Original Article

Bulletin of Pure and Applied Sciences.
Vol. 37E (Math & Stat.), No.1, 2018.P.171-177
Print version ISSN 0970 6577
Online version ISSN 2320 3226
DOI: 10.5958/2320-3226.2018.00017.6

On Euler-Beta Transform of I-function of two variables

B. Satyanarayana[1,*], Y. Pragathi Kumar[2], B.V. Purnima[3]

Author Affiliation:
[1]Department of Mathematics, Acharya Nagarjuna University, Nagarjuna Nagar, India -522 510.
E-mail: drbsn63@yahoo.co.in
[2]Department of Mathematics, College of Natural and Computational Sciences, Adigrat University, Adigrat, Ethiopia.
E-mail: pragathi.ys@gmail.com
[3]Department of Mathematics, Acharya Nagarjuna University, Nagarjuna Nagar, India -522 510.
E-mail: purnimabathina.maths@gmail.com

***Corresponding Author:**
Dr. Satyanarayana Bavanari, Assistant Professor, Department of Mathematics, Acharya Nagarjuna University, Nagarjuna Nagar, India -522 510.

E-mail: drbsn63@yahoo.co.in

Received on 10.04.2018, **Accepted on 28.04.2018**

Abstract

In this paper, the authors establish the Euler-Beta transform of various products involving a General Class of Polynomials, Struve's function and I-function of two variables. Some similar formulae are also derived as special cases.

Keywords: Euler-Beta transform, General Class of Polynomials, Struve's Function,
I-function of two variables, H-function of two variables.

1. INTRODUCTION

Recently, the Mellin Transform and Laplace Transform of product of extended general class of polynomials with I-function of two variables [4] and Mellin and Laplace transforms involving product of Struve's function and I-function of two variables [5] were evaluated . In the present paper we establish the Euler-Beta transform involving product of a General Class of Polynomials with I-function of two variables and Struve's Function with I-function of two variables.
We shall utilize the following formulae in the present investigation.

The I-function of two variables given by Shantha Kumari et.al [10]

$$I\left[z_1,z_2\right]=I^{o,n_1;m_2,n_2;m_3,n_3}_{p_1,q_1;p_2,q_2;p_3,q_3}\left[\begin{matrix} z_1 \\ z_2 \end{matrix}\left|\begin{matrix} \left(a_j;\alpha_j,A_j;\varepsilon_j\right)_{1,p_1} : \left(c_j,C_j;U_j\right)_{1,p_2} ; \left(e_j,E_j;P_j\right)_{1,p_3} \\ \left(b_j;\beta_j,B_j;\eta_j\right)_{1,q_1} : \left(d_j,D_j;V_j\right)_{1,q_2} ; \left(f_j,F_j;Q_j\right)_{1,q_3} \end{matrix}\right.\right]$$

$$=\frac{1}{\left(2\pi i\right)^2}\int_{L_S}\int_{L_\tau}\phi\left(s.\tau\right)\theta_1\left(s\right)\theta_1\left(\tau\right)z_1^{\ s}z_2^{\ \tau}dsd\tau \qquad (1.1)$$

where $\phi\left(s,\tau\right)=\dfrac{\prod_{j=1}^{n_1}\Gamma^{\varepsilon_j}\left(1-a_j+\alpha_j s+A_j\tau\right)}{\prod_{j=n_1+1}^{p_1}\Gamma^{\varepsilon_j}\left(a_j-\alpha_j s-A_j\tau\right)\prod_{j=1}^{q_1}\Gamma^{\eta_j}\left(1-b_j+\beta_j s+B_j\tau\right)}$

$$\theta_1\left(s\right)=\frac{\prod_{j=1}^{n_2}\Gamma^{U_j}\left(1-c_j+C_j s\right)\prod_{j=1}^{m_2}\Gamma^{V_j}\left(d_j-D_j s\right)}{\prod_{j=n_2+1}^{p_2}\Gamma^{U_j}\left(c_j-C_j s\right)\prod_{j=m_2+1}^{q_2}\Gamma^{V_j}\left(1-d_j+D_j s\right)}$$

