

## ON AN EXTENSION OF EXTENDED BETA AND HYPERGEOMETRIC FUNCTIONS

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**Abstract.** Motivated mainly by certain interesting recent extensions of the Gamma, Beta and hypergeometric functions, we introduce here new extensions of the Beta function, hypergeometric and confluent hypergeometric functions. We systematically investigate several properties of each of these extended functions, such as their various integral representations, Mellin transforms, derivatives, transformations, summation formulas, generating function and asymptotics. Relevant connections of certain special cases of the main results presented herewith are also pointed out.

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**Keywords and phrases:** Generalized gamma function, extended gamma function, extended beta function, extended hypergeometric function, extended confluent hypergeometric function, Mellin transforms, transformation formulas, summation formula.

## REFERENCES

- [1] M. A. CHAUDHRY, A. QADIR, M. RAFIQUE AND S. M. ZUBAIR, *Extension of Euler's Beta function*, J. Comput. Appl. Math., **78**, (1997), 19–32.
- [2] M. A. CHAUDHRY, A. QADIR, H. M. SRIVASTAVA AND R. B. PARIS, *Extended hypergeometric and confluent hypergeometric functions*, Appl. Math. Comput., **159**, (2004), 589–602.
- [3] M. A. CHAUDHRY, N. M. TEMME AND E. J. M. VELING, *Asymptotic and closed form of a generalized incomplete gamma function*, J. Comput. Appl. Math., **67**, (1996), 371–379.
- [4] M. A. CHAUDHRY AND S. M. ZUBAIR, *Generalized incomplete gamma functions with applications*, J. Comput. Appl. Math., **55**, (1994), 99–124.
- [5] M. A. CHAUDHRY AND S. M. ZUBAIR, *On an Extension of Generalized incomplete gamma functions with applications*, J. Austral. Math. Soc. Ser. B, **37**, (1996), 392–405.
- [6] M. A. CHAUDHRY AND S. M. ZUBAIR, *On a connection between the Generalized incomplete gamma functions and their extensions*, J. Austral. Math. Soc. Ser. B, **38**, (1997), 581–589.
- [7] M. A. CHAUDHRY AND S. M. ZUBAIR, *On the decomposition of generalized incomplete gamma functions with applications to Fourier transforms*, J. Comput. Appl. Math., **59**, (1995), 253–284.
- [8] M. A. CHAUDHRY AND S. M. ZUBAIR, *Extended incomplete gamma functions with applications*, J. Math. Anal. Appl., **274**, (2002), 725–745.
- [9] M. A. CHAUDHRY AND S. M. ZUBAIR, *On a Class of Incomplete Gamma Functions with Applications*, CRC Press (Chapman and Hall), Boca Raton, FL, 2002.
- [10] J. CHOI, A. K. RATHIE AND R. K. PARMAR, *Extension of extended beta, hypergeometric and confluent hypergeometric functions*, Honam Mathematical J., **36**, 2, (2014) 339–367.
- [11] J. CHOI, R. K. PARMAR AND T. K. POGÁNY, *Mathieu-type series built by  $(p,q)$ -extended Gaussian hypergeometric function*, Bull. Korean Math. Soc., To appear.
- [12] A. ERDÉLYI, W. MAGNUS, F. OBERHETTINGER AND F. G. TRICOMI, *Tables of Integral Transforms*, vol. I, McGraw-Hill Book Company, New York, Toronto and London, 1954.
- [13] DRAGANA J. MAŠIREVIĆ, RAKESH K. PARMAR AND T. K. POGÁNY,  *$(p,q)$ -extended Bessel and modified Bessel functions of the first kind*, Results in Mathematics, (2017). doi:10.1007/s00025-016-0649-1.

- [14] F. W. J. OLVER, D. W. LOZIER, R. F. BOISVERT AND C. W. CLARK (eds.), *NIST Handbook of Mathematical Functions*, Cambridge University Press, Cambridge, 2010.
- [15] R. K. PARMAR AND T. K. POGÁNY, *Extended Srivastava's triple hypergeometric  $H_{A,p,q}$  function and related bounding inequalities*, J. Contemp. Math. Anal., (2016), (to appear).
- [16] E. T. WHITTAKER AND G. N. WATSON, *Modern Analysis*, Cambridge University Press, Cambridge, 1952.