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SOLUTION OF ELECTRIC CIRCUIT PROBLEM IN H-FUNCTION OF TWO VARIABLES AND NUMERICAL ANALYSIS

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ABSTRACT

In the present paper, we make an application of Fox's H-function in an electric circuit problem consisting of a resistance R, an inductance L, a condenser of capacity C, and a source of electromotive force $E_0p(t)$, where E_0 is constant and $p(t)$ is known function of time t. The charge $q(t)$ on the plates of condenser at any time t is obtained in the series involving H-funciton of two variables. Some interesting results through fractional calculus are also analysed.

2010 Mathematics Subject Classification : 26A33, 33C60, 33B15, 33E12

Keywords : Fractional integration, H-function of two variables, Gamma and Beta functions, Mellin-Barnes contour integral, Mittag-Leffler function, fractional calculus.

1. Introduction and Preliminaries. The generalized beta function is given by (see, Mathai, Saxena and Haubold [5])

$$\int_a^b (t-a)^{\alpha-1}(b-t)^{\beta-1}\,dt = (b-a)^{\alpha+\beta-1}B(\alpha,\beta)\ \left(\mathrm{Re}(\alpha)>0, \mathrm{Re}(\beta)>0; a\neq b\right). \tag{1.1}$$

and
$$B(\alpha,\beta)=\frac{\Gamma(\alpha)\Gamma(\beta)}{\Gamma(\alpha+\beta)}. \tag{1.2}$$

We use the binomial functions in the form

$$(ut+v)=(au+v)^{\gamma}\sum_{l=0}^{\infty}\frac{(-\gamma)_l}{l!}\left\{-\frac{(t-a)u}{au+v}\right\}^l \tag{1.3}$$

where, the pochhammer symbol is $(\lambda)_u=\dfrac{\Gamma(\lambda+u)}{\Gamma(\lambda)}$, (see, Rainville [9]).

The integral due to Prudnikov et.al. [7]

$$\int_a^b (t-a)^{\alpha-1}(b-t)^{\beta-1}(ut+v)^{\gamma}\,dt=(b-a)^{\alpha+\beta-1}(au+v)^{\gamma}B(a,b)\ {}_2F_1\left[\alpha-\gamma;\alpha+\beta;-\frac{(b-a)u}{au+v}\right] \tag{1.4}$$

CONTENT