$$\theta_2\left(\tau\right)=\frac{\prod_{j=1}^{n_3}\Gamma^{P_j}\left(1-e_j+E_j\tau\right)\prod_{j=1}^{m_3}\Gamma^{Q_j}\left(f_j-F_j\tau\right)}{\prod_{j=n_3+1}^{p_3}\Gamma^{P_j}\left(e_j-E_j\tau\right)\prod_{j=m_3+1}^{q_3}\Gamma^{Q_j}\left(1-f_j+F_j\tau\right)}$$

where $n_j,\ p_j,\ \ q_j\left(j=1,2,3\right), m_j\left(j=2,3\right)$ are non-negative integers such that $0\le n_j\le p_j$, $q_j>0$, $0\le m_j\le q_j\left(j=2,3\right)$ (not all zero simultaneously) $\alpha_j,A_j\left(j=1,.....,p_1\right)$, β_j, $B_j\left(j=1,.....,q_1\right), C_j\left(j=1,.....,p_2\right), D_j\left(j=1,.....,q_2\right)$, $E_j\left(j=1,.....,p_3\right), F_j\left(j=1,.....,q_3\right)$ are positive quantities. $a_j\left(j=1,.....,p_1\right), b_j\left(j=1,.....,q_1\right)$, $c_j\left(j=1,.....,p_2\right)$, $d_j\left(j=1,.....,q_2\right)$ $e_j\left(j=1,.....,p_3\right)$, $f_j\left(j=1,.....,q_3\right)$ are complex numbers. The exponents $\varepsilon_j,\eta_j,U_j,V_j,\ P_j,Q_j$ may take non integer values. L_S and L_τ are suitable contours of Mellin-Barnes type. Moreover, the contour L_S is in the complex s-plane and runs from $\sigma_1-i\infty$ to $\sigma_1+i\infty(\sigma_1\ \text{real})$, so that all the poles of $\Gamma^{V_j}(d_j-D_j s)\ (j=1,....,m_2)$ lie to the right of L_s and all poles of $\Gamma^{U_j}(1-c_j-C_j s)\ (j=1,....,n_2)\ \Gamma^{\varepsilon_j}(1-a_j+\alpha_j s+A_j\tau)\ (j=1,....,n_1)$ lie to the left of L_s. Similar conditions for L_τ follow in complex t-plane. The detailed conditions of this function can be found in [10]. The Euler-Beta transform of the function f (z) (see [1]) is defined as

$$B\left\{f(z);a,b\right\}=\int_0^1 z^{a-1}(1-z)^{b-1}f(z)dz \quad \text{where Re (a) > 0 and Re (b) > 0} \qquad (1.2)$$

The general class of polynomials [7, 8] is

$$S_n^{\ m}[x]=\sum_{k=0}^{[n/m]}\frac{(-n)_{mk}}{k!}A_{n,k}x^k, n=0,1,2,..... \qquad (1.3)$$

where m is an arbitrary positive integer and the coefficients $A_{n,k}(n,k\ge 0)$ are arbitrary constants. The Struve’s function [3] is defined as

$$H_{v,y,u}^{\lambda,k}[x]=\sum_{m=0}^{\infty}\frac{(-1)^m (z/2)^{v+2m+1}}{\Gamma(km+y)\Gamma(v+\lambda m+u)}, \tag{1.4}$$

where $\mathrm{Re}(k)>0,\ \mathrm{Re}(\lambda)>0,\ \mathrm{Re}(y)>0,\ \mathrm{Re}(v+u)>0$.

