldots;[(q^{(r)}):\Delta^{(r)}] \\ [\beta-\sigma-\sum_{i=1}^{s} n_i\beta_i-\frac{1}{2}:\sigma_1;\ldots;\sigma_r]:[(t'):\delta'];\ldots;[(t^{(r)}):\delta^{(r)}] \end{matrix}\right] \quad \ldots(2.1)$$

provided that Re(a) > 0, Re(b) > 0, c > 0 and

$$\sigma \min\left[\mathrm{Re}\left(\frac{n_j}{N_j}\right)\right]+\sum_{i'=1}^{r}\sigma_i' \min\left[\mathrm{Re}\left(\frac{t_{j'}^{(i')}}{\delta_{j'}^{(i')}}\right)\right]>\beta-2,\ j=1,\ldots,M \text{ and } j'=1,\ldots,u^{(i')}.$$

Proof:

For getting the result (2.1) first we express the Fox H-function and a general polynomials in form of series and the H-function of multivariable in terms of Mellin-Barnes contour integrals. Now interchanging the order of summations and integration which is permissible under the stated condition, we get

$$\sum_{G=0}^{\infty}\sum_{g=1}^{L}\sum_{\beta_1=0}^{[N_1/M_1]}\cdots\sum_{\beta_s=0}^{[N_s/M_s]}\sum_{\ell=0}^{(N/M)}\frac{(-N)_{Mk}}{\ell!}B_{N,k}\frac{(-1)^G(-N_1)_{M_1\beta_1}}{\beta_1!}\cdots\frac{(-N_s)_{M_s\beta_s}}{\beta_s!}\phi(\eta_G)$$

$$.\ B[N_1,\beta_1;\ldots;N_s\beta_s](z_1)^{\beta_1}\ldots(z_s)^{\beta_s}z^{\ell}$$

$$.\ \frac{1}{(2\pi i)^r}\int_{I_1}\ldots\int_{I_r}\psi(\xi\gamma_1,\ldots,\gamma_r)\Delta_1(\nu_1)\ldots\Delta_r(\gamma_r)x_1^{\gamma_1}\ldots x_r^{\gamma_r}$$

$$.\left\{\int_0^{\infty} w^{1-[\beta-\sigma\eta_G-\sum_{i=1}^{s} n_i\beta_i-nl-\sigma_1\gamma_1-\ldots-\sigma_r\gamma_r)}\right.$$

$$\left..(a+bw+cw^2)^{(\beta-\sigma\eta_G-\sum_{i=1}^{s} n_i\beta_{i\text{-}nl}-\sigma_1\xi\gamma_1-\ldots-\sigma_r\gamma_r)-\frac{3}{2}}dw\right\}d\gamma_1\ldots d\gamma_r, \quad \ldots(2.2)$$

On solving above w-integral by help of known theorem (Saxena [8]) and reinterpreting the result obtained in terms of H-function of r variable, we get the desired result.

III. PARTICULAR CASES

(a) When we put λ = A = C = 0 in (2.1), we get the following integral result

$$\int_0^{\infty} w^{1-\beta}(a+bw+cw^2)^{\beta-3/2}H_{P,Q}^{L,R}\left[\left(\frac{w}{a+bw+cw^2}\right)^{\sigma}\middle|\begin{matrix}(m_P,M_P)\\(n_Q,N_Q)\end{matrix}\right]$$

$$.S_{N_1,\ldots N_s}^{M_1,\ldots M_s}\left[z_1\left(\frac{w}{a+bw+cw^2)}\right)^{n_1},\ldots,z_s\left(\frac{w}{a+bw+cw^2}\right)^{n_s}\right]$$

$$.\ .S_N^M\left[z\left(\frac{w}{a+bw+cw^2}\right)^{n}\right]$$

$$.\prod_{i=1}^{r}H_{B^{(i)},D^{(i)}}^{u^{(i)},v^{(i)}}\left[x_i\left(\frac{w}{a+bw+cw^2}\right)^{\sigma_1}\middle|\begin{matrix}[(b^{(i)}):\phi^{(i)}]\\ [d^{(i)}:\delta^{(i)}]\end{matrix}\right]dw$$

