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On general boundary value problem for parabolic equations

Dedicated to Prof. A. Kobori on his 60th birthday

By

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Let us consider the parabolic equation

(P. 1) $\frac{\partial}{\partial t}u(t, x) = A\left(t, x; \frac{\partial}{\partial x}\right)u(t, x),\ x\in\Omega,\ 0<t<T\ (<+\infty),$

or more simply

$$Lu \equiv \left(\frac{\partial}{\partial t} - A\right)u = 0,$$

where

$$A = \sum_{|\nu|\leqq 2b} a_{\nu}(t, x)\left(\frac{\partial}{\partial x}\right)^{\nu},$$

and Ω is a domain in R^n surrounded by a hypersurface S. Our problem is the following: Given $f_j(t, x)$, $j=1, 2,\cdots, b$, on $(0, T)\times S$, find a solution $u(t, x)$ of (P. 1) satisfying

(P. 2) $B_j u = f_j\quad (j = 1, 2,\cdots, b)$ on S, $0<t<T$,

and $u(0, x) = \lim_{t\to+0} u(t, x) = 0$, where

$$B_j\left(t, x; \frac{\partial}{\partial x}\right) = \sum_{|\nu|\leqq r_j} b_{j\nu}(t, x)\left(\frac{\partial}{\partial x}\right)^{\nu}, \quad 0\leqq r_j\leqq 2b-1.$$

Recently Eidelman has treated this problem ([2], [3], [4])*). Here we shall follow his method indicated in ([2]). More precisely,

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*) In the case where Ω is a convex domain, the corresponding result has been announced by Eidelman.