G-function of Meijer and generalized hypergeometric function: interplay of new facts

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We discuss various new properties of Meijer's G-function $G_{p,p}^{p,0}$, including integral and functional equations, nonnegativity conditions and number of zeros, convergence of measures with G-function density and regularization of integrals containing G-function. Some of these properties are then applied to derive new representations for generalized hypergeometric functions and establish some new and old facts about them. In particular, we prove log-convexity in upper parameters, demonstrate monotonicity of certain ratios and find new proofs for Luke's inequalities permitting their extension to wider parameter ranges. We further find an upper bound for the Gauss type generalized hypergeometric function not previously contained in the literature. Finally, using a different approach we give new two-sided bounds for the Bessel type generalized hypergeometric function of nonnegative argument.