$$=\sqrt{\frac{\pi}{c}}\sum_{G=0}^{\infty}\sum_{g=1}^{L}\sum_{\beta_1=0}^{[N_1/M_1]}\cdots\sum_{\beta_s=0}^{[N_s/M_s]}\sum_{\ell=0}^{(N/M)}\frac{(-N)_{Mk}}{\ell!}B_{N,k}\frac{(-1)^G}{G!F_g}\frac{(-N_1)_{M_1\beta_1}}{\beta_1!}\cdots\frac{(-N_s)_{M_s,\beta_s}}{\beta_s!}\phi(\eta_G)$$

$$.(B[N_1,\beta_1;\ldots;N_s,\beta_s]\, z_1^{\beta_1}\ldots(z_s)^{\beta_s}\, z^l$$

$$(b+2\sqrt{ca})^{\beta-\sigma\eta_G-\sum_{i=1}^{s} n_i\beta_i-1}\, H^{0,1:(u',v');\ldots;(u^{(r)},v^{(r)})}_{1,1;[B',D'];\ldots;[B^{(r)},D^{(r)}]}\left[\begin{matrix} x_1(b+2\sqrt{ca})^{-\sigma_1} \\ \vdots \\ x_r(b+2\sqrt{ca})^{-\sigma_r}\end{matrix}\middle| \begin{matrix}[\beta-\sigma\eta_G-\sum_{i=1}^{s} n_i\beta_i:\sigma_1;\ldots;\sigma_r]:[(q'):\Delta'];\ldots;[(q^{(r)}):\Delta^{(r)}] \\ [\beta-\sigma\eta_G-\sum_{i=1}^{s} n_i\beta_i-\frac{1}{2}:\sigma_1;\ldots;\sigma_r]:[(t'):\delta'];\ldots;[(t^{(r)}):\delta^{(r)}]\end{matrix}\right] \quad \ldots(3.1)$$

valid under the same condition which is obtained from (2.1).

(b) If $\lambda = A$, $u^{(i)} = 1$, $v^{(i)} = B^{(i)}$ and $D^{(i)} = D^{(i)} + 1$, $\forall\ i \in (1,\ldots,r)$ the result in (2.1) reduces to the following integral transformation:

$$\int_0^\infty w^{1-\beta}(a+bw+cw^2)^{\beta-3/2} H^{L,R}_{P,Q}\left[\left(\frac{w}{a+bw+cw^2}\right)^{\sigma}\middle|\begin{matrix}(m_P,M_P)\\(n_Q,N_Q)\end{matrix}\right]$$

$$.S^{M_1,\ldots,M_s}_{N_1,\ldots,N_s}\left[z_1\left(\frac{w}{a+bw+cw^2}\right)^{n_1},\ldots,z_s\left(\frac{w}{a+bw+cw^2}\right)^{n_s}\right] \qquad .S^{M}_{N}\left[z\left(\frac{w}{a+bw+cw^2}\right)^{n}\right]$$

$$.E^{A:B';\ldots;B^{(r)}}_{C:D';\ldots;D^{(r)}}\left[-x_1\left(\frac{w}{a+bw+cw^2}\right)^{\sigma_1},\ldots,-x_r\left(\frac{w}{a+bw+cw^2}\right)^{\sigma_s}\middle|\begin{matrix}[1-(p):\theta';\ldots;\theta^{(r)}]\\ [1-(s):\Psi';\ldots;\Psi^{(r)}]\end{matrix}\right.$$

$$\left.\begin{matrix}:[1-(q'):\Delta'];\ldots;[1-(b^{(r)}):\Delta^{(r)}]\\ [1-(t'):\delta'];\ldots;[1-(d^{(r)}):\delta^{(r)}]\end{matrix}\right] dw$$

$$=\sqrt{\frac{\pi}{c}}\sum_{G=0}^{\infty}\sum_{g=1}^{L}\sum_{\beta_1=0}^{[N_1/M_1]}\cdots\sum_{\beta_s=0}^{[N_s/M_s]}\sum_{\ell=0}^{(N/M)}\frac{(-N)_{Mk}}{\ell!}B_{N,k}\frac{(-1)^G}{G!F_g}\frac{(-N_1)_{M_1\beta_1}}{\beta_1!}\cdots\frac{(-N_s)_{M_s\beta_s}}{\beta_s!}\phi(\eta_G)$$

$$.\ B(N_1,\beta_1;\ldots;N_s\beta_s)\ .\ z_1^{\beta_1}\ldots(z_s)^{\beta_s}\ z^{\ell}(b+2\sqrt{ca})^{\beta-\sigma\eta_G-\sum_{i=1}^{s} n_i\beta_i-1}$$

