On positive solvability of neutral type equations

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Abstract

The purpose of this report is the existence and uniqueness proof of positive solution of equation

$$\frac{\partial}{\partial t}[u(t) + Du_t] = -Au(t) + Lu_t, t \geq 0, \qquad (1)$$

where A – nonlinear m-accretive operator in Banach lattice X_+, $u_t(\cdot) = u(t+\cdot)$ on $[-r,0], r > 0$, operators D, L belongs to $B(L^p([-r,0], X_+), X_+)$, for $1 \leq p < \infty$ or $B(C([-r,0], X_+), X_+)$.

The first part of report relate to the question of description of operators D and L in Banach space X and well-posed initial problems for equation (1). We suppose that D and L associated with functions $\eta_0, \eta_L : [-r,0] \to B(X)$ with bounded variation. In this case the initial problem $u(0) = x \in X$, $u_0 = \varphi \in C([-r,0], X)$ considered in direct product $X \otimes C([-r,0], X)$.

The second part of report is devoted to analysis of equation (1) in Banach lattice X_+ ordered by continuous norm. Established that C_0-semigroup T with generator A possesses module of semigroup $|T|$ with generator A^+. We consider also the examples of nonlinear partial differential equations of neutral type.