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COMPUTABLE REPRESENTATION OF ULTRA GAMMA INTEGRAL

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Abstract: A certain integral is there in the literature which some authors call ultra gamma function, some others call it generalized gamma, some others call it Krätzel integral, some others call it inverse Gaussian integral, some others call it reaction-rate probability integral, some others call it Bessel integral, some others call it the unconditional density in a Bayesian structure and some others call it the Mellin convolution of a product. Thus, this integral is very important to various people in different disciplines. In this article, this integral is evaluated in computable series form. It is shown that the names, generalized gamma and ultra gamma are not appropriate for this integral.

Keywords and Phrases: Mellin convolution, Krätzel integral, ultra gamma function, generalized gamma function, Bessel integral, reaction-rate probability integral, inverse Gaussian integral, computable series form.

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1. Introduction

Consider the integral

$$B=\int_0^\infty x^{\gamma-1}\mathrm{e}^{-ax^{\delta}-bx^{-\rho}}\mathrm{d}x \tag{1.1}$$

for $a>0, b>0, \gamma>0, \delta>0, \rho>0$. If the integrand in B is to be made a statistical density then we may multiply the integral by the normalizing constant.