2. MAIN RESULTS

Theorem 2.1:

$$\int_0^t x^{\rho-1}(t-x)^{\sigma-1}S_n^m\left(bx^h\right)I_{p_1,q_1;p_2,q_2;p_3,q_3}^{o,n_1;m_2,n_2;m_3,n_3}\left[\begin{matrix}\gamma x^{\delta}\\ \eta x^{\theta}\end{matrix}\left|\begin{matrix}\left(a_j;\alpha_j,A_j;\varepsilon_j\right)_{1,p_1}: \left(c_j,C_j;U_j\right)_{1,p_2};\left(e_j,E_j;P_j\right)_{1,p_3}\\ \left(b_j;\beta_j,B_j;\eta_j\right)_{1,q_1}: \left(d_j,D_j;V_j\right)_{1,q_2};\left(f_j,F_j;Q_j\right)_{1,q_3}\end{matrix}\right.\right]dx$$

$$=\Gamma(\sigma)\sum_{r=0}^{[n/m]}F(r)t^{\rho+\sigma+hr-1}I_{p_1,q_1+1;p_2,q_2;p_3,q_3}^{o,n_1+1;m_2,n_2;m_3,n_3}\left[\begin{matrix}\gamma t^{\delta}\\ \eta t^{\theta}\end{matrix}\left|\begin{matrix}\left(a_j;\alpha_j,A_j;\varepsilon_j\right)_{1,p_1};(1-\rho-hr;\delta,\theta)\ \left(c_j,C_j;U_j\right)_{1,p_2};\left(e_j,E_j;P_j\right)_{1,p_3}\\ \left(b_j;\beta_j,B_j;\eta_j\right)_{1,q_1};(1-\rho-\sigma-hr;\delta,\theta)\ \left(d_j,D_j;V_j\right)_{1,q_2};\left(f_j,F_j;Q_j\right)_{1,q_3}\end{matrix}\right.\right] \tag{2.1}$$

where $F[r]=\frac{(-n)_{mr}}{r!}A_{n,r}b^r$ provided $\mathrm{Re}(\rho)>0,\ \mathrm{Re}(\sigma)>0,\ \delta>0,\ \theta>0$ and h,b are complex numbers, m is an arbitrary positive integer and the coefficients $A_{n,r}(n,r\geq 0)$ are arbitrary constants.

Proof.

Express integral form of I function and general class of polynomials as series using (1.1) and (1.3) in L.H.S we get

$$\int_0^t x^{\rho-1}(t-x)^{\sigma-1}\sum_{r=0}^{[n/m]}\frac{(-n)_{mr}}{r!}A_{n,r}(bx^h)^r\frac{1}{(2\pi i)^2}\int_{L_S}\int_{L\tau}\phi(s.\tau)\theta_1(s)\theta_1(\tau)\left(\gamma x^{\delta}\right)^s\left(\eta x^{\theta}\right)^{\tau}ds\,d\tau\,dx$$

Interchanging the order of integration and evaluating the inner integral, we get the result. The change of order of integration is justifiable due to convergence of integrals.

Theorem 2.2:

$$\int_0^t x^{\rho-1}(t-x)^{\sigma-1}H_{v,y,u}^{\lambda,k}[ax^g]I_{p_1,q_1;p_2,q_2;p_3,q_3}^{o,n_1;m_2,n_2;m_3,n_3}\left[\begin{matrix}\gamma x^{\delta}\\ \eta x^{\theta}\end{matrix}\left|\begin{matrix}\left(a_j;\alpha_j,A_j;\varepsilon_j\right)_{1,p_1}: \left(c_j,C_j;U_j\right)_{1,p_2};\left(e_j,E_j;P_j\right)_{1,p_3}\\ \left(b_j;\beta_j,B_j;\eta_j\right)_{1,q_1}: \left(d_j,D_j;V_j\right)_{1,q_2};\left(f_j,F_j;Q_j\right)_{1,q_3}\end{matrix}\right.\right]dx$$

