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THE APPROXIMATE SOLUTION OF A NONHOMOGENEOUS PARTIAL DIFFERENTIAL-DIFFERENCE EQUATION

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Abstract

In the paper the approximate solution of a partial differential-difference equation is constructed using the two dimensional operational calculus introduced by T. Ogata ([4]) and the results of J. Wloka [8] for ordinary differential-difference equations.

In section 4, an estimate is given for the error of approximation in the space $\mathcal{F}_0$ of the Mikusiński operator field $\mathcal{F}$ and also obtained is that the sequence of approximate solutions $\{x_n\}$ converges to the exact solution in the convergence type I'(observed by T. Boehme [1] and J.Burzyk [2]). If the exact and the approximate solutions belong to the space $\mathcal{L}$ of locally integrable functions, then it is obtained that the sequence of the approximate solutions converges to the exact solution in $\mathcal{L}$.

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1. The form of the exact solution

We consider the linear partial nonhomogeneous differential- difference equation with constant coefficients

$$(1)\quad \sum_{\mu=0}^{m}\sum_{\nu=0}^{n}\alpha_{\mu,\nu}\frac{\partial^{\mu+\nu}x(\lambda,t)}{\partial\lambda^{\mu}\partial t^{\nu}}-\sum_{\mu=0}^{m_1}\sum_{\nu=0}^{n_1}\beta_{\mu,\nu}\frac{\partial^{\mu+\nu}x(\lambda,t-\tau)}{\partial\lambda^{\mu}\partial t^{\nu}}=\phi(\lambda,t),$$