$$\frac{\Gamma(1-\beta+\sigma\eta_G+\sum_{i=1}^{s} n_i(\beta_i+k_i))}{\Gamma(\frac{3}{2}-\beta+\sigma\eta_G+\sum_{i=1}^{s} n_i(\beta_i+k_i))}E^{A+1:B';\ldots;B^{(r)}}_{C+1:D';\ldots;D^{(r)}}$$

$$.\left[-x_1(b+2\sqrt{ca})^{-\sigma_1},\ldots,-x_r(b+2\sqrt{ca})^{-\sigma_r}\middle|\begin{matrix}[1-\beta+\sigma\eta_G+\sum_{i=1}^{s} n_i\beta_i:\sigma_1;\ldots;\sigma_r],\\ [1-(s):\Psi';\ldots;\Psi^{(r)}],\end{matrix}\right.$$

$$\left.\begin{matrix}[1-(p):\theta';\ldots;\theta^{(r)}]:[1-(q'):\Delta'];\ldots;[1-(q^{(r)}):\Delta^{(r)}]\\ [\frac{3}{2}-\beta+\sigma\eta_G+\sum_{i=1}^{s} n_i\beta_i:\sigma_1;\ldots;\sigma_r]:[1-(t'):\delta'];\ldots;[1-(t^{(r)});\delta^{(r)}]\end{matrix}\right] \quad \ldots(3.2)$$

provided that Re(a) > 0, Re(b) > 0,c > 0, the series on the right side exists.

(c) If $\theta',\ldots,\theta^{(r)} = \Delta',\ldots,\Delta^{(r)} = \psi',\ldots,\psi^{(r)} = \delta',\ldots,\delta^{(r)} = \sigma_1,\ldots,\sigma_r = \beta',\ldots,\beta^{(r)}$ in (2.1), we obtain the following integral result:

$$\int_0^\infty w^{1-\beta}(a+bw+cw^2)^{\beta-3/2} H^{L,R}_{P,Q}\left[\left(\frac{w}{a+bw+cw^2}\right)^{\sigma}\middle|\begin{matrix}(m_P,M_P)\\(n_Q,N_Q)\end{matrix}\right]$$

$$.S^{M_1,\ldots,M_s}_{N_1,\ldots,N_s}\left[z_1\left(\frac{w}{a+bw+cw^2)}\right)^{n_1},\ldots,z_s\left(\frac{w}{a+bw+cw^2}\right)^{n_s}\right] \quad .S^M_N\left[z\left(\frac{w}{a+bw+cw^2}\right)^n\right]$$

$$.F^{0,\lambda:(u',v');\ldots;(u^{(r)},v^{(r)})}_{A,C:[B',D'];\ldots;[B^{(r)},D^{(r)}]}\left[x_1^{1/\beta'}\left(\frac{w}{a+bw+cw^2}\right),\ldots,x_r^{1/\beta^r}\left(\frac{w}{a+bw+cw^2}\right),\middle|\begin{matrix}(p):(q');\ldots;(q^{(r)})\\(s):(t');\ldots;(t^{(r)})\end{matrix}\right]dw$$

$$=\sqrt{\frac{\pi}{c}}\sum_{G=0}^{\infty}\sum_{g=1}^{L}\sum_{\beta_1=0}^{[N_1/M_1]}\cdots\sum_{\beta_s=0}^{[N_s/M_s]}\sum_{\ell=0}^{(N/M)}\frac{(-N)_{Mk}}{\ell!}B_{N,k}\frac{(-1)^G}{G!F_g}\frac{(-N_1)_{M_1\beta_1}}{\beta_1!}\cdots\frac{(-N_s)_{M_s,\beta_s}}{\beta_s!}\phi(\eta_G)$$

$$.\ B(N_1,\beta_1;\ldots;N_s\beta_s)\ .\ z_1^{\beta_1}\ldots(z_s)^{\beta_s}\ z^{\ell}(b+2\sqrt{ca})^{\beta-\sigma\eta_G-\sum_{i=1}^{s}n_i\beta_i-1}$$

$$\frac{\Gamma(1-\beta+\sigma\eta_G+\sum_{i=1}^{s}n_i\alpha_i\beta_i}{\Gamma(\frac{3}{2}-\beta+\sigma\eta_G+\sum_{i=1}^{s}n_i\beta_i}E^{A+1:B';\ldots B^{(r)}}_{C+1:D';\ldots D^{(r)}}$$