$$=\Gamma(\sigma)\sum_{m=0}^{\infty}G(m)t^{\rho+\sigma+g(v+2m+1)-1}I^{o,n_1+1;m_2,n_2;m_3,n_3}_{p_1,q_1+1;p_2,q_2;p_3,q_3}\left[\begin{matrix}\gamma t^{\delta}\\ \eta t^{\theta}\end{matrix}\left|\begin{matrix}(a_j;\alpha_j,A_j;\varepsilon_j)_{1,p_1}:\\ (b_j;\beta_j,B_j;\eta_j)_{1,q_1}:\end{matrix}\right.\right.$$

$$\left.\begin{matrix}(1-\rho-g(v+2m+1);\delta,\theta),(c_j,C_j;U_j)_{1,p_2};(e_j,E_j;P_j)_{1,p_3}\\ (1-\rho-\sigma-g(v+2m+1);\delta,\theta),(d_j,D_j;V_j)_{1,q_2};(f_j,F_j;Q_j)_{1,q_3}\end{matrix}\right] \tag{2.2}$$

where $G[m]=\dfrac{(-1)^m(a/2)^{v+2m+1}}{\Gamma(km+y)\Gamma(v+\lambda m+u)}$ provided $Re(k)>0$, $\mathrm{Re}(\lambda)>0$, $\mathrm{Re}(y)>0$, $\mathrm{Re}(v+u)>0$, $\mathrm{Re}(\rho)>0$, $\mathrm{Re}(\sigma)>0$, $\delta>0$, $\theta>0$ and $a,\ g$ are complex numbers.

Proof.

Using (1.1) and (1.4) representing the integral form of I-function of two variables and Struve's function in series form we get

$$\int_0^t x^{\rho-1}(t-x)^{\sigma-1}\sum_{m=0}^{\infty}\frac{(-1)^m\left(\dfrac{ax^g}{2}\right)^{v+2m+1}}{\Gamma(km+y)\Gamma(v+\lambda m+u)}\frac{1}{(2\pi i)^2}$$

$$\int_{L_S}\int_{L\tau}\phi(s.\tau)\theta_1(s)\theta_1(\tau)\left(\gamma x^{\delta}\right)^{s}\left(\eta x^{\theta}\right)^{\tau}dsd\tau dx.$$

Interchanging the order of integration and evaluating the inner integral we get the result. The change of order of integration is justifiable due to convergence of integrals.

3. SPECIAL CASES

(i) Put b =1 and h = 0 in (2.1) we get Euler-Beta Transform of I-function of two variables.

$$\int_0^t x^{\rho-1}(t-x)^{\sigma-1}I^{o,n_1;m_2,n_2;m_3,n_3}_{p_1,q_1;p_2,q_2;p_3,q_3}\left[\begin{matrix}\gamma x^{\delta}\\ \eta x^{\theta}\end{matrix}\left|\begin{matrix}(a_j;\alpha_j,A_j;\varepsilon_j)_{1,p_1}:(c_j,C_j;U_j)_{1,p_2};(e_j,E_j;P_j)_{1,p_3}\\ (b_j;\beta_j,B_j;\eta_j)_{1,q_1}:(d_j,D_j;V_j)_{1,q_2};(f_j,F_j;Q_j)_{1,q_3}\end{matrix}\right.\right]dx$$

$$=\Gamma(\sigma)t^{\rho+\sigma-1}I^{o,n_1+1;m_2,n_2;m_3,n_3}_{p_1,q_1+1;p_2,q_2;p_3,q_3}\left[\begin{matrix}\gamma t^{\delta}\\ \eta t^{\theta}\end{matrix}\left|\begin{matrix}(a_j;\alpha_j,A_j;\varepsilon_j)_{1,p_1}:(1-\rho;\delta,\theta)\\ (b_j;\beta_j,B_j;\eta_j)_{1,q_1}:(1-\rho-\sigma;\delta,\theta)\end{matrix}\right.\right.$$

$$\left.\begin{matrix}(c_j,C_j;U_j)_{1,p_2};(e_j,E_j;P_j)_{1,p_3}\\ (d_j,D_j;V_j)_{1,q_2};(f_j,F_j;Q_j)_{1,q_3}\end{matrix}\right] \tag{3.1}$$

(ii) Take a =1 and g = 0 in (2.2), we get another Euler-Beta Transform of I-function of two variables.

