EXISTENCE, UNIQUENESS AND ASYMPTOTIC BEHAVIOR TO A FOURTH-ORDER EQUATION INVOLVING $p(x)$–LAPLACIAN OPERATOR

Abstract. This paper is concerned with the existence, uniqueness and general decay of weak solutions $u = u(x,t)$ for a class of plate equations with strong dissipation and lower order perturbation of $p(x)$-Laplacian type. Precisely, we consider the following problem

$$\begin{cases} \dfrac{\partial^2 u}{\partial t^2} + \Delta\left(|\Delta u|^{p(x)-2}\Delta u\right) - \Delta\dfrac{\partial u}{\partial t} + f\left(x,t,\dfrac{\partial u}{\partial t}\right) = g(x,t) \text{ in } Q_T, \\ u = \Delta u = 0 \text{ on } \partial\Omega \times (0,T), \\ u(x,0) = u_0(x),\ \dfrac{\partial u(x,0)}{\partial t} = u_1(x) \text{ in } \Omega. \end{cases} \tag{1}$$

Where $\Omega \subset \mathbb{R}^n$ $(n \geq 3)$ is a bounded domain with smooth boundary $\partial\Omega$, $0 < T < \infty$ is a given constant and $Q_T = \Omega \times (0,T)$.

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References.

(1) Antontsev, S. and Ferreira, J.; *Existence, uniqueness and blow up for hyperbolic equations with nonstandard growth conditions*, Nonlinear Analysis, v. 93, 2013, 62-77.

(2) Diening, L. et al.; *Lebesgue and Sobolev spaces with variable exponents*, Lecture Notes in Mathematics, v. 2017, Springer, Heidelberg, 2011.

(3) Fan, X. L. and Zhao, D.; *On the spaces* $L^{p(x)}(\Omega)$ *and* $W^{m,p(x)}(\Omega)$, Journal of Mathematical Analysis and Applications, v. 263, 2011, 424-446.

(4) Ferreira, J. and Messaoudi, S. A.; *On the general decay of a nonlinear viscoelastic plate equation with a strong damping and* $\overrightarrow{p}(x,t)$*-Laplacian*, Nonlinear Analysis, v. 104, 2014, 40-49.

(5) Nakao, M.; *Energy decay for the quasilinear wave equation with viscosity*, Mathematische Zeitschrift, v. 219, 1995, 289-299.

(6) Antontsev, S.; *Wave equation with* $p(x,t)$*-Laplacian and damping term: existence and blow-up*, Differ. Equ. Appl., v. 3, 2011, 503-525.

(7) Antontsev, S. and Ferreira, J.; *On a viscoleastic plate equation with strong damping and* $\overrightarrow{p}(x,t)$*-Laplacian: existence and uniqueness*, Differential and Integral Equations, v. 27, Numbers 11-12, 2014, 1147-1170.