$$.F^{0,\lambda+1\ :(u',v');\ldots;(u^{(r)},v^{(r)})}_{A+1,C+1:[B',D'];\ldots;[B^{(r)},D^{(r)}}\left[x_1^{1/\beta'}(b+2\sqrt{ca})^{-1},\ldots,x_r^{1/\beta^r}(b+2\sqrt{ca})^{-1}\right|$$

$$\left.\begin{matrix}\left[\beta-\sigma\eta_G-\sum_{i=1}^{s}n_i\beta_i\right],(p):(q');\ldots;q^{(r)}\\(s),\left[\beta-\sigma\eta_G-\sum_{i=1}^{s}n_i\beta_i-\frac{1}{2}\right]:(t');\ldots;(t^{(r)})\end{matrix}\right] \quad \ldots(3.3)$$

provided that Re (a) > 0, Re (b) > 0, c > 0; $\beta^{(i)} > 0$ (i = 1,…,r), $2(u^{(i)}+v^{(i)}) > (A+C+B^{(i)}+D^{(i)})$

$$|\arg(z_i)| < \left[u^{(i)}+v^{(i)}-\frac{A}{2}-\frac{C}{2}-\frac{B^{(i)}}{2}-\frac{D^{(i)}}{2}\right]\pi \text{ and}$$

$$\sigma\left\{\min_{1\le j\le M}[\mathrm{Re}(n_j/N_j)]\right\}+\sum_{i=1}^{r}\left\{\min_{1\le j\le u^{(i)}}[\mathrm{Re}(t_j^{(i)})]\right\}>\beta-2.$$

IV. CONCLUSION

The result so obtained may be found useful in several interesting situation appearing in the literature on Mathematical analysis applied Mathematics and Mathematical physics**.** These results are basic in nature and likely to find useful application in the study of simple and multivariable hypergeometric series.

REFERENCES

[1]. T.M. Atanackovie,M., Bundincevie and s.pilipovie, on a fractional distributed –order oscalator , J.phys.A38 (2005),6705-6713

[2]. B.L.J.Braaksma, Asymptotic Expansions and Analytic Continuations for a Class of Barnes Integrals, Compositio Math. 15, (1963), 239-341.

[3]. R.G. Buschman,and H.M. Srivastava, The $\overline{H}$ -function associated with a certain class of Feynman integrals, J.phys. A: Math.Gen.23,4707-4710 (1990)

[4]. V.B.L. Chaurasia and Anju Godika, An integral involving certain product of special functions, Bull. Cal. Math. Soc. 91 (1999), 337-342.

[5]. V.B.L. Chaurasia and Ashok Singh Shekhawat, An integral involving general polynomials and the H-function of several complex variables, Tamkang J. Math. 36(3) (2005), 255-260.

[6]. S.P.Goyal and S.L.Mathur, On Integrals Involving the H-function of two variables, Indian J. Pure & Appl. Math. 7(1976), 347-358.

[7]. K.C.Gupta and R.Jain, An Integral Involving a General Polynomial and Product of Fox's H-function having General Arguments, Ganita Sandesh, 3 (1989), 64-67.

[8]. R.K.Saxena, An Integral Involving G-Function, Proc. Nat. Inst. Sci. India, 26A(1960), 661-664.

[9]. H.M. Srivastava, A contour integral involving fox's H-function ,Indian J.math.14 (1972),1-6.
[10]. H.M.Srivastava, A Multilinear Generating Function for the Kohnauser sets of Bi-orthogonal Polynomials suggested by the Laguerre Polynomials, Pacific J. Math.; 117(1985), 183-191.
[11]. H.M. Srivastava and M. Garg, Some integrals involving a general class of polynomials and the multivariable H-function, Rev. Roumaine Phys., 32 (1987), 685-692.
[12]. H.M.Srivastava and S.P. Goyal,Fractional Derivative of the H- function of several variable, J.Math.Anal. Appl.112 (1985),641-651.
[13]. H.M.Srivastava and R.Panda,Expansion theorem for the H-function of 2several complex variable, J.Reine Angew.Math.288 (1976),129-145.
[14]. H.M.Srivastava and R.Panda, Some Bilateral Generating Function for a Class of Generalized
[15]. Hypergeometric Polynomials, J. Raine Angew. Math., 283/284(1996), 265-274.

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