(iii) Take $\varepsilon_j=\eta_j=U_j=V_j=P_j=Q_j=1$ in (2.1) we get Euler-Beta Transform of product of a general class of polynomials and H-function of two variables.

$$\int_0^t x^{\rho-1}(t-x)^{\sigma-1}S_n^m\left(bx^h\right)H_{p_1,q_1;p_2,q_2;p_3,q_3}^{o,n_1;m_2,n_2;m_3,n_3}\left[\begin{matrix}\gamma x^\delta\\ \eta x^\theta\end{matrix}\middle|\begin{matrix}\left(a_j;\alpha_j,A_j\right)_{1,p_1}:\left(c_j,C_j\right)_{1,p_2};\left(e_j,E_j\right)_{1,p_3}\\ \left(b_j;\beta_j,B_j\right)_{1,q_1}:\left(d_j,D_j\right)_{1,q_2};\left(f_j,F_j\right)_{1,q_3}\end{matrix}\right]dx$$

$$=\Gamma(\sigma)\sum_{r=0}^{[n/m]}F(r)t^{\rho+\sigma+hr-1}H_{p_1,q_1+1;p_2,q_2;p_3,q_3}^{o,n_1+1;m_2,n_2;m_3,n_3}\left[\begin{matrix}\gamma t^\delta\\ \eta t^\theta\end{matrix}\middle|\begin{matrix}\left(a_j;\alpha_j,A_j\right)_{1,p_1};\\ \left(b_j;\beta_j,B_j\right)_{1,q_1};\end{matrix}\right.$$

$$\left.\begin{matrix}\left(1-\rho-hr;\delta,\theta\right),\left(c_j,C_j\right)_{1,p_2};\left(e_j,E_j\right)_{1,p_3}\\ \left(1-\rho-\sigma-hr;\delta,\theta\right)\left(d_j,D_j\right)_{1,q_2};\left(f_j,F_j\right)_{1,q_3}\end{matrix}\right], \tag{3.2}$$

where $F[r]=\frac{(-n)_{mr}}{r!}A_{n,r}b^r$ provided $\mathrm{Re}(\rho)>0$, $\mathrm{Re}(\sigma)>0$, $\delta>0$, $\theta>0$ and h,b are complex numbers, m is an arbitrary positive integer and the coefficients $A_{n,r}\,(n,r\ge 0)$ are arbitrary constants.

(iv) Take $\varepsilon_j=\eta_j=U_j=V_j=P_j=Q_j=1$ in (2.2) we get Euler-Beta Transform of product of Struve's function and H-function of two variables

$$\int_0^t x^{\rho-1}(t-x)^{\sigma-1}H_{v,y,u}^{\lambda,k}[ax^g]H_{p_1,q_1;p_2,q_2;p_3,q_3}^{o,n_1;m_2,n_2;m_3,n_3}\left[\begin{matrix}\gamma x^\delta\\ \eta x^\theta\end{matrix}\middle|\begin{matrix}\left(a_j;\alpha_j,A_j\right)_{1,p_1}:\left(c_j,C_j\right)_{1,p_2};\left(e_j,E_j\right)_{1,p_3}\\ \left(b_j;\beta_j,B_j\right)_{1,q_1}:\left(d_j,D_j\right)_{1,q_2};\left(f_j,F_j\right)_{1,q_3}\end{matrix}\right]dx$$

