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ON THE EXISTENCE IN LARGE FOR ALMOST EVERYWHERE SOLUTION OF ONE-DIMENSIONAL MIXED PROBLEM FOR FOURTH ORDER SEMILINEAR PARABOLIC EQUATIONS

Abstract

This work presents a study of existence in large for almost everywhere solution of one-dimensional mixed problem with Riquier type homogenous boundary conditions for the semilinear parabolic equation of the following form:

$$u_t(t,x)+u_{xxxx}(t,x)=F(t,x,u(t,x),u_x(t,x),u_{xx}(t,x))\ (0\le t\le T, 0\le x\le \pi).$$

The concept of almost everywhere solution for the given mixed problem is introduced. The almost everywhere solution $u(t,x)$ of mixed problem under consideration is sought in the form of Fourier series

$$u(t,x)=\sum_{n=1}^{\infty} u_n(t)\sin nx \quad (0\le t\le T, 0\le x\le \pi).$$

After applying Fourier method, the finding of unknown Fourier coefficients $u_n(t)$ $(n=1,2,...)$ of sought almost everywhere solution $u(t,x)$ is reduced to solving some countable system of nonlinear integral equations. Then, under rather general one-sided restrictions on nonlinear right side of considered equation, the a priori estimate in $C^{0,2}_{t,x}([0,T]\times[0,\pi])$ for all the possible almost everywhere solutions of mixed problem under consideration is obtained and the existence in large theorem for almost everywhere solution is proved.