$$=\Gamma(\sigma)\sum_{m=0}^{\infty}G(m)t^{\rho+\sigma+g(v+2m+1)-1}H_{p_1,q_1+1;p_2,q_2;p_3,q_3}^{o,n_1+1;m_2,n_2;m_3,n_3}\left[\begin{matrix}\gamma t^\delta\\ \eta t^\theta\end{matrix}\middle|\begin{matrix}\left(a_j;\alpha_j,A_j\right)_{1,p_1};\\ \left(b_j;\beta_j,B_j\right)_{1,q_1};\end{matrix}\right.$$

$$\left.\begin{matrix}\left(1-\rho-g(v+2l+1);\delta,\theta\right),\left(c_j,C_j\right)_{1,p_2};\left(e_j,E\right)_{1,p_3}\\ \left(1-\rho-\sigma-g(v+2l+1);\delta,\theta\right),\left(d_j,D_j\right)_{1,q_2};\left(f_j,F_j\right)_{1,q_3}\end{matrix}\right], \tag{3.3}$$

where $G[m]=\frac{(-1)^m(a/2)^{v+2m+1}}{\Gamma(km+y)\Gamma(v+\lambda m+u)}$ provided $\delta>0$, $\theta>0$, $\mathrm{Re}(k)>0$, $\mathrm{Re}(\lambda)>0$, $\mathrm{Re}(y)>0$, $\mathrm{Re}(v+u)>0$, $\mathrm{Re}(\rho)>0$, $\mathrm{Re}(\sigma)>0$ and a,g are complex numbers,

(v) Put t =1 in (2.1) we get

$$\int_0^1 x^{\rho-1}(1-x)^{\sigma-1}H_{v,y,u}^{\lambda,k}[ax^g]I_{p_1,q_1;p_2,q_2;p_3,q_3}^{o,n_1;m_2,n_2;m_3,n_3}\left[\begin{matrix}\gamma x^\delta\\ \eta x^\theta\end{matrix}\middle|\begin{matrix}\left(a_j;\alpha_j,A_j;\varepsilon_j\right)_{1,p_1}:\\ \left(b_j;\beta_j,B_j;\eta_j\right)_{1,q_1}:\end{matrix}\right.$$

$$\left.\begin{matrix}\left(c_j,C_j;U_j\right)_{1,p_2};\left(e_j,E_j;P_j\right)_{1,p_3}\\ \left(d_j,D_j;V_j\right)_{1,q_2};\left(f_j,F_j;Q_j\right)_{1,q_3}\end{matrix}\right]dx$$

$$=\Gamma(\sigma)\sum_{r=0}^{[n/m]}\frac{(-n)_{mr}}{r!}A_{n,r}b^{r}I^{o,n_1+1;m_2,n_2;m_3,n_3}_{p_1,q_1+1;p_2,q_2;p_3,q_3}\left[\begin{matrix}\gamma\\ \eta\end{matrix}\middle|\begin{matrix}(a_j;\alpha_j,A_j;\varepsilon_j)_{1,p_1};(1-\rho-hr;\delta,\theta)\\ (b_j;\beta_j,B_j;\eta_j)_{1,q_1};(1-\rho-\sigma-hr;\delta,\theta)\end{matrix}\right.$$

$$\left.\begin{matrix}(c_j,C_j;U_j)_{1,p_2};(e_j,E_j;P_j)_{1,p_3}\\ (d_j,D_j;V_j)_{1,q_2};(f_j,F_j;Q_j)_{1,q_3}\end{matrix}\right] \tag{3.4}$$

(vi) Put t =1 in (2.2) we get

$$\int_0^1 x^{\rho-1}(1-x)^{\sigma-1}H^{\lambda,k}_{v,y,u}[ax^{g}]I^{o,n_1;m_2,n_2;m_3,n_3}_{p_1,q_1;p_2,q_2;p_3,q_3}\left[\begin{matrix}\gamma x^{\delta}\\ \eta x^{\theta}\end{matrix}\middle|\begin{matrix}(a_j;\alpha_j,A_j;\varepsilon_j)_{1,p_1}:\\ (b_j;\beta_j,B_j;\eta_j)_{1,q_1}:\end{matrix}\right.$$

$$\left.\begin{matrix}(c_j,C_j;U_j)_{1,p_2};(e_j,E_j;P_j)_{1,p_3}\\ (d_j,D_j;V_j)_{1,q_2};(f_j,F_j;Q_j)_{1,q_3}\end{matrix}\right]dx$$

$$=\Gamma(\sigma)\sum_{m=0}^{\infty}\frac{(-1)^m(a/2)^{v+2m+1}}{\Gamma(km+y)\Gamma(v+\lambda m+u)}I^{o,n_1+1;m_2,n_2;m_3,n_3}_{p_1,q_1+1;p_2,q_2;p_3,q_3}\left[\begin{matrix}\gamma\\ \eta\end{matrix}\middle|\begin{matrix}(a_j;\alpha_j,A_j;\varepsilon_j)_{1,p_1}:\\ (b_j;\beta_j,B_j;\eta_j)_{1,q_1}:\end{matrix}\right.$$

$$\left.\begin{matrix}(1-\rho-g(v+2m+1);\delta,\theta);(c_j,C_j;U_j)_{1,p_2};(e_j,E_j;P_j)_{1,p_3}\\ (1-\rho-\sigma-g(v+2m+1);\delta,\theta);(d_j,D_j;V_j)_{1,q_2};(f_j,F_j;Q_j)_{1,q_3}\end{matrix}\right] \tag{3.5}$$

4. CONCLUSION

On specialization of parameters in I-function of two variables, we get Euler-Beta Transform of various special functions with general class of polynomials and Struve's function as special cases.

REFERENCES

[1]. Mathai, A. M., Saxena, R.K. and Haubold, H. J. "The H-Function Theory and Applications", ISBN 978-1-4419-0915-2, Springer.

[2]. Erdely, A. "Tables of Integral Transforms", Vol. 1, Mc Graw Hill Book Co., New York (1953).

[3]. Pragathi Kumar, Y. and Satyanarayana, B. (2011). Integral transforms involving a generalized Struve's function and H-function of two variables, Int. J. Appl. Math.Analysis and Applications. Vol. 6(1): 215-220.

[4]. Pragathi Kumar, Y., Alem Mabrahtu, Purnima, B.V. and Satyanarayana, B. (2016). Mellin and Laplace Transforms involving product of Extended General Class of Polynomials and I-function of two variables, IJMSEA. Vol. 10(III): 143-150.

[5]. Satyanarayana, B., Purnima, B.V. and Pragathi Kumar, Y. (2018). Mellin and Laplace transform involving product of Struve's function and I-function of two variables, Arya Bhatta Journal of Mathematics and Informatics. Vol. 10(1): 17-24.

[6]. Pragathi Kumar.Y and Satyanarayana, B. (2011). On Laplace Transform of product of generalised Struve's function and H-function of two variables. IJAMAA.Vol. 6(1- 2):193-198.

[7]. Pragathi Kumar, Y. and Satyanarayana. B. (2011). On Mellin transform involving the product of general class of polynomials, Struve's function and H-function of two variables, General Mathematics Notes. Vol. 3(2): 123-129.

[8]. Pragathi Kumar. Y. and Satyanarayana. B. (2012). Laplace transforms involving the General Class of polynomials and H-function of two variables, Reflections des ERA-JMS. Vol.7 (2): 135-144.

[9]. Rathie Arjun K. (1997). A new generalization of generalized hypergeometric functions, Le Mathematiche. Vol. LII. Issue II: .297-310.

[10]. Shantha Kumari K., Vasudevan Nambisan and Rathie Arjun K. (2014). A study of I-function of two variables, Le Mathematiche. Vol. 69 (1): 285-305.

[11]. Srivastava H.M, Gupta K.C. and Goyal S.P. (1982). The H-function of one and two variables with applications, South Asian Publishers, New Delhi.